

Research Report

2012



UNIVERSITY OF
KWAZULU-NATAL™

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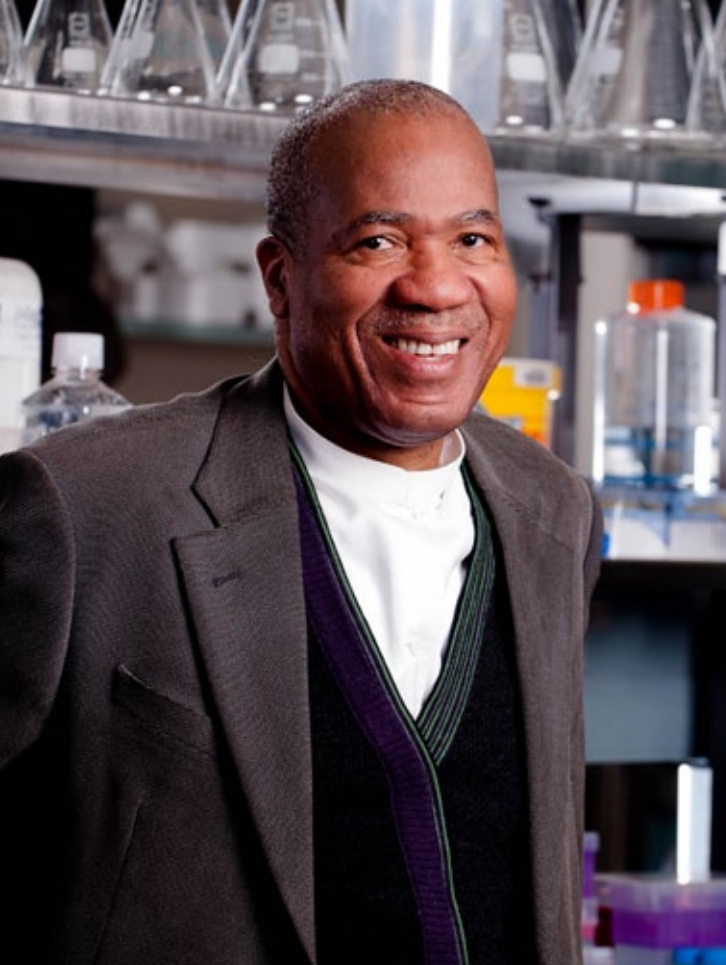
INSPIRING GREATNESS

Research Report 2012

RESEARCH REPORT 2012

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A Research Ethos

MESSAGE FROM THE VICE-CHANCELLOR AND PRINCIPAL

Professor Malegapuru Makgoba

It is gratifying to see that the momentum in the growth of the research enterprise was maintained in 2012, enabling us to attain many of our objectives.

The research productivity did not only exceed the previous year's in terms of publications, but also the number of staff publishing and the per capita output increased. This is a clear demonstration that the research ethos has been embraced across all sectors of the research community, which is also indicative of the success in the capacity building and transformation initiatives of the institution. In 2012, UKZN's research excellence was further recognised through the award of three South African Research Chairs and appointment of two new A-rated researchers by the National Research Foundation.

UKZN was also identified as one of the leading research universities on the continent by the world university ranking bodies such as the Times Higher Education (THE), Academic Ranking of World Universities (ARWU) and the Quacquarelli Symonds (QS). The increase in the number of research projects funded by industry and other sources indicates enhanced institutional capacity and reputation in attracting research funding.

I would like to take this opportunity to thank all the staff and students for their hard work, which contributes to the reputation and recognition of UKZN as a research-led institution.

This is the last research report prepared under the leadership of Professor Nelson Mutatina Ijumba. He has served as the longest Deputy Vice-Chancellor: Research at UKZN. During his tenure he has been the most effective and efficient DVC in this portfolio. He has ensured that UKZN reaps the benefits of all the research policies recommended by the Senate and approved by the Council. On behalf of the Executive and the University community I wish him and his family well.

Malegapuru Makgoba
Vice-Chancellor and Principal

Exceeding Research Productivity

MESSAGE FROM THE DEPUTY VICE-CHANCELLOR RESEARCH

Professor Nelson Ijumba

The research productivity in 2012 exceeded the previous year's in many indicators, making it the most productive since the inception of UKZN.

The overall institutional research productivity and journal articles output increased by 15%. The number of publishing staff as well as the output per staff improved substantially from the previous year. The proportion of publishing staff increased to 89% from 81% and the per capita output increased from 60 to 73 productivity units. In 2012 about 13% of the Lecturers had PhDs compared to 83% for the Professors, an improvement from 12% and 74% in 2011, respectively. The proportion of Research/Instruction staff with PhDs increased from 41% in 2011 to 47% in 2012. The number of publishing African staff has increased from 127 (11%) in 2011 to 153 (12%) in 2012 and the number of publishing female staff has increased from 451(38%) to 488 (39%) in the same period. The increased participation in research cut across academic levels, race and gender signified the success of the institutional capacity building and transformation initiatives.

The increased level of productivity and participation are also clearly reflected in the profile of the Top 30 Published Researchers for 2012. The listed number of researchers increased from 30 to 34. Four of them are Africans compared to one in 2011, and the number of listed females increased from 4 to 7. In terms of age groups, the number of researchers below 40 years of age increased from 3 (10%) to 6 (18%), and those older than 60 years, decreased from 7 (23%) to 5 (15%).



In 2012, two of the institutionally supported research initiatives showed significant progress. The number of postdoctoral scholars increased to 148, from 22 in 2011. About 85% of the postdocs were funded by UKZN, which marked a significant institutional commitment of resources. The African Indigenous Knowledge Systems (AIKS) was initiated as a signature project to facilitate and co-ordinate the integration of AIKS into research, teaching, learning and community engagement, making UKZN a hub for scholars on AIKS and African Scholarship, consistent with the institutional vision of being the "Premier University of African Scholarship". In 2012, 103 of the doctoral degrees (58%) and 154 (8%) of the journal publications were in AIKS related topics in disciplines across all the four Colleges.

In the national system, UKZN produced the highest number of book units and was third overall, in terms of total publications units, based on the 2011 outputs, which were evaluated in 2012 by the Department of Higher Education and Training. In 2012, UKZN was awarded three South African Research Chairs (SARChI) and two of its researchers received, for the first time, the A rating by the National Research Foundation. Internationally, UKZN was listed in the four major world university ranking bodies. It was in the Top 400 in the Times Higher Education (THE); Top 500 in the Academic Ranking of World Universities and Top 600 in the Quacquarelli

“ Our improved performance in the rankings where we are benchmarked against the world’s best has had a positive impact on how we conduct our core business and a significant effect on the institutional reputation. ”

Symonds (QS) listings, respectively, as well as fifth in Africa by the Webometrics rankings. Our improved performance in the rankings where we are benchmarked against the world's best has had a positive impact on how we conduct our core business and a significant effect on the institutional reputation.

In 2012, funding attracted through grants and contracts with industry and funding agencies, was R 385 million, compared to R 261 million in 2011. This was indicative of our enhanced capacity to attract funding through collaborations and partnerships.

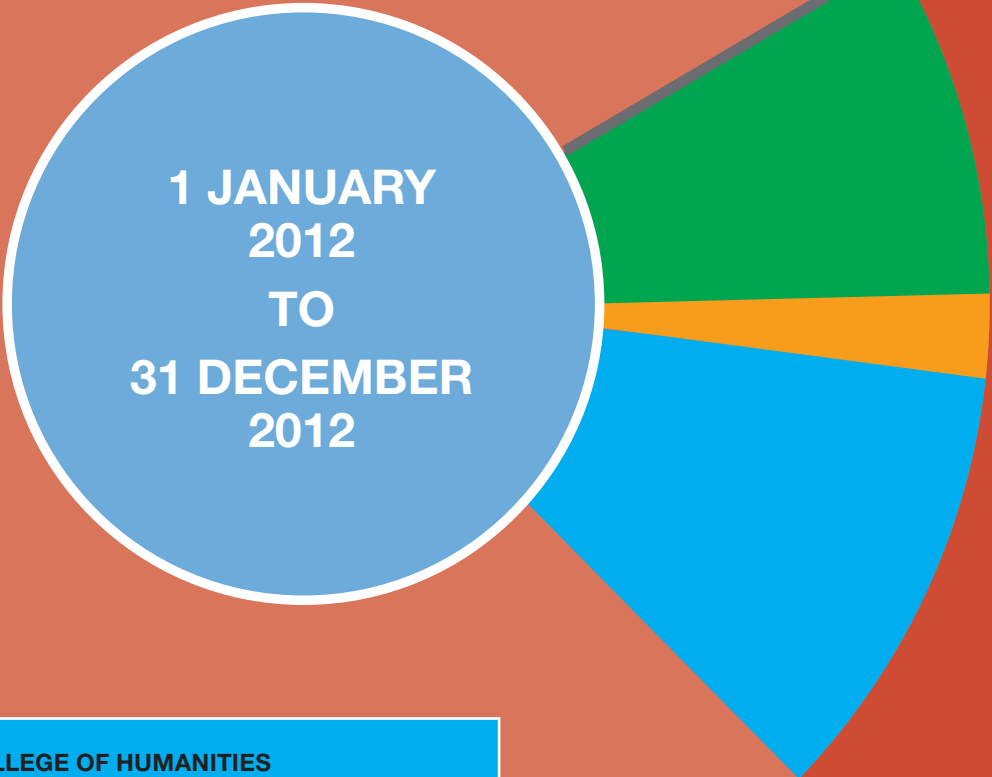
Last year saw a number of our researchers receiving a number of national and international awards in recognition of their significant contributions to research. These include: the first South African-German Science award was presented to Professor Malegapuru Makgoba, Professor Roland Schulze was voted South Africa's top water researcher in an nationwide survey, Professor Jacek Banasiak was awarded the South African Mathematics Society medal for research excellence, Professor Salim and Quarraisha Abdool Karim were awarded the international N'Galy-Mann award for their contribution to epidemiology and clinical research and Professor Keyan Tomaselli received the Lifetime Achievement award for communication research by Johns Hopkins Health and Education in South Africa.

I would like to congratulate all the researchers for their hard work as well as acknowledge the support we have enjoyed from our funders and collaborators, all of which contributed to the institutional achievements for 2012.

Professor Nelson Ijumba
Deputy Vice-Chancellor: Research

R 389 689 750

TOTAL VALUE OF RESEARCH GRANTS AND CONTRACTS 2012



COLLEGE OF HUMANITIES R40 672 260
COLLEGE OF AGRICULTURE, ENGINEERING AND SCIENCE R 31 622 007
COLLEGE OF HEALTH SCIENCES R 310 072 737
COLLEGE OF LAW AND MANAGEMENT STUDIES R 7 107 247
RESEARCH OFFICE R 215 500

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Research Focus Areas

African Indigenous Knowledge Systems
Agriculture and Food Security
Biotechnology

Energy and Technology for Sustainable Development

Gender, Race and Identity Studies
HIV/AIDS, Tuberculosis and Health Promotion
Maritime Studies
Social Development and Economic Studies
Water, Environment and Biodiversity

11

SARChI Chairs

Economic Development
Evolutionary Biology
Fluorine Process Engineering and Separation Technology
Quantum Information Processing and Communication
Gravitating Systems
Systems Biology of HIV and AIDS

Applied Poverty Reduction Impact Assessment
Indigenous Health Care Systems
Land Use Planning and Management
Intelligent Real Time Power Systems
Rural Agronomy and Development

105 957,61

Total Institutional Output in Productivity Units

102 385,26

Institutional Submission to DHET in Equivalent Productivity Units

1 814

Submitted Number of Journal Articles

1 240

Publishing Research Staff

501

Black Researchers

153

African Researchers

488

Women Researchers

209

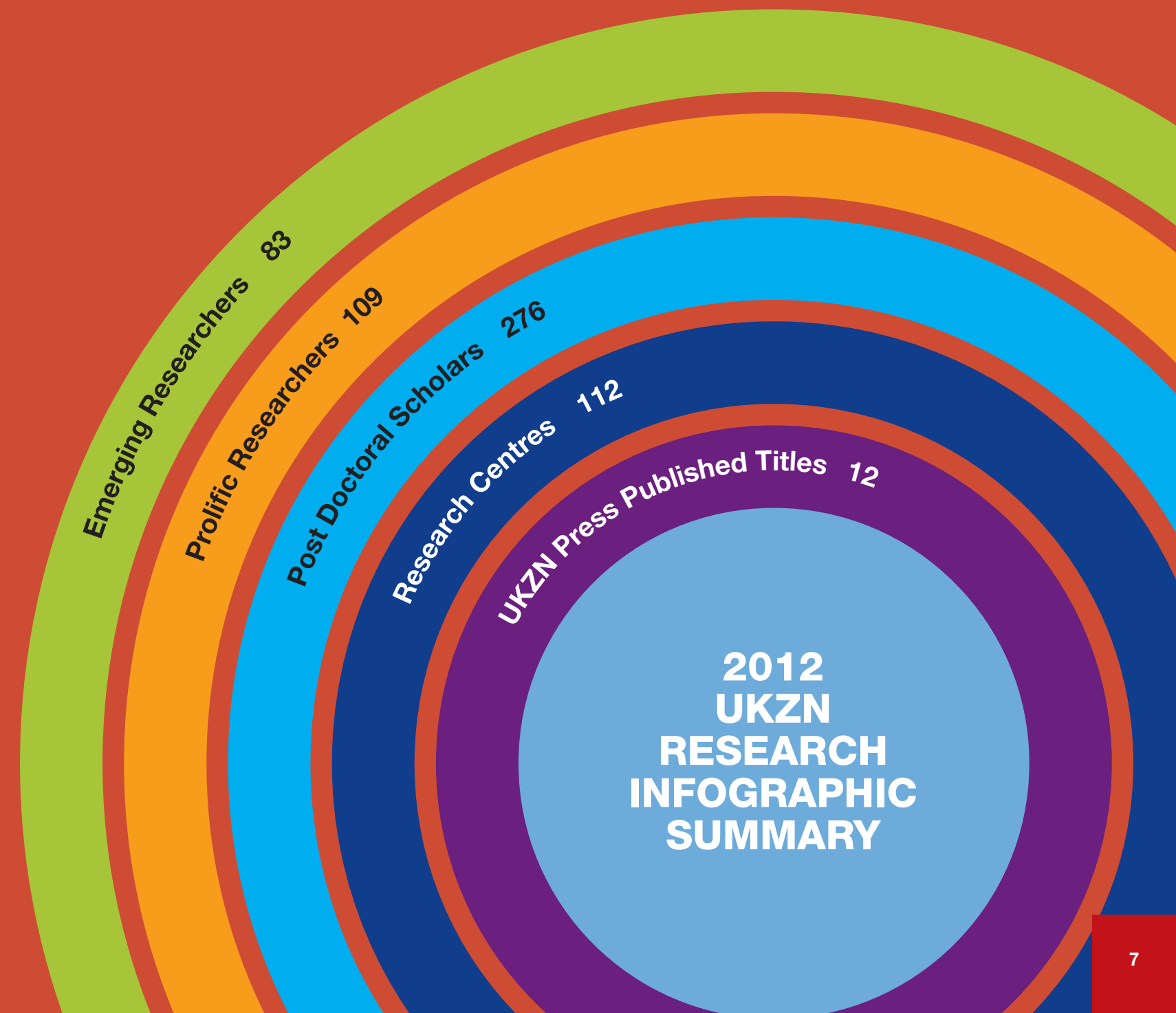
Number of NRF-Rated Researchers

6

NRF A-Rated Researchers

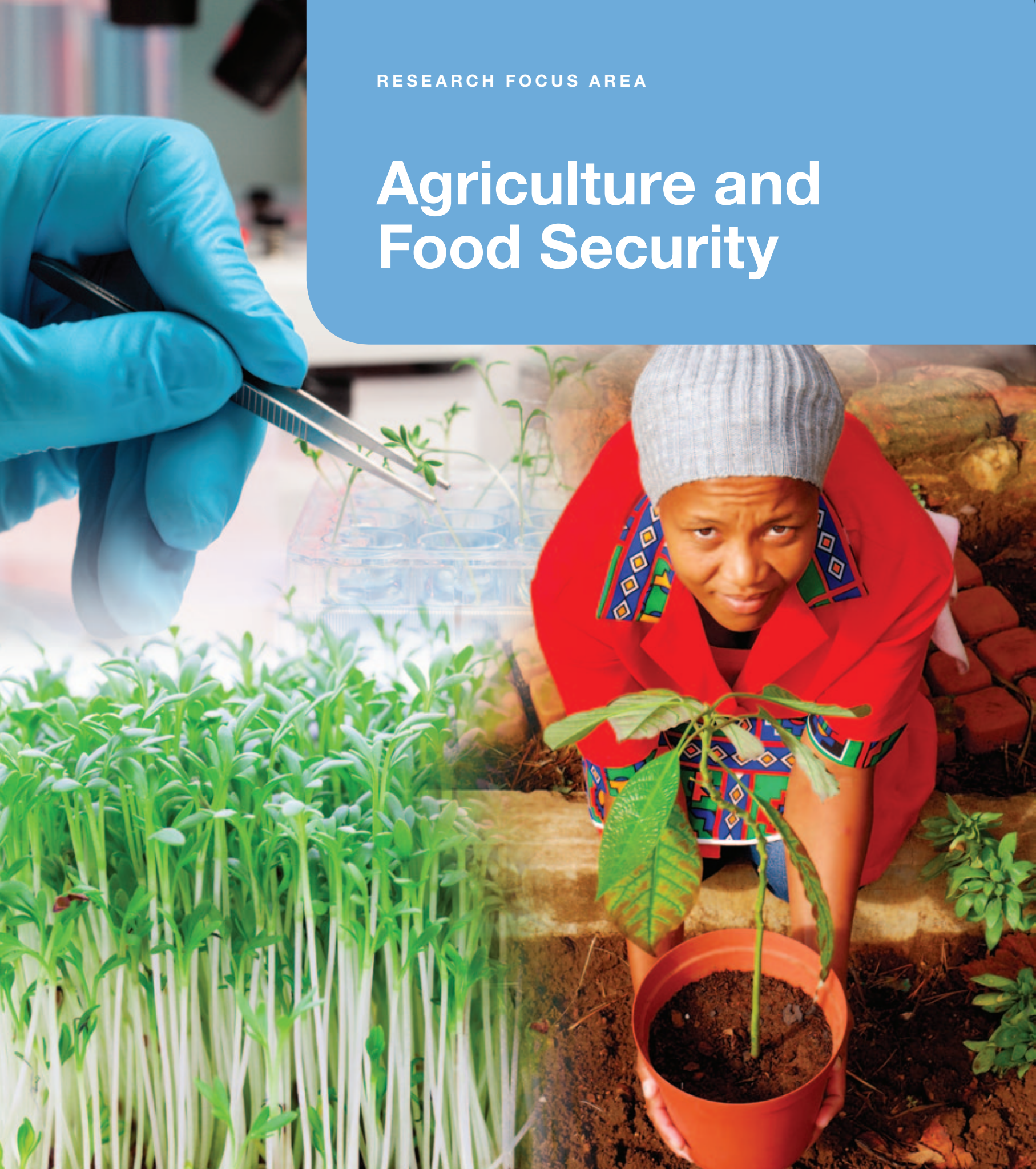
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SARChI Chairs



Agriculture and Food Security

This focus area is home to A-rated National Research Foundation researcher Professor Rob Gous and two recently awarded Research Chairs – in Land Use Planning and Management and Rural Agronomy and Development – awarded in terms of the South African Research Chairs Initiative.



Research in this area is aimed at eradicating food insecurity and enhancing sustainable livelihoods in Africa. A number of research institutes support this mission, all of which are recognised for their work which is changing the way crops and animals are produced and managed throughout the world.

They include:

- The African Centre for Crop Improvement (ACCI)
- The African Centre for Food Security (ACFS)
- Poultry Research

The African Centre for Crop Improvement trains African plant breeders with the aim of solving Africa's food problems – in Africa.

Initially funded by the Rockefeller Foundation, the ACCI is now supported by the Bill & Melinda Gates Foundation which came on board through a consortium known as the Alliance for a Green Revolution in Africa (AGRA).

In 2012, the ACCI won the AGRA award for outstanding contributions to food security in Africa. The award was presented in Tanzania by AGRA Chair and former Secretary-General of the United Nations, Mr Kofi Annan.

Since 2002 the ACCI has recruited 85 students from 13 African countries and has graduated 42 with PhD degrees in plant breeding. It has achieved exceptionally rapid throughput of graduates – 85 percent of its students have graduated on time.

Without exception, all ACCI graduates have stayed in Africa, mostly to work on food crops in their home country. In most cases, this has been with ongoing funding from AGRA, which has allowed them to continue their PhD breeding programmes

to the point of release of many new crop varieties, lines and hybrids.

The ACCI staff and students have published more than 85 scientific articles in international ISI-accredited journals. All academic staff of the ACCI have their own breeding programmes working on both food and biofuel crops and constitute one of the strongest groupings of active plant breeders in Africa.

Established in 2006 in response to Africa's growing food security crisis, the African Centre for Food Security is helping to build the critical mass of African expertise required to address hunger on the continent. The ACFS is one of very few institutions in the world providing accredited capacity development for food security research and policy analysis.

The Centre has been endorsed by the New Partnership for Africa's Development (NEPAD) as the lead agency in the food security activities of the Comprehensive African Agricultural Development Programme (CAADP) and has received formal recognition as the Southern African Development Community (SADC) Regional Centre of Excellence for Vulnerability Assessment and Analysis (VAA), including VAA training and co-ordination. It is one of the few established Food Security Centres in the world to offer trans-disciplinary training, and through UKZN, named degrees in food security. Through its representatives, the Centre played a leading role in the development of the Framework for Agricultural Food Security (FAFS).

In the area of **Poultry Research**, scientists at UKZN have developed a model that has been adopted by poultry scientists and producers around the world. Research over the past two decades has involved the development of simulation models that predict food intake and growth of broilers and pigs, and reproductive activity in broiler breeders and laying hens. The research has led to extensive publications on the lighting management of broiler breeders and has resulted in a paradigm shift in the way that the birds are managed throughout the world. As part of its engagement with the community, the Poultry Institute is involved in training prospective poultry managers.

AFRICAN CENTRE FOR FOOD SECURITY (ACFS)

Professor Albert Modi

Traditional Crops: The promise of greater food security



The re-introduction and widespread cultivation of traditional African food crops in South Africa opens the door to greater food security, sustainable agricultural practices and economic development, argues UKZN agronomist and crop scientist Professor Albert Modi.

“With population increases and the anticipated impacts of climate change, the reality is that we need to expand the national food basket to include indigenous and traditional African crops,” says Modi.

“We cannot continue to rely on a few commercial crops, many of which cannot be used as daily food without some degree of processing.”

As Modi points out, most of the agricultural land in KwaZulu-Natal is under commercially-produced sugarcane. “We can’t forget that the majority of people living in KwaZulu-Natal are Black who need access to healthy nutrition – that means energy and protein in terms of the definition of food security,” he says. Many traditional crops could provide these nutrients – sorghum, millet, old varieties of maize, bambara groundnuts, amadumbe and cowpeas – but they are not well-researched and their benefits as food crops are not widely understood.

“I believe that one of the reasons that Africans are not participating in agriculture is because we are imposing on them crops they are unable to manage. We need participatory research to help people to plant the right crops, re-embrace them as part of their culture, and use the land in a sustainable manner to better address food security,” he says.

In addition, less research is done on traditional crops because they are grown by subsistence farmers and there is not a lot of money in this area, says Modi. “One of my goals is to develop the relevant scientific information, reach out to communities, and conduct research trials in these communities.”

Modi has already successfully forged a partnership with small-scale farmers in Umbumbulu in KwaZulu-Natal and secured their registration and certification as organic producers. In 2002/3 it was successful in bringing the traditional root crop amadumbe produced by these farmers to supermarkets,



a project which attracted funding from the Water Research Commission which recognised the value of crops able to grow in water-scarce environments. “The real challenge is: how do you grow food crops in a country with limited water and where more than 50% of available water is used in agriculture? We should be able to produce a sufficient yield regardless of water availability,” argues Modi.

Modi is currently mentoring a number of students in the area of sustainable agriculture and collaborates frequently with the African Centre for Food Security because, as he says, “Agriculture is at base about food security.”

He is also researching management systems to encourage biodiversity in agriculture so that a variety of crops, planted at the same time and in the same area, might assist each other in terms of factors such as pest control. This will ultimately lead to sequential harvesting – a strategy to ensure food is available all year round. The intersection of science and indigenous knowledge is not always a comfortable place, but Modi suspects that in many cases scientists and farmers share similar understandings of crops and their production, but are separated in the way that their knowledge was originally derived. The ultimate aim, however, is to bring the two systems together – to everyone’s advantage: “My aim is to see whether indigenous knowledge is something we can tap into to inform the science that exists in universities and textbooks,” he says.

AT A GLANCE: PROFESSOR ALBERT MODI

An Agronomist with a PhD in Seed Science and Technology, Albert Modi’s interests are concentrated in the field of rural agriculture and development, organic farming and agricultural sociology.

As a Fulbright Scholar, Modi earned his doctorate from Ohio State University where he worked on soluble carbohydrates in soybean during seed development and germination.

After returning to the University of KwaZulu-Natal for a period, he joined the Department of Economic Development in KwaZulu-Natal in 2008 to establish and lead the Moses Kotane Institute of Science and Technology as a Chief Executive Officer, while he continued to be associated with UKZN as an Adjunct Professor. He has supervised six PhD and 11 MScAgric students, publishing widely in national and international journals.

Modi was the founder in 2001 of the Ezemvelo Farmers’ Organisation (EFO) with farmers of Umbumbulu, the first association of small-scale farmers in South Africa to obtain group organic certification. The farmers have supplied Woolworths since 2003. In 2009, he succeeded in raising R2.5 million from the National Development Agency for training and technical development of the farmers.

Modi has been the President of the South African Society of Crop Production for two terms. He is a member of the Academy of Science of South Africa, the Third World Academy of Sciences and the New York Academy of Sciences, among others. In 2009, the Agricultural Writers SA (North) honoured him with the Agriculturalist of the Year Award, and in 2011, he received a Fellowship Award from the South African Society of Crop Production.

He has participated in research with the Seedling Growers Association of South Africa and South African National Seed Organisation to determine a seed quality model for the South African seed and nursery industries. He was also a member of Organics South Africa, where he was responsible for the development of a technical support and R&D strategy for the organic industry in South Africa.

Professor Ayalneh Bogale

Food Security: A global concern

The headway made by countries such as Brazil shows what can be done if there is political commitment and long-term investment in the poor. This is the view of Professor Ayalneh Bogale who heads UKZN's African Centre for Food Security, the University's pioneering contribution to building and sustaining the critical mass of expertise in Africa required to alleviate hunger on the continent.

An agricultural economist, Bogale is alive to the complex political, social and economic dimensions of the prevailing phenomenon of food insecurity in the 21st Century – a phenomenon he insists is not confined to the developing world.

"Africa is certainly one of the most food insecure continents, with one-third of the continent's population estimated to be food insecure. But there are pockets of food insecurity throughout the world," he says. "In the United States, a recent report by Economic Research Services of the US Department of Agriculture found that 14.9% (17.9 million) of US households were food insecure at some time during 2011."

Simply on the grounds of scale – there are more than one billion people who are food insecure in the world – there is growing realisation that food security qualifies as a global issue. This is reflected, says Bogale, in the increasing number of agriculture and food security related initiatives including teaching and research programmes being initiated at universities and various institutions around the world, including in the United Kingdom, Australia, Canada, Germany and the US, to mention a few. "At an international level, the United Nations, largely through the FAO, has devoted large resources to food security initiatives, bringing together researchers, policy makers, academia, civil society organisations and agencies."

In South Africa, recent surveys estimate that at least 20% and at most 33% of the population (depending on location) are food insecure with massive implications for the health and productivity of the population. According to a report recently released by the Human Sciences Research Council, also known as the SANHANES-1 report, overall only 45.6% of the population are food secure, whereas 28.3% are at risk of hunger and 26.0% experienced hunger. When disaggregated by province, the degree of hunger is the lowest in the Western Cape (16.4%) and Gauteng (19.2%) whereas the proportion of food insecure population is higher than 30% for the Eastern Cape and Limpopo provinces.

"In a very simple statement, if your workforce is hungry, it cannot be expected to be productive. Hunger and nutritional deficiencies may influence food availability by lowering the labour productivity of the workers – by reducing the adoption of improved technologies and the use of inputs and by leading to suboptimal use of resources including land and water."

For children there are implications for long-term cognitive development. "The International Policy Research Institute, for example, reports that more than half of developing countries' child mortality is associated with malnutrition and hunger. Children who suffer from hunger and malnutrition are less resistant to several infectious diseases and more likely to die from such illness. Current generation and future generations are affected. It must be tackled," says Bogale.

For Bogale, the role of governments in this bid is critical. "In Africa we are in a good position because of our natural resources, but political will is also needed," he says.

African governments for their part have recognised the importance of regional collaboration around food security through the establishment and work of the Comprehensive African Agriculture Development Programme (CAADP), the agricultural programme of NEPAD. And the continental expertise of the ACFS has been recognised in its being appointed the lead technical agency for CAADP Pillar 3, which is dedicated to food security issues.

The ACFS is also the SADC Centre of Excellence for Vulnerability Assessment and Analysis and, with its SADC partners (Bunda College and Chancellor College of the University of Malawi, University of Zimbabwe, University of Namibia and Sokoine University of Agriculture, Tanzania), is designing and offering appropriate training programmes and qualifications to address the skills shortage in this crucial area.

Because of the multidisciplinary nature of food security, the Centre facilitates transdisciplinary collaboration among and between staff, students, stakeholders and civil society communities.

Says Bogale: "Food security can't be addressed through one discipline such as crop science or water science, soil science, economics, sociology, etc ... it affects every sector of life. We bring together different experts to conduct research as a team."



In addition to course-work based and research-based postgraduate degrees, the Centre offers a popular one-year postgraduate diploma in food security.

"A number of new research projects launched in 2011 and 2012 are set to give academics and students extensive opportunities for relevant research," says Bogale.

One of these is the Developmental Research Activities in Support of Food Security in Selected District Municipalities of the Department of Agriculture, Forestry and Fisheries Project, a three- to five-year project that carries a minimum allocation of R3 million. Others include a Department of Agriculture project in relation to the Strategic Plan for Smallholders Support and three Water Research Commission-sponsored research projects that relate to access to irrigation for entrepreneurship, empowerment of women, and food security.

"It is expected that this research will generate fundamental knowledge about processes that become the basis for advancement and implementation of the food security agenda from both policy and practice perspectives," says Bogale.

AT A GLANCE: PROFESSOR AYALNEH BOGALE

Professor Ayalneh Bogale holds a PhD in Agricultural and Resource Economics from Humboldt University of Berlin and BSc and MSc degrees in Agricultural Economics from Haramaya University, Ethiopia.

His research interests are the economics of resource degradation, poverty and food security, property rights, and adoption of technologies.

He has received various research and fellowship awards including the Alexander von Humboldt Research Fellowship (2007-2009), the Agriculture for Peace Research Fellowship from the International Foundation for Science and the United Nations University-Institute of Advanced Studies, the DAAD Scholarship and Nuffic Scholarship.

He has published refereed articles in, among others, the *Journal of Development Studies*, *Land Degradation and Development*, *Tropical Science*, *Human Ecology*, *Ecological Economics*, *Irrigation and Drainage Systems*, the *Quarterly Journal of International Agriculture*, the *Journal of Rural Development in the Tropics and Sub-tropics* and the *Journal of Rural Development*. He has made numerous contributions in the form of papers to national and international conferences to share his findings from collaborative research projects.

Biotechnology

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iotechonology is a broad multidisciplinary area which is defined by the United Nations Convention on Biological Diversity as

“any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use”. Biotechnology has a range of applications in medicine, industry, agriculture and the environment, and can play a key role in meeting national imperatives in these areas.

UKZN provides a broad platform for various biotechnology research projects and has a wide curriculum geared to train students in areas of biotechnology ranging from the bio-engineering of industrial yeast for controlled flocculation, biofuel production, mitochondrial enzyme regulation, the development of biomarkers of water pollution in aquatic organisms, the microbial response to climate changes in soils, and the implications on carbon-cycle feedbacks. Biotechnology research is conducted in disciplines such as:

Chemistry

Research areas include organic synthesis, asymmetric catalysis, peptide drug design and computational chemistry. Collaborative research is conducted around the testing of tuberculosis and anti-fungal drugs, the identification and diagnosis of tuberculosis and radio-labelled imaging agents. Researchers have access to an extensive collection of modern instrumentation – among the best on the African continent – which includes four NMR spectrometers (including 600 MHz with solids probe), and a wide range of chromatographic equipment (including GC-MS, LC-MS and MALDI TOF).

Medical Biochemistry

A mini drug discovery platform setup facilitates the conducting of assays for various natural and synthetic compounds to test for cytotoxicity. An evaluation of immunotoxicity using apoptosis assays is also conducted.

Novel drug development is underway to treat a range of diseases affecting people in Africa, ranging from cancer to diabetes, malaria and sleeping sickness. In the case of HIV and tuberculosis research efforts are aimed at the development of new treatments to combat growing drug resistance.

Research on stem cells is also taking place, while under the sphere of nanotherapeutics, the use of nanotechnology in foreign gene delivery is being investigated. UKZN has a dedicated cell/tissue culture facility which is also actively involved in assays looking at the *in vitro* cytotoxic effects of natural products.

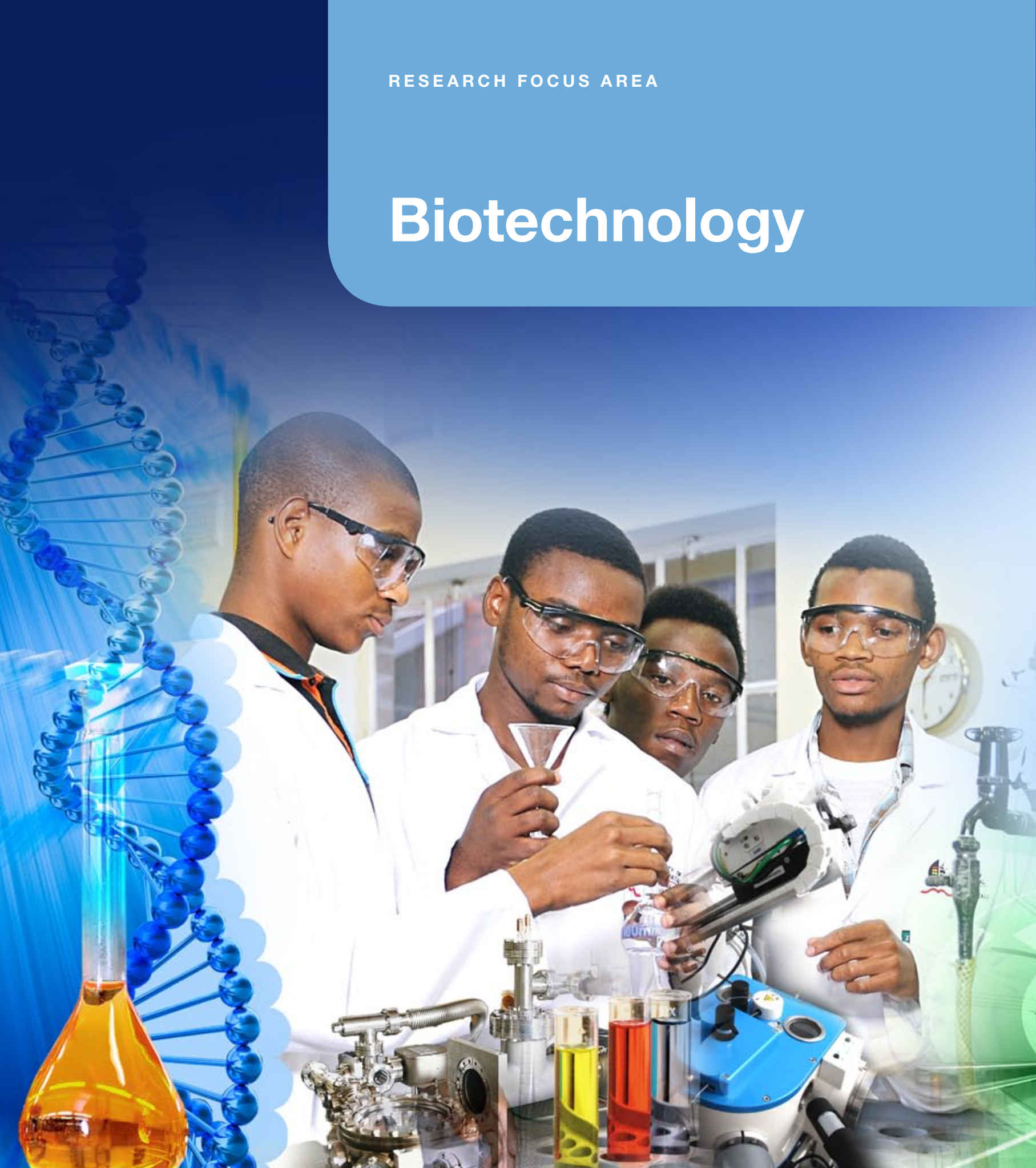
Genetics

Quantitative, population and molecular genetics technologies are employed in unveiling the contribution that genes make to important traits in animals. Molecular techniques are used to examine genetic factors underpinning biological diversity in the field of evolutionary biology. In the field of redox systems biology, the focus is on elucidating how the components in biological systems are integrated to give functional properties.

Microbiology

Research is conducted into the role and function of micro-organisms in a wide range of environmental and biotechnological processes. These include screening for biocatalysts from environmental samples, optimisation of biotechnological processes by artificial intelligence tools, isolation and characterisation of micro-organisms and their secondary metabolites with potential to tackle pathogens, improving beer quality by profiling flavour-active ester compounds in beer under different fermentation and nutritional conditions, and the study of diesel degradation mechanisms by several isolates using real time PCR and proteomic techniques. Screening is performed to isolate micro-organisms with potential for biotechnological applications.

Studies are currently taking place in the areas of biofuels and biopulping. Biotechnology is also being used in a range of water-related studies, including the impact of irrigation on the safety of food and bioremediation of water.



Professors Thavendran Govender and Gert Kruger

Drug development: Combating resistance

Resistance to drugs currently being used to treat some of the world's most deadly diseases such as tuberculosis and HIV/AIDS is rapidly increasing, making the search for new treatments one of science's most pressing current tasks, says Professor Gert Kruger of the UKZN Peptide and Catalysis Research Unit.

The Unit, formed in 2007 by Professor Thavi Govender, Kruger and Dr Glen Maguire to achieve "a critical mass in intellectual capacity and effectively do better research", is currently pursuing the development of new synthesised HIV and TB drugs which also address the problem of resistance. The group is currently one of the most prominent local role players in this field. Dr Tricia Naicker has joined the Unit recently, thereby expanding it. Fernando Alberico from University of Barcelona and Per Arvidsson from Karolinska Institute in Sweden are both fractional Research Professors at UKZN and are also members of the Unit.

The interests of the research group span the disciplines of organic synthesis, asymmetric catalysis, peptide drug design and computational chemistry. "In a relatively short period, we have managed to establish the most advanced synthesis and analytical chemistry research group on the continent," says Govender.

The work is actively enabled by a laboratory containing over R40 million worth in state-of-the-art equipment. "If your questions are limited by the capacity of your equipment, your answers will also be limited," says Govender. "Here in our lab and through our collaborations with the best in the world, we are able to provide the best answers to the most critical challenges."

Currently, among the greatest of these challenges is the rapid growth of drug resistance. According to Kruger, the failure of collective research efforts to produce new antibacterial drugs dates back to the late 1960s when pharmaceutical companies may have believed that the war against bacteria was won owing to the overwhelming success of chemotherapy during the 1950s and 1960s, and an under-estimation of the versatility of bacteria.

Perceptions that the current crisis might be limited only to the developing world – where fewer profits are to be expected from drug patents – might also explain the downscale in research

efforts, according to Kruger.

Already, the first new TB drug in 40 years (Bedaquiline) which reached the market in 2012, has been undermined by resistance.

Furthermore, a devastating new beta-lactamase (an enzyme produced by bacteria which provides resistance to antibiotics such as penicillins, cephamycins, and carbapenems) was recently discovered in India – the New Delhi metallo-beta-lactamase 1 (NDM-1). "Some scientists fear this drug resistant gene will be introduced to tuberculosis," says Govender.

Fortunately, the seriousness of this problem is now widely acknowledged, says Govender, and where pharmaceutical companies failed to provide enough new drug leads, opportunities have opened for universities to actively participate in the preclinical stages of drug development.

On the TB front, the UKZN team has focused on developing novel β -Lactams with which to target drug-resistant forms. The research explores the effect of change of steric and electronic characteristics in beta-lactams (carbapenems) on the effective inhibition of TB. "We are also using organocatalysis to introduce a new chiral centre close to the lactam bond of carbapenems ... Preliminary results have been positive and we believe we will be able to synthesise several new series of novel carbapenem derivatives in the next three years," says Govender.

In the field of HIV, the need is for new mutant-resistant HIV inhibitors. Existing AIDS drugs target the aspartic protease (PR) encoded by HIV. However, long-term ARV therapy has been found to promote the re-emergence of resistant mutation of the HIV PR and reduce the efficacy of the drugs.

In collaboration with institutions such as the University of the Witwatersrand and working closely with the Nelson R Mandela School of Medicine where *in vitro* testing on living cells is conducted, the team is investigating the use of polycyclic cage peptides which offer exciting new opportunities in terms of HIV PR inhibitors.

In addition to the synthesis and evaluation of inhibitors targeting HIV and TB, the research group is conducting research into the synthesis of classes of chiral ligands and catalysts and experimental and theoretical research on fundamental aspects of peptide folding.



(L-R) Dr Tricia Naicker, Professor Thavi Govender and Professor Gert Kruger.

In 2012 Govender and Kruger were also co-researchers in a study focused on developments in the field of polycyclic cage compounds which featured as the cover article of the journal *ChemMedChem* in March 2012 in a special issue on neuroscience drug discovery.

At a glance: Professor Thavendran Govender

A Pharmaceutical Chemist, Professor Thavi Govender's research interests are in asymmetric, catalytic and analytic chemistry.

In 2012, he was acknowledged for publishing his 100th ISI-recognised publication. He was among UKZN's top published researchers for 2011 and 2012 and has attracted over R33 million in funding.

Govender has published extensively in the fields of tuberculosis, HIV and asymmetric catalysis. He believes publishing in international papers and journals is one of the best measures of the quality of your training.

At a glance: Professor Gert Kruger

Professor Gert Kruger has expertise in polycyclic cage chemistry, NMR structure elucidation and computational chemistry.

He is a rated National Research Foundation (NRF) researcher and has attracted research funding of more than R9 million from various funding agencies since he joined the University. He was co-applicant with Professor Thavi Govender for an additional R17 million of funding for research equipment.

In 2000 he was a Visiting Professor at the University of North Texas in Denton, United States, in the laboratory of a world leader in cage chemistry, Professor Alan Marchand.

Kruger's current research interests are: cage chemistry, organic synthesis, NMR spectroscopy, computational chemistry, and cage drug synthesis (HIV and TB applications).

He has graduated 26 MSc and 13 PhD students and 15 Postdoc fellows with his group publishing more than 160 articles in international peer-reviewed journals and one book chapter.

Kruger was among UKZN's top 30 researchers in 2006, 2007, 2010, 2011 and 2012. He is a Scientific Editor of the *South African Journal of Chemistry* (Organic section) and publishes in journals such as: *Medical Chemistry Research*, *Bioorganic Chemistry Journal of Peptide Science*, *Journal of Medicinal Chemistry*, *Journal of American Chemical Society* and *Chemical Reviews*.

Energy and Technology for Sustainable Development

This research focus area is also the home base for three South African Research Chairs Initiative (SARChI) Chairs, namely, the Quantum Information Processing and Communication Chair held by Professor Francesco Petruccione, which is at the frontier of applying quantum mechanics to develop new technologies in the areas of quantum cryptography and quantum computing; the Fluorine Process Engineering and Separation Technology Chair, held by Professor Deresh Ramjugernath, which supports the South African Fluorochemical Expansion Initiative (FEI) and will aid in the development of a substantial fluorochemical industry in the country; and the recently awarded Chair in Intelligent Real Time Power Systems which will focus on optimised utilisation of energy sources in an integrated power system.



The energy sector is by far the largest contributor to global GDP and is the engine that drives the world's economy. The Energy and Technology for Sustainable Development focus area is providing leading research for the needs of South Africa, in keeping with the mission of UKZN as the Premier University of African Scholarship.

In the National System of Innovation, energy security has been identified as one of the “grand challenges”. Research in this sector is not limited to production and distribution of electricity, but also to efficient energy usage, as well as the limitation of the negative environmental effects which are caused by the production and use of energy sources. In this regard there has been a rapidly-growing research interest in improving and developing new technologies for the reduction of carbon dioxide and other greenhouse and flue gases emitted from coal power plants and fuel burning plants.

Research at UKZN in the area of technologies for sustainable development is finely woven into the research being undertaken in the energy sector. The University has a number of centres which are conducting research in various aspects of energy production and utilisation as well as technology application for sustainable development.

Research on renewable and alternative energy systems and technologies such as solar and wind as well as biofuels and conversion of municipal waste to natural gas for electricity production is being conducted by multidisciplinary teams in the College of Agriculture, Engineering and Science.

One of the pillars of this initiative is the Integrated Renewal Energy Advancement Programme (IREAP) which is a partnership between UKZN, an engineering company Karebo Systems, the Department of Trade and Industry, the Industrial Development Corporation of South Africa (IDC), the Technology and Human Resources for Industry Programme (THRIP), and other relevant partners for the development of a strategy for fundamental research into renewal energy.

Through its partnership with ESKOM, the University has enjoyed a significant investment in research and the establishment of state-of-the-art facilities such as the High Voltage Direct Current Centre and the Vibrational Research and Test Centre. The facilities are for research on improved equipment and system performance of electricity transmission and distribution networks. Sustainable manufacturing and chemical production is an area of strength in the School of Engineering with large research groupings in Mechanical and Chemical Engineering respectively.

The Thermodynamics Research Unit which is located in the Discipline of Chemical Engineering is a SASOL Centre of Excellence in Chemical Thermodynamics and undertakes research into the improvement and optimisation of chemical and separation processes for SASOL. Partnerships also exist with major players in the telecommunications industry with a centre of excellence in this area in partnership with Telkom and Alcatel-Lucent in the Discipline of Electrical, Electronic and Computer Engineering.

Research in Mechatronics and Robotics for Advanced Manufacturing Systems at UKZN has focused on Reconfigurable Manufacturing Systems (RMS), autonomous mobile robots and quality control systems for Advanced Manufacturing environments. RMS research has included reconfigurable machine design and materials handling for mass produced custom products. Research in autonomous mobile robots has focused on navigation, guidance, mobile robot co-operation, differential drive operational dynamics and optimised material handling routing, while research in quality control for Advanced Manufacturing systems has produced designs, assemblies and results that validate research objectives for part inspection and recognition.

FLUORINE PROCESSING ENGINEERING AND SEPARATION
TECHNOLOGY/THERMODYNAMICS RESEARCHProfessor Deresh Ramjugernath
The innovation ride

South Africa has the second largest reserves of fluorspar (calcium fluoride) in the world, most of which (95%) is exported without beneficiation into higher value fluorochemical products which can be derived from the raw material.

The global market for fluorochemicals fluorine in 2006 was estimated to be about US\$16 billion per year. Thus, despite supplying 10% of the fluoride source for this industry, South Africa is estimated to earn less than 0.5% of its value.

In a bid to address this deficiency, the South African government launched the Fluorochemical Expansion Initiative (FEI) in 2009, a priority strategy aimed at increasing the beneficiation of domestic fluorspar (calcium fluoride), expanding product development and growing human capital.

Part of this strategy was a substantial investment in national research capacity concentrated in a handful of industrial and academic research institutions, one of which is the University of KwaZulu-Natal, where Professor of Chemical Engineering, Deresh Ramjugernath leads a large team of post-graduate students and researchers – arguably one of the leading research groups in its field globally – which actively contributes to the Fluorochemical Expansion Initiative by researching and developing South Africa's fluorinated products. Its activities are directly linked to the South African Nuclear Energy Corporation (NECSA) and SASOL.

Although fluorinated chemicals are used to produce a wide range of materials, the most important products earmarked by the FEI for development include fluoropolymers (Teflon), elastomers, pharmaceuticals and gases for semi-conductor processing. Fluoride chemicals are also important in the fields of renewable and nuclear energy.

The group's concern with sustainability is manifest in the area of separation technology. "Here, the emphasis is on better understanding chemical processes in order to optimise them and thus reduce energy requirements for those processes. In this way we contribute towards environmental sustainability," says Ramjugernath.

Ramjugernath and his team have also conducted preliminary research converting carbon dioxide into synthetic fuels, findings which open the door to a range of possibilities for using unwanted and often toxic waste products as energy sources.

In conjunction with other Schools in the University, and the Nelson R Mandela School of Medicine, the group is working on the synthesis of drugs containing fluorine atoms, and are testing the activities of these compounds in the treatment of diseases such as cancer, HIV and TB.

In 2012, the group published over 80 peer-reviewed articles reflecting its scientific investigations into various aspects of chemical process development and optimisation of separation processes. It also registered two patents.

The work of the Unit is also recognised globally and operates in partnership with a number of research groups throughout the world including the United Kingdom, Poland, the Czech Republic, France, Germany, the United States and Sweden. The Unit consistently attracts a number of international students and visiting scholars.

"Our group is truly internationalised," says Ramjugernath. "About 50% of our students are international and many of them come from African countries."

In addition to research, the opportunity afforded by his position to nurture the next generation of researchers and scientists ranks along with enterprise development as one of Ramjugernath's strongest "passions".

"I see tremendous value for South Africa in setting students up to be employment creators rather than employees. It's about an ethos, which I believe benefits the country. I get a major joy out of turning research projects into commercial ventures – and taking students along for that ride."

AT A GLANCE: PROFESSOR DERESH RAMJUGERNATH

Professor Deresh Ramjugernath is the DST/NRF South African Research Chair for Fluorine Process Engineering and Separation Technology and also Director of the Thermodynamics Research Unit at the University of KwaZulu-Natal (UKZN).

Ramjugernath has won numerous institutional and national awards. He received the National Science and Technology Forum (NSTF) Award in 2005 and 2010; the National Research Foundation (NRF) President's Award in 2005; the UKZN Faculty of Engineering Research Excellence Award on five occasions, and the UKZN Vice-Chancellor's Research Award in 2010.

In 2012, he was inducted into the Academy of Science of South Africa (ASSAf).

Over the past 10 years, Ramjugernath has successfully graduated more than 70 masters and PhD students and is currently supervising or co-supervising over 30 postgraduate and post-doctoral students. Together with his team of researchers, he has produced more than 300 conference and journal papers during the past decade.

Ramjugernath featured on a list published in 2013 by New York-based Thomson Reuters reflecting the world's most highly cited scientists. The study was based on the number of times that scientific papers published between 2002 and 2011 have been cited by other researchers.



QUANTUM TECHNOLOGY - THEORETICAL PHYSICS

Professor Francesco Petruccione

Quantum technologies: In search of coherence

In early 2012, Professor Francesco Petruccione and members of his research team published their first paper on quantum biology since research in quantum technologies started in 2004 with Petruccione’s appointment as Professor of Theoretical Physics.

The paper, titled “Decoherence-assisted transport in a dimer system” was published in *Physical Review Letters* shows how decoherent interaction between a simple quantum system and an environment of quantum spin-half particles can increase the efficiency of energy transfer processes in photosynthesis.

According to Petruccione, quantum biology is the application of quantum mechanics to the biological sciences. It is an emerging research area aimed at trying to establish whether the quantum inanimate phenomena of the microscopic world could play a role in macroscopic living systems.

Developments in spectroscopy have revealed quantum effects in biological systems, such as the photosynthetic light-harvesting complexes of certain bacteria and marine algae. A number of experiments have shown there is quantum coherence in the transfer process.

“Understanding how living systems – which are complicated, relatively warm, constantly evolving and interacting with the environment – can sustain rather than destroy quantum coherence has important implications for the engineering of quantum systems to perform tasks such as quantum computation,” says Petruccione.

The field of quantum biology also holds the potential to help produce technologies geared towards sustaining life on our threatened planet. “Artificial photosynthetic systems may be a solution to our quest for clean, renewable energy, but that’s a long way off,” says Petruccione. “At this point, a proper understanding of the primary processes of photosynthesis is needed.”

How far quantum biology can enhance our understanding of life remains to be seen, says Petruccione. “The primary importance of quantum biology, in its present state, lies in the identification, appreciation and mimicry of the ingenious feats of nanoengineering taking place in living systems,” he says.

“If nontrivial quantum effects on a macroscopic scale play a role in getting the job done better in processes perfected

over billions of years at physiological temperatures and in immensely complex systems, then there exists before our very eyes a wealth of information in the biological world from which to draw inspiration for our own potential quantum technologies.”

Quantum biology is only one aspect of quantum technology, which also includes quantum computing, quantum communications (quantum cryptography and teleportation), and quantum information science (quantum control, quantum simulations and quantum metrology), all of which are pursued at the Centre as research areas.

While the unique phenomena introduced by the theory of quantum mechanics – wave particle duality, the uncertainty principle and quantum entanglement – have already found application in the electronics industry (think lasers, electron microscopy and magnetic resonance imaging), quantum technologies are now having an impact in their own right in fields such as quantum computing, information and communications, says Petruccione.

In the next five to 10 years, he says, the worldwide market for quantum products is expected to exceed \$70 billion per annum, with quantum-related services also likely to grow.

“With quantum technology, the power and speed of computers could double every 18 months. In the next five to 10 years it is expected that there will be commercial viability in fields such as quantum/atomic clocks, games, optical storage, biomedical imaging and simulation.”

As the only significant quantum information research group in Africa, the QTG is in a sound position to lead this technological revolution.

Already, the group has drawn international recognition: In 2010 staff member Abdul Mirza put his doctoral research on quantum cryptography (supervised by Petruccione) into practice when he project-managed the successful installation of vital communications and security systems for the 2010 World Cup at Moses Mabhida Stadium in Durban. He subsequently set up a company, QZN Technology, to commercialise his work.



AT A GLANCE: PROFESSOR FRANCESCO PETRUCCIONE

Professor Francesco Petruccione is a Theoretical Physicist who received his PhD and “Habilitation” (Dr. rer. nat. habil.) from the University of Freiburg i. Br.(Germany)

In 2004 he was appointed Professor of Theoretical Physics at the University of KwaZulu-Natal and in 2005 was awarded an Innovation Fund grant to set up a Centre for Quantum Technology. In 2007 he was granted a South African Research Chair for

Quantum Information Processing and Communication from the National Research Foundation.

He is the Deputy Director of the National Institute of Theoretical Physics and since March 2008 he is a member of the Board of the UKZN Innovation Company.

Petruccione has published more than 130 papers in refereed journals. He is the co-author of a monograph on *The*

Theory of Open Quantum Systems, that was published in 2002, reprinted as paperback in 2007, and has been translated into Russian.

He is a member of the Editorial Board of the International Journal *Open Systems and Information Dynamics*. He is the Editor of several proceedings volumes and of special editions of scientific journals. He has been invited to deliver more than 50 talks.

Gender, Race and Identity Studies



The focus area draws on multiple disciplines within the University to examine the ways in which identities are constructed, created and consolidated. These disciplines draw on several frameworks for engaging with issues of race, and gender, among other social categories – like age, sexualities and class.

In the context of health inequalities, AIDS, gender and sexual violence, the focus area of Gender, Race and Identity provides important conceptual tools to address how social structures that arise in history are reproduced but are also open to change. The research is strongly influenced by contemporary critical theories which question the framing of power inequalities.

Gender, Race and Identity focus on the dynamism and intersections of social inequalities and the vulnerabilities and anxieties of those belonging to groups usually constructed as powerful, as well as the agency of those belonging to groups usually seen as lacking power. The focus area thus locates itself by initiating serious and difficult debate, and by researching alternative routes to creating a society that is nonracial and that is simultaneously and measurably moving towards greater equality than that which is currently experienced by all South Africans.

Centre for Critical Research on Race and Identity (ccrri)

The focus area is a home to the Centre for Critical Research on Race and Identity (ccrri) which is dedicated to facilitating the study of race thinking and changing identities so as to improve understanding of, and stimulate public dialogue about, the epistemological, moral, cultural and other bases for perceptions of human diversity and difference.

Many of the initiatives in this focus area are housed in the College of Humanities. Some of its key programmes include:

Postgraduate and Research Programme in Gender and Education

Making schools safer, more peaceful and egalitarian, the Gender and Education programme examines how educators and learners interact, how they construct their gender identities and how schools operate. This postgraduate programme has trained many Masters and PhD students to address ongoing challenges (including violence in schools), and approaches to achieving Gender Equity (in e.g. the curriculum).

Postgraduate and Research Programme in Gender and Religion

South Africa, like many other parts of Africa, claims to be 85% religious, yet patriarchy and sexism still persists within a web of other oppressions such as racism and poverty. These oppressions often find overt and covert justification from within religion and culture. At the same time, it is acknowledged that religion and culture can also provide plausible structures as a means with which to overcome oppression. This seemingly dialectic tension is explored through research and the sharing of knowledge from such research within the Gender and Religion programme which has not only produced many masters and PhD graduates but has also produced research that has gained national and international prominence as the only formalised programme in Gender and Religion offered in Africa.



Professor Sarojini Nadar

Bridging the gap between society and the academy

In a roundtable discussion published in the *Journal of Feminist Studies in Religion* in 2012, Professor Sarojini Nadar and her co-author Professor Isabel Phiri argued that the epistemological frameworks generated by gender and religion studies have caused “significant paradigm shifts” within HIV knowledge production, affecting the ways in which knowledge on HIV is produced and used for prevention and care.

“These shifts have been so profound”, the authors argue, “that HIV studies that do not take these areas of study seriously can and should have their credibility questioned.”

Among these profound shifts – which include a focus on religion and culture in the discourse, the particularity of context, and a focus on masculinities – the authors list: “action research for change”, a methodology which, they argue, speaks to both the intellectual and activist commitments of the individual researcher.

“We wanted to achieve transformation not just through the product of the research but also through and during the process of research ... The process of doing research in these communities proved to be transformational for both the participants and for us as researchers; in fact, they were upfront about what they wanted from us as researchers. Hence the feminist values of relationality and mutuality were made manifest during the process of our research,” argue Nadar and Phiri.

This kind of research invites other researchers to reconsider the ways in which empirical research is conducted, to consider that research participants are much more than “raw data,” says Nadar.

“While we have always maintained this conviction within our [own] empirical research..., the conviction gained intensity and more significance in the context of HIV and AIDS – especially when one considers that HIV is not just a matter of theory but of life and death.”

A scholar in the field of feminist biblical hermeneutics, Nadar is one of UKZN’s top researchers. In 2012 she received the 2012 Department of Science and Technology’s Distinguished Young Women in Science Award in the category of Human and Social Sciences.

In 2012 she also piloted the Cohort Supervision Workshops for PhD students in the College of Humanities. Aimed at improving degree completion rates and offering academic support and interdisciplinary richness, the initiative was the first of its kind operating across the College in a trans-disciplinary context. “The feedback from the students concurs with what studies on the model have shown: that the model produces graduates who become critical thinkers and responsible knowledge producers and researchers,” says Nadar.

As an academic Nadar examines the way in which culture and religion sustain particular forms of gender discrimination which, in its most extreme form, can manifest as physical and sexual violence, but is also evident in the gendered pandemic of HIV and AIDS.

In keeping with her roundtable argument, she describes herself as an academic-activist with a commitment to transformational praxis.

“I am always in search of ways to bridge the gap between the academy and civil society,” she says. “What is important to me is that I live my research.”

Nadar says her own past experience of childhood sexual violence directly informs her current approach to research. “My research cannot be divorced from who I am. It is not only done for the sake of scholarship. It should make a difference in the world. Theory must lead to change,” she says, arguing for the need for the academy’s work to feed into policy decisions at all levels of society, including religious institutions.

“Some churches preach the headship of men, but it’s been shown through research that such belief systems in fact sustain violence. Many repeat offenders, for example, admit that their female victims ‘need to know who the boss is,’” she says. She quotes Anne Borrowdale who argues: “If submission continues to be the ‘theory,’ then abuse will inevitably continue to be the ‘practice.’”

Because not all violence is physical, Nadar adopts a holistic approach by examining the epistemic violence which sometimes manifests in religious texts, both sacred and contemporary. “Often the roles, voices and perspectives of women are missing, pushed to the margins where they remain unheard and usually unheeded.”

Nadar argues for interrogating religion rather than dismissing it, particularly as the 2001 religious census of South Africa reported that almost 85% of South African citizens claim to be religious. “You cannot fail to take religion in Africa seriously.



“ The feedback from the students concurs with what studies on the model have shown: that the model produces graduates who become critical thinkers and responsible knowledge producers and researchers. ”

It provides meaning and constructs the identities of millions. Religion and religious texts also contain vital resources to challenge gender inequity and prevent gender-based violence. Religious institutions too can provide transformative spaces for women, and feminists do themselves and the cause a disservice if they ignore this,” she says.

The study of religion also has a vital place in the public university. As Nadar and Phiri argued in a 2011 article titled “The personal is political: Faith and religion in a public university” published in *Acta Theologica*: “It should be noted that those who dismiss the study of religion in public universities claim that religion is ‘irrational’ and ‘unreasonable’ in modern society. To presume that those who subscribe to religious practices are all ‘irrational’ and ‘unreasonable’ is at the very least insulting, but it also shows a disregard for the significance of religion in Africa (as opposed to largely secular Europe).” She and Phiri conclude: “faith and religion can and must be exposed to academic scrutiny, and ... the best place for such scrutiny is the public university.”

At a glance: Professor Sarojini Nadar

In 2012, Professor Sarojini Nadar was appointed Dean of Research for the College of Humanities.

A prolific researcher, she has researched and published widely in the field of feminist biblical hermeneutics with a special focus on HIV and AIDS, gender-based violence, masculinity and sexuality. She also has a special interest in theories of feminism in Africa.

In 2012, she received the Distinguished Young Women in Science Award (Human and Social Sciences) from the Department of Science and Technology.

She is considered one of the University’s top-published researchers and has a C2 rating from the National Research Foundation.

In 2010 she received the University Dean of Research Award for top published woman researcher at UKZN, for her contributions in 2009. In that year she also achieved the position of top published researcher in the Faculty of Humanities, Development and Social Sciences and secured the second position among all UKZN researchers.

She has successfully supervised or co-supervised six PhD and nine masters students. As at 2012 she had published a total of 36 peer-reviewed journal articles; 14 book chapters and co-edited five books.

In 2006, Nadar and Professor Isabel Phiri won the UKZN Book Prize for their edited book *African Women, Religion and Health*.

Nadar is an Editor of the *Journal of Gender and Religion in Africa* and sits on the editorial board of the Harvard-based *Journal of Feminist Studies in Religion*.

BIKO

IN TIME, WE
SHALL BE IN A
POSITION TO
BESTOW ON
SOUTH AFRICA
THE GREATEST
POSSIBLE GIFT
- A MORE
HUMAN FACE

STEPHEN BANTU BIKO
18 DECEMBER 1946 – 12 SEPTEMBER 1977



Professor Rozena Maart New forms of consciousness

While still a child and doctoring the grievous psychological wounds of her family's forcible removal from District Six, Rozena Maart was handed a banned pamphlet produced by Steve Biko's Black Consciousness Movement.

"Few words since then have had such resonance for me," says Maart, now Head of Gender Studies at the University of KwaZulu-Natal and Acting Director of the Centre for Critical Research on Race and Identity [ccrri]. "Biko's ideas changed my life; they showed me the centrality of the mind; that the mind is the most important part of the body."

Since then, Biko's ideas – interrogated at the intersection of Derridean deconstruction and psychoanalysis – have remained an unbroken thread in her intellectual development and critical approach, coalescing in part as the intellectual scaffolding for her doctoral thesis – *The Politics of Consciousness: the Consciousness of Politics. When Black Consciousness meets White Consciousness* – completed at the Centre for Contemporary Cultural Studies at the University of Birmingham.

Together with feminism, Maart lists black consciousness philosophy as one of the foundations upon which her generation was raised.

Currently she is concerned to move students' conception of Biko as a revolutionary or protest scholar towards that of a globally-relevant thinker in the field of philosophy of consciousness, a man who understood the centrality of the mind in dissidence. This is readily illustrated though Biko's own references throughout his work to philosophers such as Hegel, Marx, Jaspers, Césaire, Fanon and Sartre. "There are many cases of revolutionaries who, like Biko, trained as medical doctors. Here it is possible to explore the materiality of race; the way in which race and racism affect physical and particularly mental health," argues Maart.

"My students often resist an emphasis on psychoanalysis, which they question and ask if it is African. But I remind them that one of the first recorded cases of psychoanalysis

“ ...African scholarship is not about negating European philosophy or other knowledge formation...It's about broadening our horizons and recognising not only one source of knowledge, but many, and trying to make connections between them. ”

came in the form of dream interpretation by Joseph in Egypt – when Joseph interpreted the dreams of Pharaoh, an event which had a profound impact on the history of Africa and its development. Both Freud and Jung were fascinated with aspects of Africa and its peoples and this had a significant impact on some of their work," she says.

In any event African scholarship is not about negating European philosophy or other knowledge formation, says Maart. "It's about broadening our horizons and recognising not only one source of knowledge, but many, and trying to make connections between them."

Since leading the Centre, Maart has introduced several research groups examining issues such as transformation, Biko, whiteness and colonial amnesia, Black consciousness, gender-based violence, gender, sexuality, and the city, HIV and AIDS, masculinities, the Namibian holocaust and Pan Arabism and Pan Africanism.

She is committed to establishing a student-run Biko Colloquium to mark the University as the home of Biko, the South African Students' Organisation (SASO) and the Black Consciousness Movement of Azania.

According to Maart, the Centre is attracting a number of students interested in "interrogating silences" and engaging relevant and topical identity-based issues through new theoretical frameworks.

"Guilt and shame about race or gender, for example, don't sit well. We have a whole new research area arising out of whiteness, for example, in which the emphasis is on transformative agency rather than past burdens. We have Black women students engaging academically with the issue of skin lighteners," and coming to consciousness about their agency within the world.

At a glance: Professor Rozena Maart

Professor Rozena Maart is Head of Gender Studies at UKZN and at the end of 2012 was appointed as Acting Director of UKZN's Centre for Critical Research on Race and Identity.

Maart works within the intersections of Political Philosophy, Black Consciousness, Derrida and deconstruction, Psychoanalysis, Critical Race Theory and Feminist Theory.

A published author, she won "The Journey Prize: Best Short Fiction in Canada 1992," for *No Rosa, No District Six* which later became part of a collection titled *Rosa's District Six* and made the best seller list in Canada in 2006 and the Homebru list in South Africa. Her 2008 book *The Writing Circle* made the top 10 novels list in South Africa and was shortlisted for the African Studies award in the United States.

In 1987 she was nominated for the "Woman of the Year," award for her work in the area of violence against women and for starting, with four women, the first Black feminist organisation in South Africa in 1986, Women Against Repression [W.A.R.].

Maart is a member of the International Assembly of Women in Philosophy (UNESCO), The Collegium of Black Women in Philosophy, the Sartre Society, the Society for Phenomenology and Existential Philosophy and the Caribbean Philosophy Association, among others, and serves on the Editorial Board of the Journal *Critical Philosophy of Race*.

In 2012, she was appointed UNESCO African Regional Co-ordinator of Philosophy South-South Dialogues, part of the larger UNESCO sponsored group SOPHITHINK which is a group of international Philosophers working towards educational packages in an effort to promote philosophies that have been marginalised by the history of philosophy itself.

Maart was Director of the Biko Institute in Guelph, Canada from 2001-2006 and was a member of the Biko, Rodney, Malcolm Coalition in Toronto. She is one of the co-ordinators of the panel series of the World Philosophy Congress, which is to be held in Athens, Greece, in August 2013.



Professor Deevia Bhana

The high price of childhood innocence

Early childhood offers a window of opportunity to promote gender equality and address the scourge of sexual violence and the spread of HIV and AIDS. But critical to this level of intervention is a finer understanding of the role of childhood sexuality, argues Professor Deevia Bhana.

Drawing on gender studies, political economics, sociology and critical sexuality studies and motivated by a concern for “deep structural inequalities”, Bhana has pioneered the field of childhood sexualities in South Africa. She took the opportunity presented by her inaugural lecture in early 2012 to highlight the relationship of childhood sexuality in South Africa to power and social inequalities in a lecture titled ‘What children can teach us about love, sex and gender’ in which she argued for an end to the “Byzantine-like theories” which limit our understanding of children and sexuality.

For Bhana, understanding childhood sexuality puts society in a better position to deal with issues such as gender-based violence, sexual violence and the transmission of HIV – all critical and persistent challenges to South Africa’s hard-won political democracy. “I’m committed to doing research that matters,” she says.

Her thinking is informed by years of interaction with and research involving children of all races between the ages of six and 18 and significant adults who matter to intervention programmes.

“I’ve encountered children as young as six who understood themselves as being prescribed by gender roles, which sets up patterns for adulthood. In some cases for girls, this meant subordination, particularly to romance and romantic love, and in some boys, it was expressed as a toxic form of masculinity.”

GENDER, RACE AND IDENTITY STUDIES

“...understanding childhood sexuality puts society in a better position to deal with issues such as gender-based violence, sexual violence and the transmission of HIV – all critical and persistent challenges to South Africa’s hard-won political democracy.”

personnel. Titled *Books and Babies: pregnancy and young parents in schools*, the book “shines a gendered light” on the responses of teachers, principals and learners themselves to pupil pregnancy, and shows how pregnancy often crystallises issues of gender and patterns of gender inequality.

While teenage pregnancies undeniably have a number of negative impacts on young girls, most obviously increasing their risk of an incomplete education experience and the loss of employment opportunities, the book also discusses some positive shifts in traditional attitudes towards pregnancy and the potential for parenting to be used as an opportunity to engage men in transformative masculinity work.

At a glance: Professor Deevia Bhana

A Professor of Education, Deevia Bhana focuses in her research on childhood sexualities, gender and childhood, AIDS and schooling.

She is regarded as a prolific researcher by the University of KwaZulu-Natal and has a C1 rating from the National Research Foundation.

Bhana has received a number of awards for her research. She has twice been a recipient of the Columbia University-Southern African Fogarty AIDS International Training and Research Program award, and was a short-term scholar at the Mailman School of Public Health, Columbia University.

She was a finalist in the South African Women in Science awards in 2011 in the category Distinguished Woman Scientist (Social Sciences and Humanities).

Bhana has nurtured a cohort of scholars in the field of gender-based violence and has successfully supervised masters, PhD and postdoctoral students. She has co-authored one book and co-edited another and has peer-reviewed journal articles and chapters in some of the most prestigious journals in her field. She is a member of seven international editorial boards and is Associate Editor of the UK-based *Health Education* journal.

She served as the Deputy Dean: Postgraduate Studies and Research in the College of Humanities from 2008 to 2011.

However, not all boys are violent and not all girls are passive. “Young girls are themselves inducting themselves into violence in an effort to assert power,” she says. Neither can the debate be framed as men perpetrating violence against weak and vulnerable women. “There is no ready vaccine, but until we promote a deeper understanding of the political economy of gender and sexuality, emotions and relationships, we are not likely to make headway,” she says.

As places where children spend most of their days, schools represent the most appropriate sites for programmes aimed at building greater awareness of the issues and changing mindsets.

But South African schools themselves are not neutral spaces. A 2012 book co-authored by Bhana shows how pregnancy in high schools is an issue which is filtered through the gendered identities, moralities and practices of the school



RESEARCH FOCUS AREA

HIV/AIDS, Tuberculosis and Health Promotion

HIV/AIDS, TUBERCULOSIS AND HEALTH PROMOTION



The focus area is home to the SARCHI Chair in Systems Biology of HIV/AIDS, held by Professor Thumbi Ndung'u.

A

As the pre-eminent academic institution at the epicentre of the HIV epidemic in South Africa, UKZN has taken up the challenge of providing leadership in response to HIV and AIDS and tuberculosis, and is undertaking ongoing research to enhance scientific capacity in these critical areas and strengthen the biomedical and broader societal response to the epidemic.

UKZN's focus on HIV/AIDS, Tuberculosis and Health Promotion is a multi-faceted and multi-disciplinary initiative, involving a number of established research groups and projects which recognise the importance of rigorous scientific inquiry aimed at, for example, an understanding, of the pathogenesis, virology, immunology and epidemiology as it relates to HIV and AIDS, or the role of breastfeeding in mother-to-child HIV transmission and the facilitation of clinical trials for treatment of HIV and TB in both children and adults.

UKZN continues to attract international recognition for its groundbreaking research in both HIV and TB prevention and treatment. At a global level, UKZN strives to nurture international institutional partnerships such as its long-standing relationship with the universities of Columbia and Harvard, both in the United States.

In recognition of its standing as a world-class research centre in HIV/AIDS and Tuberculosis, the University has attracted significant funding from influential international organisations such as the Howard Hughes Medical Institute (HHMI), the Wellcome Trust, the US National Institutes for Health (NIH), the US Agency for International Development (USAID), and the European Union (EU).

Major research centres and institutes include:

- The Centre for the AIDS Programme of Research in South Africa (CAPRISA);
- The KwaZulu-Natal Research Institute for Tuberculosis and HIV (K-RITH);
- The Africa Centre for Health and Population Studies;
- The Health Economics and HIV/AIDS Research Division (HEARD);
- The Enhancing Care Initiative;
- The Centre for HIV/AIDS Networking (HIVAN); and
- The HIV Pathogenesis Programme (HPP).

CAPRISA is a designated UNAIDS collaborating centre for HIV prevention research. Through the Columbia University Southern African Fogarty AIDS Training and Research Programme, the institution is committed to building scientific capacity in HIV/AIDS and tuberculosis research in several countries in Southern Africa to enhance continuing efforts to counter the HIV/AIDS and TB epidemics. Over the years the programme has trained many of South Africa's young AIDS and TB researchers.

K-RITH is an independent research institute that works in collaboration with UKZN and other academic and clinical institutions in South Africa and around the world to conduct basic science research on tuberculosis (TB) and HIV and translate the scientific findings into new tools to control TB and HIV. In addition to its research, K-RITH is committed to expanding the science education opportunities in the region as well as strengthening the TB and HIV research capabilities of scientists throughout Africa.

The Africa Centre for Health and Population Studies undertakes research on pressing population and reproductive health issues in Africa from its base in rural KwaZulu-Natal.

Although there is a strong medical research emphasis, the research cluster does not neglect the socio-economic implications and impact of diseases such as HIV/AIDS and TB. Thus, there is significant emphasis on research into the ethics, law and human rights issues as they relate to the administering of AIDS vaccines through the ELH (Ethics, Law, Human Rights) programme, and the HIV/AIDS Vaccine Ethics Group (HAVEG). In recognition of the importance of ethics in its research programmes, CAPRISA has appointed a dedicated bioethicist.

Furthermore, the broad socio-economic impacts of AIDS are examined through the Health Economics and HIV/AIDS Research Division (HEARD), and the research around the role of indigenous health care systems in addressing the epidemic is conducted under the leadership of a Chair in Indigenous Health Care Systems.

Professor Marie-Louise Newell

Africa Centre for Health and Population Studies



“ You can’t do
research here and
not care for the
community. ”

In the rural sub-district of Hlabisa in northern KwaZulu-Natal, fewer funerals are taking place these days – a visible indication of increased life expectancy in the area and one of the positive outcomes of the sustained work of the Africa Centre for Health and Population Studies.

“The reduction in mortality has been very visible to members of the community. Whereas six years ago there was at least one funeral every weekend, now this is more like one a month,” says Centre Director Professor Marie-Louise Newell.

An Epidemiologist with a long-standing interest in mother-to-child transmission in HIV infection, Newell joined the Wellcome Trust-funded Centre in late 2005.

Part of the University of KwaZulu-Natal’s College of Health Sciences, the Centre was established to undertake research on pressing population and reproductive health issues in Africa. Based in the rural uMkhanyakude District, the internationally recognised research site is embedded in a population that carries a heavy burden of disease in the form of HIV.

One of Newell’s early initiatives at the Centre was the establishment of a sub-district HIV treatment and care programme in partnership with the Department of Health. At the end of 2012, 24 000 people from the area were receiving antiretroviral (ART) therapy at local clinics and thousands more were undergoing monitoring.

“Research is our main brief but you cannot do research here and not care for the community,” says Newell, who, since gaining her PhD in medical demography from the University of London in 1991, has been involved with research in developing countries, particularly sub-Saharan Africa.

Newell also initiated a broad programme of research to address the impact of HIV infection at a population, community, household and individual level. She developed an integrated infrastructure of demographic and socio-economic household surveillance and individual HIV surveillance. All of this data is linked to virology laboratory services and to the treatment and care programmes.

From 2000 to 2007, Newell was part of the research team that conducted the groundbreaking Vertical Transmission Study at the Centre, which showed that exclusive breastfeeding was beneficial for infants of both infected and uninfected mothers – a study which was also influential in terms of international guidelines.

Newell describes the Centre as a “powerful resource from which to derive unique insights into the dynamics of HIV infection in this rural population”.

Recent research focused on quantifying the impact of comprehensive antiretroviral therapy (ART) on both life expectancy and HIV incidence proves this to be an apt descriptor.

Findings of a study to be published in *Science* in early 2013 show that adult life expectancy in the area has increased by more than 11 years (from 49.2 in 2003 to 60.5 years in 2011) following the scale-up of ART in public sector clinics and hospitals. These gains were driven entirely by a decline in HIV-related mortality.

And in another study – the first to present evidence of the positive impact of ARV therapy on HIV incidence in a community setting – the Centre’s researchers demonstrated

that in areas where ARV treatment uptake is greater than 30%, people who do not have HIV are 38% less likely to acquire the virus than in areas where uptake is less than 10%.

These findings also confirmed results from the recent HIV Prevention Trials Network study (HPTN052) which showed that if an HIV-positive person adheres to an effective antiretroviral therapy regimen, the risk of transmitting the virus to their uninfected sexual partner can be reduced by 96%.

For Newell, the need for research to inform practice is paramount. “These findings should be part of a clear public health message on the benefits of treatment,” she says.

More recently, Newell’s research includes TB cohort studies. Her interest in infections in pregnant women and their children continues with research on the immunological implications of exposure to infections and treatment for the uninfected child of an infected mother.

The strength of the Centre, she notes, lies in its progress in developing a deeper understanding of the community it works with, in the hope of leading the way in eliminating HIV transmission and acquisition. “With the challenges of life in rural South Africa, achievements here are highly relevant for other parts of sub-Saharan Africa,” says Newell.

At a glance: Professor Marie-Louise Newell

Seconded from the Institute for Child Health at University College London, where she is Professor of Paediatric Epidemiology, Professor Newell is a strong advocate of international collaboration and is a co-founder of the International Ghent Group which addresses research on issues relating to mother-to-child transmission of HIV, particularly in developing countries, by collaborating with key researchers around the world.

In 2012 she was appointed as a Fellow of the UK Academy of Medical Sciences.

Newell is frequently engaged as an expert by International organisations such as the World Health Organization (WHO) and UNAIDS, because of her expertise in the epidemiology of HIV infection, particularly in women and children, but increasingly for her work in HIV prevention.

In 2012 she was appointed a member of the European and Developing Countries Clinical Trials Partnership (EDCTP) scientific advisory board (formerly the Partnership board).

She undertakes frequent peer-reviews for more than 25 national and international scientific journals and is on the editorial board of several journals including *AIDS*, *Current HIV Research* and *PLoS One*. She has been invited to become an Academic Editor of *PLoS Medicine*.

She is a member of the international advisory board of *The Lancet*, and of the International Editorial Board for the UCSF Center for HIV Information. She is a Senior Advisor for the *Pan African Medical Journal*.

She also reviews for the SA Medical Research Council and the National Research Foundation, and is involved in the development of the South African National Health Research Agenda.

From 2000 Newell was a member of the UK MRC Clinical Training and Career Development Panel for a three-year period, assessing applications for clinical senior fellowships, a member of the MRC Infections and Immunity Board (for six years), and the MRC Global Health Group. She continues to provide formal and informal support to various research groups such as the MRC units in Uganda and Gambia.

From 1997 to 2001, she co-ordinated the European arm of the PACTG 316 trial to evaluate the addition of Nevirapine in reducing the risk of vertical transmission of HIV-1.

Professor Salim Abdool Karim

AIDS research in South Africa: A strong sense of purpose

In a major publication in *Nature Medicine* in 2012, a team of CAPRISA researchers shared their groundbreaking discovery that unique changes in the virus of two HIV infected women enabled them to produce potent antibodies which are able to kill up to 88% of human immunodeficiency virus (HIV) types found throughout the world.

Until this finding, it was not known by which mechanism the human body was able to make broadly neutralising antibodies.

“The discovery has contributed to our understanding of the relationship between broadly neutralising antibodies and HIV, and has provided valuable insights and information in the ongoing quest to find an AIDS vaccine,” says Professor Salim Abdool Karim, one of the study’s authors.

As Director of CAPRISA, Abdool Karim leads a large team of national and international experts dedicated to research on all aspects of HIV pathogenesis, prevention and epidemiology, and the links between tuberculosis and AIDS care.

During 2012, the Centre published 53 peer-reviewed journal publications, several in high impact journals such as *The Lancet*, *New England Journal of Medicine*, *Nature*, *Science*, *AIDS*, *Journal of Virology*, and the *Journal of Infectious Diseases*.

Another high impact research finding released in 2012 was about elevated genital cytokine concentrations after HIV infection and their association with more rapid disease progression. The study concluded that strategies aimed at reducing genital inflammation during early HIV infection may slow HIV disease progression.

“Understanding what happens in the female genital tract has become a major focus area at CAPRISA in collaboration with its mucosal laboratory partners at the University of Cape Town,” says Abdool Karim.

CAPRISA still remains true to its objective of finding effective female-controlled HIV-prevention methods to address the needs of young African women, who remain most vulnerable to HIV infection – particularly in sub-Saharan Africa. CAPRISA is continuing with the CAPRISA 008 tenofovir gel implementation

“The discovery has contributed to our understanding of the relationship between broadly neutralising antibodies and HIV, and has provided valuable insights and information in the ongoing quest to find an AIDS vaccine.”

study, looking into the effectiveness of the gel as an HIV prevention option when provided through family planning services in the public sector, he says.

“Our experiences in HIV trials have shown the need for dogged persistence, the need to develop diverse approaches and to be prepared for surprising results,” says Abdool Karim.

In HIV treatment research, the *Annals of Internal Medicine* published a major CAPRISA scientific contribution on immune reconstitution inflammatory syndrome (IRIS) in HIV/TB co-infected patients initiated on antiretrovirals. The study showed that initiation of ART in early stages of tuberculosis treatment resulted in significantly higher IRIS rates, longer time to resolution, and more severe cases of IRIS requiring hospitalisation.

CAPRISA’s research has had significant influence on policy and practice, including the contributions to the World Health Organization guidelines on the treatment of TB and HIV co-infection, the US government’s guidelines for treating HIV and TB co-infection and the South African guidelines for treatment of TB-HIV co-infected individuals.

Its achievements in scientific discovery have earned the Institution a reputation for its world-class science.



At a glance: Professor Salim Abdool Karim

Professor Salim Abdool Karim, MBChB, MMed, MS(Epi), FFPHM, DipData, PhD is a South African clinical infectious diseases epidemiologist whose main research interests are in microbicides and vaccines to prevent HIV infection as well as implementing antiretroviral therapy in resource constrained settings.

He is Director of the Centre for the AIDS Programme of Research in South Africa (CAPRISA), President of the South African Medical Research Council, Pro Vice-Chancellor (Research) at the University of KwaZulu-Natal. He is also Professor of Clinical Epidemiology at the Mailman School of Public Health at Columbia University, Adjunct Professor of Medicine at the Weill Medical College of Cornell University, New York, and Associate Member of The Ragon Institute of Massachusetts General Hospital (MGH), Massachusetts Institute of Technology (MIT) and Harvard University.

Professor Abdool Karim’s scientific contributions include over 250 peer-reviewed journal articles, including publications in high impact journals such as *Science*, *Nature*, *New England Journal of Medicine*, and *The Lancet*. He is co-editor of the epidemiology textbook (Oxford University Press) and the book on HIV/AIDS in South Africa (Cambridge University Press) that are prescribed texts in almost every medical school in South Africa.

He is widely recognised for his scientific contributions to HIV prevention, especially for the CAPRISA 004 trial which showed that tenofovir gel reduced HIV and HSV-2 acquisition. This study was ranked by the journal *Science* as one of the top 10 Scientific Breakthroughs in 2010. He was involved in the development, as patent co-inventor, of clade C HIV vaccines and subsequently led the first HIV vaccine trial in South Africa. His clinical research on TB-HIV treatment has impacted on and continues to shape the clinical management of co-infected patients.

During 2012, together with his wife Professor Quarraisha Abdool Karim, he received the prestigious N’Galy-Mann Award, and Minara recognition award for Academic Excellence.

He was elected as a foreign associate to the Institute of Medicine, which is part of the US National Academy of Sciences, in recognition of his scientific achievements.

He is a Member of the WHO Expert Advisory Panel on Sexually Transmitted Infections and HIV, Member of the Scientific Advisory Board of the US President’s Emergency Plan for AIDS Relief (PEPFAR), and Chair of the UNAIDS Scientific Expert Panel.

Professor Frederick Balagadde

Microfluidics: Fast-forwarding the diagnostics cycle

Ask any patient: it all starts with a diagnosis. In South Africa, it currently takes up to eight weeks to receive a definitive diagnosis for tuberculosis. This typically requires conventional laboratory testing procedures, which in turn require the culturing of *Mycobacterium tuberculosis* organisms taken from a patient specimen, usually sputum.

The patient is thus confronted with a serious dilemma: If, during that time, the patient remains untreated, there is a risk of him or her dying or passing on the infection to others. Yet, if the patient receives medication to tide him or her over until an accurate diagnosis is confirmed and that treatment turns out to be inappropriate for the particular strain of tuberculosis, that patient may suffer from unnecessary side-effects, or worse, develop drug resistance. Furthermore, that drug, which could have been used to save another patient's life, is effectively wasted.

Tuberculosis is the leading cause of death in South Africa and the number of people needing to be diagnosed has increased dramatically. The tools that served us well in the past – the petri dish, the test tube, and a handful of overworked laboratory workers – are no longer able to cope with the increased demand.

But that's all set to change. The key to successful diagnostics – whether it be TB or HIV – says Professor Frederick Balagadde – is miniaturisation.

From his office in the K-RITH Tower Building, Balagadde uses the story of the first computer as a metaphor to explain the way in which medical diagnostics in Africa is set to be revolutionised.

"In 1945, the ENIAC [Electronic Numerical Integrator And Computer] occupied an entire building; full-grown men and women worked inside the computer. Today, cell phones with 10 000 times the computing power of the ENIAC are found even in the most remote villages.

"Whereas instant communication was at one time reserved for James Bond and the rich, miniaturisation of integrated circuits

and cellphones has removed those boundaries, making the technology cheaper and widely accessible," he says.

The "miracle" of miniaturisation is now being applied to medical diagnostics through microfluidics technology which is able to manipulate fluids at the sub-millimetre scale. Using microfluidic chips – small clear plastic slabs containing a complex web of tiny pipes and pumps – it is now possible to rapidly test hundreds and potentially thousands of samples at the same time.

"Because they run autonomously, microfluidic systems eliminate pipetting, plating and other hands-on tasks while providing minute-by-minute data about cell count, morphology, motility and gene expression. Microfluidic systems are also comparatively inexpensive, combining ultra-low reagent consumption with a space-saving footprint to yield high throughput results at low cost," says Balagadde.

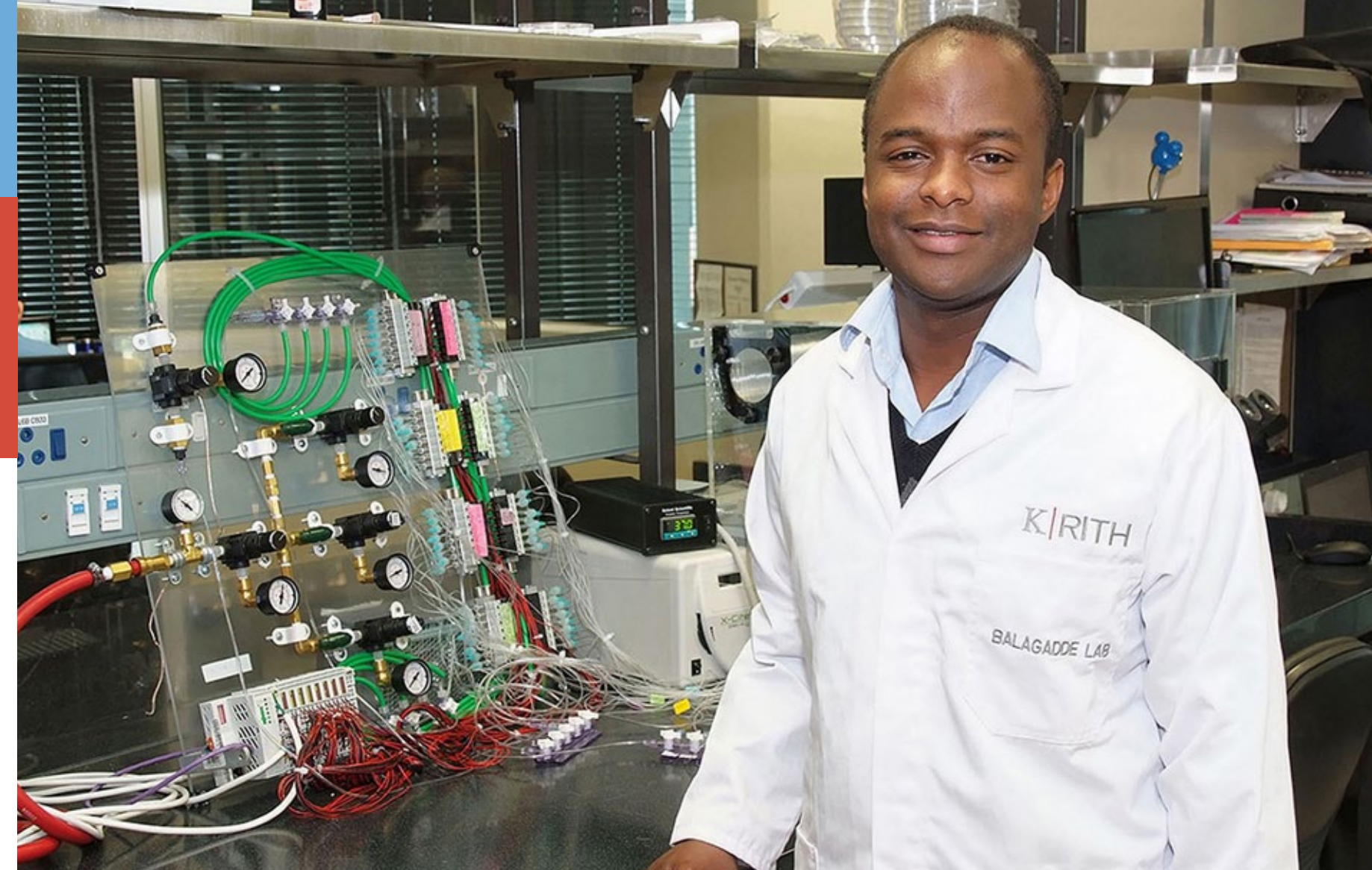
"We are doing for health care and diagnostics what the integrated circuit did for the computer and I believe the impact will be of a similar scale. In the same way that the poorest of the poor can afford cell phones, they will soon be able to afford first-class diagnostic services."

"Business leader Peter Drucker observed that 'what gets measured gets managed'. In the same vein, microfluidic tools offer an opportunity to improve the quality, accessibility and effectiveness of health care in low resource settings by providing accurate diagnostics."

As recognised by the World Health Organization, accurate diagnosis is a critical first step to managing and eradicating disease.

What has been proven to work in the laboratory is now ready for application in the real world. Balagadde is leading the establishment of the first microfluidics lab of its kind in Africa.

"Now is the time to scale up and move the technology from its academic womb into the clinic – where it can actively reduce the overcrowding in hospitals and mitigate the lack of healthcare workers."



“Ask any biotechnologist: this really is a quantum leap towards transforming healthcare.”

A state-of-the art microfluidics fabrication facility has been commissioned in the K-RITH Tower Building: "We are ready to set up the first microfluidics fabrication facility in Africa. We will be the first to produce the devices locally and to apply the technology towards addressing public health challenges."

Balagadde describes it as "cutting edge research with a meaningful outcome".

"Ask any biotechnologist: this really is a quantum leap towards transforming healthcare."

At a glance: Professor Frederick Balagadde

Professor Frederick Balagadde is an Assistant Investigator at the KwaZulu-Natal Research Institute for Tuberculosis and HIV (K-RITH) and a consulting Assistant Professor at Stanford University.

While completing his PhD in Applied Physics at the California Institute of Technology, Balagadde developed the microchemostat, the first implementation of a microfluidic chip that cultures live bacterial cells in perpetuity. This seminal work was published in the journal *Science* and enabled discoveries about biological circuits that eluded detection in conventional settings.

At K-RITH, Balagadde heads an independent, bioengineering research programme focused on using microfluidics large-scale integration (MLS) to multiply the output of clinical and laboratory scientists. This strategic initiative is aimed at bridging the health resource gap in the developing world.

In December 2009, he was one of 20 individuals selected to join the inaugural class of the Technology, Entertainment and Design (TED) Senior Fellowship programme, a global network of people identified as having some of the world's most innovative minds.

Prior to this, he worked at Lawrence Livermore National Laboratory, California as a research scientist in the Engineering Technologies Division from 2007 to 2010. In July of 2010 he joined Stanford University as a consulting Assistant Professor in the Division of Infectious Diseases, while also developing low-cost disease diagnostic devices for the developing world.

Professor
Alan Whiteside

HEARD: Research
with impact

Evidence from three randomised controlled trials in Africa has indicated voluntary medical male circumcision (VMMC) can reduce HIV incidence in heterosexual men by up to 60%. On the basis of this and other research, a joint UNAIDS and WHO programme aimed at accelerating the scale-up of VMMC in 13 southern and east African countries, including South Africa, got under way in 2012.

However, according to researchers at the Health Economics and HIV/AIDS Research Division (HEARD) at UKZN, there are concerns around sexual disinhibition, a situation whereby the protective effect of the circumcision may be negated by risk-related behavioural changes.

“Male circumcision may provide a false sense of protection among men resulting in the adoption of unsafe sexual practices such as decreased condom use and multiple sexual partnerships. These behaviours may ultimately place women at greater risk of HIV infection,” explains HEARD Executive Director Professor Alan Whiteside.

In view of the on-going scale-up of VMMC, the Unit initiated a project on medical male circumcision for HIV prevention to investigate the potential for risk compensation by men who have undergone the procedure.

Piloting for the project – a joint initiative between HEARD and CAPRISA (both UNAIDS collaborating centres at UKZN) – started in February 2012 in Vulindlela, a rural site in KwaZulu-Natal where HIV prevalence among pregnant women is close to 35%. The study involves both qualitative and quantitative data collection in order to determine whether males who undergo the procedure are more likely to engage in risky sexual behaviour, given the widespread, if erroneous, perception that circumcision offers full protection against HIV transmission.

“The outcomes of the study, which also gives us information on why men choose to get circumcised or not, will be of great importance in designing responses to the study in the years to come,” says Whiteside.

In 2012 the programme successfully enrolled 500 male adolescents into its intervention arm (circumcised boys, who were tested for HIV) at baseline. Baseline findings indicate that the main reason for undergoing circumcision was to prevent acquiring HIV. The majority of adolescents were either influenced by a friend (23%) or parents/relatives (28%) to get circumcised. Some of the reasons given for refusing circumcision were resistance to HIV testing and fear of pain of the procedure.

Other major HEARD research projects (2012) include:

● HIV/AIDS and Sexuality Programme in Schools

Based on research on the perceptions of the implementation of the Life Orientation (LO) curriculum at 16 secondary schools in three districts, it was found that the LO programme is not being implemented and delivered optimally in several schools. Arising out of this research, key recommendations were drafted for the national Department of Basic Education.

● HIV Prevention for Learners with Disabilities

Quantitative data collected from 10 schools representing a range of different types of disabilities indicates that while teachers believe it is important to teach sexuality education in special schools, it is generally not receiving adequate attention. Teachers indicated their need for training, skills and materials to better integrate sexuality education within LO lessons.

● Young Carers and HIV

The Young Carers (YC) SA study is the world’s first large-scale quantitative study of the impacts of familial HIV and AIDS on children’s wellbeing. The KwaZulu-Natal arm of the study, conducted in conjunction with Oxford University (UK) and Brown University (USA), aims to examine the impact of living in an AIDS affected family on children’s physical, emotional, social, sexual and educational wellbeing; and identify risk and protective factors which can be directly targeted by government policy in order to improve child outcomes. Seven presentations based on both the qualitative and quantitative KZN work were made during the second half of the year, most of these at the XIX International AIDS Conference in Washington DC in July. Initial findings reveal a relationship between HIV and poor mental health for caregivers of orphaned children, a relationship between poor parental supervision and greater risk behaviour among children (10-17), caregiver HIV-related activity limitation associated with worse child outcomes (e.g. hunger, school attendance, work in the home) and evidence of social support as a protective factor for caregiver mental health. The research has produced a number of research papers.



At a glance:
Professor Alan Whiteside

Professor Alan Whiteside has an MA from the University of East Anglia and a Doctorate in Economics from the former University of Natal. He is the Executive Director of HEARD which he established in 1998.

His main research interests are the economic and development impact of HIV and AIDS. For over 10 years he produced the newsletter *AIDS Analysis Africa* which he started. He has authored, co-authored or edited a number of books, all dealing with aspects of the HIV and AIDS pandemic and its impact in South Africa and the world.

In 2003 he was appointed by then UN Secretary General Kofi Annan as a commissioner on the Commission for HIV/AIDS and Governance in Africa. He is also a Governing Council member for the International AIDS Society.

He was Visiting Professor at the Liverpool School of Tropical Medicine and Leverhulme Visiting Professor at the University of Southampton. He is a Visiting Fellow at the University of East Anglia. In 2012 he was appointed as CIGI Chair in Global Health Policy, Balsillie School of International Affairs/Wilfrid Laurier University, Waterloo Canada. He is an elected member of the Governing Council of Waterford Kamhlaba College. He worked for the British Department of International Development as a Senior Research Fellow from 2009 to 2012.

● HAPSAT in Swaziland and Lesotho

HEARD partnered with Abt Associates to implement two national HIV programme sustainability analyses in southern African countries (Swaziland and Lesotho). Using the HIV/AIDS Program Sustainability Analysis Tool (HAPSAT) developed by Abt Associates under the flagship USAID Health Systems 20/20 project, the project examines the financial and human resources required for delivering major HIV/AIDS services. The HAPSAT studies in Lesotho and Swaziland increased HEARD’s capacity and experience in costing national HIV/AIDS programmes, while the exercise in Swaziland also helped to consolidate HEARD’s partnership with Swaziland’s National Emergency Response Council on HIV/AIDS (NERCHA). The Lesotho exercise provided substantive, quantitative information on the state of that country’s health system.

● Chronic Diseases and Health Systems Research

HEARD was awarded a Swedish International Development Cooperation Agency (Sida) planning grant which allowed

the opportunity to develop a long term partnership with researchers from the University of Gothenburg, Sweden, in the field of chronic disease and health systems research. The main objectives of the research, within the context of the changing burden of disease in southern Africa, will be to identify changing health care needs in different population groups and identify challenges in accessing health in the context of limited resources.

According to Whiteside, HEARD produced a record number of research units in 2012, including 34 peer-reviewed publications.

“HEARD is an applied research unit that aims to make a difference in the lives of the people of southern Africa. This means that our research has to be of the highest possible standard. It is a source of great pride to us that we are able to place so many articles in good, peer-reviewed journals,” he said.

Professor Jerome Singh

Bioethics: Resolving ethical dilemmas in medicine and the health sciences

In the months preceding the 2012 United Nations Climate Change Conference in Doha, an article by Jerome Singh was published in *PLoS Medicine* in which he argued for the importance of human health and health ethics in climate change discussions and in climate-change related future risk management.

In the article, titled “Why human health and health ethics must be central to climate change deliberations”, Singh questions the ethics of the World Bank’s decision to fund the construction of the Medupi and Kusile coal-fired power stations in South Africa, despite coal-powered stations being huge contributors not only to global warming but to human ill-health. “Alarming, an estimated 6 000 and 10 700 annual deaths just from cardio-pulmonary diseases and cancer can be attributed to the 88 coal-fired power plants and companies that received public international financing, including from the World Bank,” he writes.

Like most of Singh’s research in the field of bioethics, the paper highlights the tensions and “practical discrepancies” which frequently arise in that grey area between “what must be done” (in terms of economic, scientific, social and legal imperatives) and “what should be done” (to achieve ethical outcomes).

“The laws regulating society are important, but they don’t always get it right,” says Singh. “Laws may, and frequently do, inadvertently produce unethical outcomes.” For example, medical interventions which help to limit the spread of HIV among sex workers and their clients may be considered ethical despite the fact that sex work in South Africa is illegal.

Although Singh’s academic background is in law, the field of ethics extends far beyond law and is increasingly showing its value in the health sciences – a value recognised by CAPRISA when it appointed him as the Head of its Bioethics and Health



Law Programme in 2003. “Many cases in medicine call for an ethical rather than a legal response,” says Singh. “Take the case of a child under 12 who under law cannot seek autonomous treatment for a sexually transmitted disease. If that child presents at a clinic without a parent, what should the health worker do?”

Despite the growing scope for bioethics, Singh is one of the only dedicated bioethicists in South Africa. However, the impact of his work is consistently high and has a direct influence on global policy.

In a 2007 article published in *PLoS Medicine* Singh tackled the sensitive question of how to handle patients suffering from multi and extensive drug-resistant tuberculosis who refuse treatment. Arguing – somewhat controversially – against an individual rights perspective, Singh defended the State’s right to detain unco-operative patients suffering from MDR-TB and XDR-TB for forced treatment. He argued that in the crisis presented by the outbreak, the interests of public health prevailed over the rights of the individual.

The paper became one of the most cited papers on drug-resistant tuberculosis and is still considered the most influential

“Alarming, an estimated 6 000 and 10 700 annual deaths just from cardio-pulmonary diseases and cancer can be attributed to the 88 coal-fired power plants and companies that received public international financing, including from the World Bank.”

paper on the social, human rights, and ethics dimensions of drug-resistant TB, having generated considerable international media attention. Cited in a precedent-setting South African High Court judgement, it has directly impacted on how non-compliant drug-resistant TB patients are managed in South Africa and led to the establishment of the World Health Organization’s (WHO) Global Task Force on Addressing Ethical Issues in TB Care and Control Programmes, to which Singh was appointed. This body eventually made recommendations which led to the 2008 WHO guidelines, *Ethical Issues in Tuberculosis Prevention, Care and Control*.

Since then Singh has been consistently active at an international level – as an expert consultant to the WHO on pandemic flu, as a member of its working group on Programmatic Guidance for Strategic Use of Antiretroviral Drugs (ARVs), and as an expert consultant to on The Ethics of Pre-exposure Prophylaxis (PrEP) and Early Treatment. He is the lead author of the WHO’s impending guidelines *Ethical Considerations in Planning and Reviewing Research Studies on Sexual and Reproductive Health in Adolescents*, and a contributing author to WHO-UNICEF-UNFPA-UNESCO’s 2013 guidelines, *HIV Testing and Counselling and Care for Adolescents Living with HIV*.

In 2012, he was identified as a global “New Champion” and invited to present a paper at the World Economic Forum in China. He has also been invited to the 2013 World Science Forum in Brazil.

In a clear indication of the significance of his research field, Singh was invited by the WHO to a top-secret meeting in Geneva in February 2012 to debate whether to publish research containing information about how to make the deadly H5N1 avian influenza virus transmissible between ferrets. Among a group of 23 pandemic experts, Singh was the only bioethicist and civilian.

Publication of the research findings was stopped after concerns that the potentially dangerous research could fall into the hands of terrorists or develop mutations which could result in human pandemics. After the meeting, copies of the manuscripts were destroyed under the observation of Singh and two other panel members.

Singh said the group voted in favour of uncensored publication, largely on the grounds of a need for public health surveillance. Yet, the publications were still delayed for a few months before being published in redacted form in the journals *Nature* and *Science*.

At a glance: Professor Jerome Singh

Professor Jerome Singh is an internationally recognised expert in the field of research ethics, international humanitarian law, human rights, and law, particularly in relation to HIV, Tuberculosis, and Malaria.

Based at the Centre for the AIDS Programme of Research in South Africa (CAPRISA), he is also adjunct Professor in the Dalla Lana School of Public Health Sciences and Joint Centre for Bioethics at the University of Toronto, Canada, and Course Director for Bioethics and the Law at the Howard College School of Law, UKZN. He is a Senior Bioethics Researcher at the Sandra Rotman Centre, Toronto, Canada, which advises the Bill & Melinda Gates Foundation on ethical, social, cultural, and regulatory issues.

Singh serves as a consultant to the World Health Organization (WHO) on several matters, and to the United Nations Interregional Crime and Justice Research Institute (UNICRI). He is the Co-Chair of the US NIH’s HIV Prevention Trial Network’s (HPTN) Ethics Working Group and is an elected Founding Member and in-augural Co-Chair of the South

African Young Academy of Science (SAYAS). He is a member of the South African National AIDS Council (SANAC) Technical Task Team on Ensuring Protection of Human Rights and Improving Access to Justice. He has served as a consultant to the South African Law Reform Commission on health law.

He currently serves on several research bodies, including the International Research Ethics Board of Médecins Sans Frontières (MSF), the Research Ethics Committee of the South African Human Sciences Research Council, and the Scientific Advisory Board of the Aurum Institute of Health Research.

Singh, a recipient of a US NIH Fogarty Fellowship, has authored approximately 100 works (mainly as first author), including 75 papers (primarily in high impact journals such as *Nature*, *The Lancet*, *BMJ*, and *PLoS Medicine*), 21 book chapters, and several technical reports for WHO and UNAIDS.

African Indigenous Knowledge Systems



The focus area is home to the SARChI Chair in Indigenous Health Care Systems.



he South African National Indigenous Knowledge System Policy of 2004 identified the promotion of IKS in Higher Education as a

key component of human capital development and social transformation.

In a project closely aligned with these aspirations, the University of KwaZulu-Natal launched the African Indigenous Knowledge Systems (AIKS) project in 2012 aimed at integrating African indigenous knowledge into the Institution's research, teaching and community engagement programmes. Aided by the appointment of a dedicated director, the AIKS project aims to co-ordinate and enhance the extensive research capability of the University in the area of indigenous knowledge systems.

Taking into consideration the holistic and multi-disciplinary nature of AIKS, the scope of research undertaken in the field is broad and extensive. Researchers are engaged in collaborative research work locally, nationally and internationally in areas of:

1 Indigenous African Agriculture and Food Security

This includes the use of wild food resources and postharvest technologies in the context of natural resource and disaster management systems for climate change adaptation and mitigation. Researchers in these areas investigate the behaviours of living organisms as early warning systems, taboos and totemic systems as indigenous environmental protection mechanisms.

2 Traditional African Medicine

Researchers work with traditional healers in the identification and screening of medicinal plants for the treatment of various community ailments. Smoke research for conservation, cultivation and improving chemical constituents of indigenous medicinal plants is also conducted.

The scope of research in this area is wide – there are more than 3 000 medicinal plants presently traded and used in African traditional medicine – and ranges from the pharmacological screening of coniferous plants such as the *African Podocarpaceae* and the pharmacological potential of plants from the *Orchidaceae* family, to investigations of the effect of storage on the phytochemical composition and biological activities of certain Southern African medicinal species.

Other areas of research include the study of medicinal plants traditionally used for the treatment of stomach ailments; the isolation of the antibacterial compounds from *Erythrina caffra*; the study of medicinal plants used by the Venda communities to treat venereal disease and plants used to treat diarrhoea; the efficacy, safety and pharmacological properties of commercial herbal mixtures which are an increasingly popular form of African traditional medicine. Studies are also being undertaken to compare the antimicrobial activity of bulb versus leaf extracts of certain plants so as to reduce the threat to species that comes with the increasing harvesting of bulbs. Work has also started on the phytochemical makeup of *Cyrtanthus contractus*, a member of the family *Amaryllidaceae*, from which the commercial Alzheimer drug Galanthamine has been produced.

3 Indigenous African approaches to conflict management and transformation.

This includes investigation into actors, principles, mechanisms and their applicability in modern times within the context of culture, gender and human rights.

4 Traditional African leadership and governance systems

Here, researchers investigate the nature and characteristics of traditional African institutions; issues of legitimacy, democracy and accountability; traditional African institutions and modernity (challenges and prospects).

5 Indigenous Knowledge Systems and creative/cultural industries

This area focuses on promoting indigenous community enterprises for employment creation and income generation among vulnerable social groups (women, youth and people living with disability).

6 Indigenous African languages

Here, researchers are investigating issues relating to the diversity of indigenous African languages and its impact on development policy, language demographics, linguistic features of indigenous African languages, etc.

The issue of gender and language is also considered crucial in all AIKS research areas at UKZN due to the centrality of African women and language in sustainable community livelihoods in African communities.

INDIGENOUS KNOWLEDGE SYSTEMS

Professor Hassan Kaya

Indigenous knowledge: Looking back to reclaim the future

African indigenous ways of knowing have been undermined and marginalised over the years in the search for sustainable solutions to development challenges. However, there is now a growing realisation that a country's ability to build on and mobilise the knowledge systems available among its people is vital for sustainable socio-economic development.

This is the view of Professor Hassan Kaya, Director of the Department of Science and Technology/National Research Foundation IKS Centre at the University of KwaZulu-Natal.

Established in 2012 as a signature project of the University, the AIKS initiative is aimed at integrating African indigenous knowledge into the core business of the University – teaching and learning, research and community engagement – and to this end in November successfully hosted a southern African regional colloquium on Methodologies and Epistemologies of Integrating IKS into Research, Teaching, Learning and Community Engagement.

The project is closely informed by the aspirations of the South African National IKS Policy (2004) which has identified the promotion of IKS in Higher Education as a key component of human capital and social transformation.

“Learning from local communities creates an understanding of local conditions and provides an important context for activities designed to support them,” argues Kaya.

In a project exploring the interface between indigenous and modern practices, the IKS office is working with a group of UKZN medical students aimed at improving circumcision practices performed by traditional surgeons in South Africa. There is also formal collaboration with the Gandhi Development Trust to develop a programme around non-violence in the critical field of Early Childhood Development.

The AIKS project runs out of a co-ordinating office in the Westville campus library, which also hosts the Department of Science and Technology/Indigenous Knowledge Systems Documentation Centre geared towards protecting indigenous knowledge resources through recording, documentation and dissemination, particularly in the research fields of traditional medicine and agriculture.



The project is run with the benefit of a multi-disciplinary advisory team, which includes indigenous knowledge practitioners, and has been successful in identifying champions within the various disciplines to promote the work of the project. An institutional IKS Policy is currently under discussion.

Research forms a critical focus of the project which, in its first year of existence, managed to recruit six doctoral and four masters students who will research IKS in relation to themes such as food security, climate change, environmental governance, traditional governance and leadership and African indigenous languages.

Of particular concern to Kaya is Africa's silence on the issue of global environmental challenges. “Africa has made relatively little contribution to the global environmental crisis, yet we are the most affected owing to our lack of capacity to deal with global challenges,” he argues.

To this end, he has been central to the process of crafting a draft African Convention on Environmental Ethics, which emphasises the need to understand cultural attitudes and relations to the environment.

While most of the existing work on environmental ethics is based on Eurocentric worldviews which claim to be universal, Kaya argues for a “philosophical interrogation” of Africa's position on the environment which promotes Afro-centered, culturally specific approaches to environmental ethics and reinterprets African environmental governance principles and values for a modern, plural and vibrant Africa.

“The object is not to establish the superiority of one system above the other, but to contribute towards the consolidation of an emerging orientation in African environmental ethics and environmental management which takes into account the continent's and the world's cultural diversity,” he says.

The draft convention is to form the organising principle of an international conference hosted by the University of KwaZulu-Natal in 2014.

“ Learning from local communities creates an understanding of local conditions and provides an important context for activities designed to support them.”

At a glance: Professor Hassan Kaya

Professor Hassan Kaya holds a PhD in Sociology of Development and International Political Economy from the Freie Universität Berlin, Germany as well as a post-doctoral certificate in International Agricultural Development and Rural Development from the Technical University of Berlin.

He has published widely on a number of issues ranging from the political economy, to rural development and climate change and, more recently, Peace Studies and various aspects of African indigenous knowledge systems.

Kaya is a member of the American University of Sovereign Nations (AUSN) Board of Trustees and a Visiting Professor (Indigenous Knowledge Systems) for AUSN.

As Co-ordinator of the North-West University's Indigenous Knowledge Systems Centre of Excellence, he introduced South Africa's first Bachelor of Indigenous Knowledge degree, which combines natural and social sciences.

He was Co-ordinator of the IKS Southern African Regional Node of the NEPAD/Southern African Network of Biosciences (SANBio) from 2006-2012. In 2011, he was Co-ordinator for the COP17 Round Table on IKS, Climate Change and African Young Scientists and a member of the Preparatory Committee (content) for the COP17 UN Conference on Climate Change.

Maritime Studies

The Maritime Studies research focus area was identified on the basis of the strategic positioning of UKZN in relation to the biggest port in the southern hemisphere and the Eastern Seaboard. It is an inter-disciplinary area with opportunities for research themes on the utilisation of sea and port resources for socio-economic benefits in fishing, tourism, mining and energy, as well as the understanding of the impact of human activities on the coastal and marine environments for sustainable development. The primary research focus areas are in marine science and coastal engineering and maritime and port-related studies.

Research in the primary focus area of Marine Science and Coastal Engineering is supported by the eThekweni Municipality Chair in Civil Engineering and a collaborative project in Coastal Engineering with TU Delft in Holland which is one of the top 20 universities in the world. Working in partnership with national and international biological and conservation sciences units, researchers are examining the ecosystem functioning of Lake St Lucia, one of the world's critically important estuarine systems which is part of the iSimangaliso World Heritage Site. The aim is to develop an integrated biophysical model for the entire estuarine system. Overall the group's research suggests that the artificial separation of the St Lucia and Mfolozi inlets is by far the most significant anthropogenic impact on the functioning of the lake and that its reversal is key to sustainability of the system. Ongoing research aims to guide future management strategies to best achieve this.

The main objective of the research in this area is to achieve significant scientific advances in the analysis and modelling of human impacts on productive aquatic ecosystems, including threatened estuarine systems – addressing issues of sustainability, pollution, flow reductions, and widespread degeneration of the functioning of the ecosystems. The main innovation targeted in the research is the effective integration of physical dynamics with ecosystem responses in a way that is appropriate for encapsulating understanding of their functioning into predictive models for application to sustainable management.

Overall, the scientific importance of the activities of the research group is embedded in its focus on developing new insights and understanding of the structure, functioning and sustainable management of critical productive hydro-ecosystems.

Another focus in this area is climate change, which includes work in the following areas:

- Prediction models, adaptation strategies, air quality analysis and modelling in urban areas.
- Analysis and design of renewable energy systems, including wave, wind and current energy.
- Analysis and mitigation of natural hazards such as floods, droughts and the dispersion of toxic gases.
- Catchment management, which includes erosion/sediment yield, soil moisture mapping, remote sensing, modelling.
- Management of urban water reticulation networks and storm water systems.

The group uses theoretical, computational and field-based research techniques to develop insight and understanding of flows in the natural environment. They work as a multidisciplinary team using an integrated approach to understanding and modelling physical and biological systems.

Research on the maritime and port-related programme is co-ordinated through the Maritime Law and Maritime Studies Unit. The Unit, currently offering postgraduate programmes in Maritime Law, will be developed to facilitate research in areas such as: Maritime environmental management, port economics, port health, maritime transport, maritime law, customs and excise.

Professor Trevor Jones

The Maritime Law and Maritime Studies Unit: A unique research hub

Recognising the strategic opportunity presented by having the biggest port in the southern hemisphere virtually on its doorstep, the University of KwaZulu-Natal launched the Maritime Law and Maritime Studies Unit in 2012 on the Howard College campus.

According to Unit Co-ordinator Professor Trevor Jones, the specialised inter-disciplinary Unit offers a novel set of postgraduate diplomas and degrees, the flagship programme being a re-introduced Masters degree (LLM) in Maritime Law.

As well as a consolidated teaching site set to address the skills shortage in the maritime industry, it is intended that the Unit will serve as a research portal for the professional and commercial maritime community – not only in maritime law, but in areas such as maritime transport, port economics, and customs and excise.

In a first for the continent, the Unit is to offer a Masters of Commerce in Customs and Excise in 2014 for students seeking expertise in customs administration. There has been ample support for the programme, says Jones. “The South African Revenue Services is on board and we are striving for full alignment of our syllabus with the World Customs Organisation’s requirements for accreditation. The Department of Higher Education and Training as well as the University Senate approved the programme in 2012 and we are awaiting South African Qualifications Authority (SAQA) accreditation,” he says.

The Unit offers teaching and research expertise from various Schools and Disciplines within the College of Law and Management Studies such as maritime law, environmental law, international trade law and international economics, maritime economics, transport economics, taxation and maritime management.

These are complemented by members from beyond the University with practical industry expertise, the most illustrious of whom is Justice Malcolm Wallis, a sitting judge on the Supreme Court of Appeal and an Honorary Professor in UKZN’s School of Law and Management Studies. He is also the bearer of a doctorate from UKZN earned in 2010 as a consequence of research on the topic of ship arrests.

Wallis – an iconic figure in the maritime law fraternity – has assisted in mobilising support for the new Unit from the Maritime Law Association and legal professionals more generally. “We have enjoyed a huge groundswell of goodwill from the profession which has been eager to see the LLM in particular back on the University syllabus,” says Jones. Wallis has had a significant input into the teaching, supervision and the shaping of the academic programmes.

As well as doctoral studies by research, other postgraduate programmes on offer at the Unit include a coursework-based interdisciplinary Diploma in Maritime Studies which combines transport economics and maritime law and a two-year Masters of Commerce in Maritime Studies programme. Both programmes are a unique amalgam of economics and law.

The Unit has successfully forged links with the office of the National Ports Regulator based in Durban, the eThekweni Maritime Cluster and the South African Association of Ship Operators and Agents, all of which have assisted in forging a set of professional programmes with relevance to the maritime industry in the province.

While the Unit’s academic output thus far has been limited to conferences, port summits and presentations at Nautical Institute conferences, it is anticipated that its contribution to novel research will grow with time.



At a glance: Professor Trevor Jones

Professor Trevor Jones is an Economist with particular expertise in maritime transport economics and the economics of ports and harbours.

His research output is directed principally at the maritime sector. Major works include two technical reports for the Council for Scientific and Industrial Research (CSIR), a monograph on the economic role of Durban port, a co-authored book on the ports of sub-Saharan Africa and several journal articles.

He has undertaken consulting work for the Department of Transport, the South African Shipowners’ Association, the Durban Unicity authority and Transnet. He was a member of several national policy-making fora, such as the maritime transport sub-committee of the former Transport Advisory Council and the Maritime Transport Policy Working Group that provided specialist input to the Ministry of Transport in shaping the country’s current transport legislation.

“ We have enjoyed a huge groundswell of goodwill from the profession which has been eager to see the LLM in particular back on the University syllabus. ”

Social Development and Economic Studies

The focus area is a home to two SARCHI Chairs: Economic Development held by Professor Dorrit Posel; and Applied Poverty Reduction Assessment



Integral to UKZN's mission is a strategic thrust towards research and knowledge production that expresses itself in practical interventions for the upliftment of the wider South African society.

Economic development is a national priority and the University makes full and innovative use of its existing capacity in this regard. The primary objective of this area of research is to strengthen and enhance applied and policy relevant research in the fields of Economic Development, Finance, Sociology, Development Studies, Economic History, Agri-Business, Cultural and Heritage Tourism, and Health Economics.

Some of the leading research undertaken in this focus area delves into urban-rural economic and livelihood inequalities in South Africa and continues to ask what the relationship is between the growth and spatial distribution of the public and private economic sectors, and explores the interface between households and labour markets in South Africa, advancing knowledge across a range of socio-economic areas, including those relating to marriage, migration, child care, household survival strategies and resource sharing, and labour force participation and employment.

The research encompasses the formal and informal economy, the nature of poverty, the characteristics of the poor, and socio-economic empowerment.

HIV/AIDS, gender, race and the environment are cross-cutting themes in the focus area.

A high-profile research unit in this area, the Centre for Civil Society (CCS) advances socio-economic and environmental justice by developing critical knowledge about for and in dialogue with civil society through teaching, research and publishing.

This research focus area covers social issues on education and also houses the JL Dube Chair in Rural Education which aims to improve and advance rural education through the development of scholarship which more thoroughly prepares graduates for teaching in a rural environment.



Professor Patrick Bond

Climate change and water: The search for justice and new frontiers

According to a 2009 report, *The Anatomy of a Silent Crisis*, by former UN Secretary-General Kofi Annan's Global Humanitarian Forum, an estimated 325 million people are seriously affected by climate change every year and more than 300 000 die due to extreme weather conditions every year. Most of these people, it goes without saying, live in the poorest countries.

How best to address this crisis – effectively and fairly – is one of the longstanding concerns of political economist, activist and public intellectual Professor Patrick Bond.

In the run-up to and after the COP17 summit (the 17th meeting of the Conference of the Parties to the United Nations Framework Convention on Climate Change) in Durban at the end of 2011, Bond published two books and more than 30 shorter articles, drawing out the “deleterious” implications of the UN talks for global-scale management of the crisis. As he argued, the UN process has drawn African elites into a “neoliberal climate policy framework and a project-funding strategy based on financial markets that will mainly enrich speculators and impoverish the continent's poorest people”.

For example, Bond and fellow UKZN and Dartmouth College researchers showed the dangers of the UN “Clean Development Mechanism” emissions-trading strategy in a major booklet released in 2012, titled *CDMs Cannot Deliver the Money to Africa*. Bond argues that even though they appear attractive to elites, in part as a “spatio-temporal displacement technique for overaccumulated capital”, carbon markets have failed, as witnessed in the carbon price crash of 80 percent from its 2008 peak.

“The extreme volatility associated with emissions trading so far makes it abundantly clear that market forces cannot be expected to discipline polluters,” he writes in an article titled “Durban's conference of polluters, market failure and critic failure”, published in *Ephemera* in 2012. The market system, as he shows, is also plagued by vulnerability to fraud; Ukraine, for example, was suspended by the UN from carbon trading in 2011 for underreporting greenhouse gas emissions, while Value Added Tax market gaming helped wreck the European Union's Emissions Trading Scheme.

“Carbon markets have demonstratively shown they cannot finance renewable energy ... You need about a \$50 per ton price on carbon dioxide, and these markets are running at around a 10th of that price”

“Carbon markets have demonstratively shown they cannot finance renewable energy,” says Bond. “You need about a \$50 per ton price on carbon dioxide, and these markets are running at around a 10th of that price, and so they just are unable to deliver the goods.”

The most appropriate solution, he believes, is espoused by the climate justice movement: dramatic emissions cuts and the decommissioning of carbon markets and their replacement with a regulatory cap system that directly channels resources to climate victims – a payment of the so-called “Climate Debt” owed by industrialised countries – without the typical skimming and gatekeeping by “corrupt aid agencies, middlemen or venal state elites”.

“Since markets have failed, we have to turn to a regulatory approach,” he says.

In his recent work, Bond has also addressed what he sees as the worrying absence of a coherent climate politics across civil society – an absence very evident at COP17 – despite the “spectacular failure of mainstream strategies”.

“The raised consciousness required to make dramatic shifts in public policy – such as the 1999-2004 period during which the Treatment Action Campaign defeated President Thabo Mbeki's denial of AIDS medicines to the 5.5 million HIV-positive South Africans – is not yet at the critical mass required when it comes to climate,” he says.



At a glance: Professor Patrick Bond

Professor Patrick Bond is the Director of the Centre for Civil Society, an institute founded in 2001 to advance socio-economic and environmental justice by developing critical knowledge about, for and in dialogue with civil society.

Bond has conducted both theoretical research and applied work in global governance and national policy debates, urban communities and global justice movements.

His research focuses on political economy, the environment (climate, energy and water), social policy and geopolitics.

He is an advisory board member of several international journals. He is also a regular contributor to *The Mercury* newspaper, *ZNet*, *Pambazuka*, *Counterpunch*, and *Links* ezines.

Considered one of UKZN's top-published researchers, Bond produced a book, eight refereed articles and eight academic book chapters in 2012.

Since coming to UKZN in 2004, his authored or edited books include: *Durban's Climate Gamble* (Unisa Press); *Politics of Climate Justice* (UKZN Press); *Zuma's Own Goal* (Africa World Press); *Climate Change, Carbon Trading and Civil Society* (UKZN Press); *The Accumulation of Capital in Southern Africa* (Rosa Luxemburg Foundation); *Looting Africa* (Zed Books); *Talk Left, Walk Right* (UKZN Press); *Fanon's Warning* (Africa World Press); and *Elite Transition* (UKZN Press). The latter is the single most cited social science book in South Africa.

Bond authored/edited more than a dozen policy papers for the South African government from 1994-2002, including the Reconstruction and Development Programme and the RDP White Paper.

So where to from here? In the context of neoliberal pressure to commodify nature, climate change activists will need to choose their approach with care. In a November 2012 plenary lecture to the Norwegian Development Studies Association, Bond suggests that while a rights-based climate agenda can potentially challenge the dominant market narrative with respect to reparations, adaptation and mitigation, it is just as likely – based on South Africa's experience with water commercialisation (especially a 2009 Constitutional Court case in which he served in an amicus role, in which Sowetans lost their campaign to increase Free Basic Water and ban pre-payment meters) – that such “rights-talk” will be co-opted by neoliberalism.

Thus he suggests instead an exploration of the idea of a “commons” strategy which embraces a culture of sharing, linkage between the social and ecological spheres, and a common ownership of natural resources.

“We need new strategies that can transcend consumption-based rights demands. And we need coherent critiques of the full range of practices that undermine our ability to perceive and respect water and other aspects of nature as a commons. These strategies may emerge through fusions of community, environmental and labour in the alliance-formation that necessarily occurs during eco-social justice struggles, as rights-talk meets its limits, and as the commons appears as a new frontier,” he predicts.



ECONOMIC DEVELOPMENT

Professor
Dorrit Posel

The high price of marriage

Marriage rates among African men and women in South Africa are low and declining, with critical implications for society. The reasons for this decline are complex and varied but a key factor concerns the costs of marriage. These costs include bride wealth (or *ilobolo*) payments, which are very high relative to the earnings capacity of many of South Africa's men and which serve as an economic constraint to marriage.

Professor Dori Posel, who holds the DST-NRF South African Research Chair in Economic Development at the University of KwaZulu-Natal, has spent a number of years researching marriage patterns and markets in South Africa. Her findings, based on both qualitative and quantitative data, tell us a great deal about economic dynamics, but also hint at the potential longer-term social effects of shifting relationship patterns on future generations.

Groundbreaking research by Posel has confirmed the applicability to South Africa of the "male marital earnings premium" – a term used internationally by economists to describe the phenomenon whereby married men earn more than single men. Using data from the Labour Force Survey Panel, however, Posel established further that much of this premium is explained by the selection of higher-earning African men into marriage. In other words, among African men in South Africa, higher earners are more likely to marry – a finding which supports the idea that the high costs of marriage, including the payment of *ilobolo*, result in delayed marriage, or even non-marriage.

In addition to low marriage rates in South Africa, non-marital cohabitation rates among Africans are also low. Subsequent research by Posel and a colleague investigated attitudes to cohabitation among 80 Zulu-speaking men and women from

“ Our in-depth interviews with urban isiZulu speakers show that cohabitation is widely viewed as disrespectful – towards Zulu culture and tradition, and the family and community – unless *ilobolo* negotiations have been initiated. ”

Durban. “Our in-depth interviews with urban isiZulu speakers show that cohabitation is widely viewed as disrespectful – towards Zulu culture and tradition, and the family and community – unless *ilobolo* negotiations have been initiated,” she says.

But while African women are less likely to be married than their White counterparts, they are just as likely as White women to be mothers. “The implications are that children in most cases live only with their mothers, and not also with their fathers, and often in conditions of greater poverty. In 2008, using nationally representative micro-data, we found that only 30% of all African children lived with both parents,” says Posel.

Whereas it may have been possible historically to explain the phenomenon of single-parent households as a function of apartheid-driven practices such as labour migration, and current high mortality rates as a result of HIV/AIDS, researchers like Posel are now considering more closely the impact of *ilobolo* – still a highly-valued custom among Zulu-speakers and difficult to adhere to in the context of South Africa's high number of unemployed men, and seemingly unaffected by market forces.

“We wanted to understand why *ilobolo* payments remain high if these payments are a constraint to marriage,” says Posel. “What we found in the interviews was overwhelming support for marriage and for *ilobolo*, despite the acknowledgment that the latter was becoming increasingly commercialised and individualised.”

Female interviewees regarded the payment of *ilobolo* as a sign of respect and appreciation for themselves, and for their family; and some single mothers viewed *ilobolo* as their reward

At a glance: Professor Dorrit Posel

Professor Dori Posel is an Economist who specialises in the micro-econometric analysis of household survey data and has published widely on questions of marriage, labour migration and remittance behaviour, labour markets, labour force participation and employment, and socio-economic indicators of wellbeing.

As holder of the South African Research Chair (SARChI) in Economic Development, she explores the interface between households and labour markets in South Africa, advancing knowledge across a range of socio-economic areas. Her work as Chair is integral to evaluating the experiences of economic development among individual South Africans and to assessing economic and social policy aimed at poverty reduction and improving well-being.

Posel holds a PhD in Economics from the University of Massachusetts (Amherst) and is the recipient of a number of fellowships and research awards, including a Research Fellowship at Princeton University in 2000, the NRF President's Award in 2001, and the Vice-Chancellor's Research Award in 2005.

In 2011, Posel initiated the first Micro-Econometric Analysis of South African Data (MASA) Conference – now an annual conference – which brought together researchers who work on related socio-economic questions using South African micro-data.

for having raised their daughters well. The ability of men to pay *ilobolo* was also seen by both men and women as a sign of manhood and as signalling a man's further commitment to the marriage.

“*Ilobolo* is clearly part of the construction of male and female identities,” says Posel, “with both men and women actively maintaining the practice.”

But importantly, *ilobolo* was also consistently seen by interviewees as a particularly important custom, and as an integral part of Zulu culture.

Professor Imraan Valodia

The many faces of employment

Viewing the informal economy as a transitional “shock absorber” during economic slumps is extremely simplistic; as is the notion that it provides a space outside of the mainstream economy for earners who are “deviant” or wish to by-pass formal taxation systems, argues UKZN economist Professor Imraan Valodia who has focused much of his academic energy on the issue of employment – one of South Africa’s most pressing challenges.

The informal economy

“The informal economy is a long-standing feature of most of the developing world, and as the largest source of employment for the majority of workers in the developing world – accounting for as much as 82% of non-agricultural employment in sub-Saharan Africa – it deserves far more attention from policy-makers,” says Valodia.

As Research Director of a unique 10-city panel study funded by the Bill & Melinda Gates Foundation, Valodia is part of a strategic bid to challenge these perceptions. Focusing on informal workers and their organisations in the cities of Ahmedabad, Pune, Lahore, Bangkok, Bogota, Lima, Belo Horizonte, Durban, Accra and Nakuru, the Informal Economy Monitoring Study (IEMS) will for the first time provide in-depth assessment on a longitudinal basis (two years) of the state of the urban informal workforce and how it is affected by economic trends, urban policies and practices, value chain dynamics and climate change.

As one of the few studies to evaluate the grounded realities of work in the informal economy and as one of the only studies to do so over time and across a sufficiently large number of sectors and cities, the study is expected to provide reliable indicators on the state of the urban economy.

“Using both qualitative and quantitative methods, the project seeks to change mindsets and provide hard data that would support the view that the informal economy is important, and

that those who are involved in it are making a contribution to state resources,” says Valodia. “We want to change the perception that the informal economy is a transitional feature that will eventually disappear.”

The first wave of data for the study was collected in 2012 and is currently being analysed. “Early results confirm that the informal economy does not serve as a shock absorber during hard times: workers suffer considerably more during recessions,” says Valodia.

Manufacturing - success and failure

The secret behind the successes – and failures – of manufacturing firms in Durban over the past 10 years of policy and industrial change is the subject of another two-year project led by Valodia.

Building on data collected during a World Bank supported study during 2002-3 from a range of manufacturing firms in Durban, the eThekwin Municipality Survey aims to revisit these firms in order to understand the dynamic changes in industry in the area over time. “We want to understand what is going on inside firms – why some have adapted better to increased international competition, and why others have not,” he argues.

A collaborative project between the eThekwin Municipality, UKZN and the national and KwaZulu-Natal economic development departments, with additional funding from the DFID-funded Employment Promotion Programme, Valodia says the project will produce data not currently available in South Africa and is likely to provide insight into work-place innovations that keep companies productive, and their workers employed. It will also serve as a valuable resource for policymakers in local and national government.



At a glance: Professor Imraan Valodia

Professor Imraan Valodia is an Economist with a particular interest in employment, the informal economy, and industrial development.

A related research focus – gender and economic policy – arose out of research on the informal economy, an experience which fore-grounded the role of women as the informal sector’s major participants.

A prolific researcher with a B-rating from the National Research Foundation, Valodia’s most recent book (2010) is a co-edited volume, titled *Taxation and Gender Equity* that reports on the methodology and research findings of a three year-project conducted in eight countries, on the gender impacts of direct and indirect taxation.

Valodia is a member of the Competition Tribunal of South Africa and serves on a number of economic policy advisory panels, including the South African Employment Conditions Commission and the Clothing and Textile Competitiveness Programme at the Industrial Development Corporation. He has worked with leading international development organisations including the United Nations Research Institute for Social Development (UNRISD), the United Nations Development Programme (UNDP), the World Bank, the British Department for International Development (DFID) and the International Development Research Centre (IDRC).

He is a member of the international research network known as Women in Informal Employment: Globalising and Organising, and the International Working Group on Gender and Macroeconomics. He recently participated in reviews of the Employment Creation Fund and the Employment Promotion Programme.

Youth unemployment

Tackling the challenge of youth unemployment is the Poverty Reduction through Informal and Digital Employment (PRIDE) project, led in Africa by Valodia, which is set to provide a labour market analysis of the PRIDE Africa countries: South Africa, Kenya and Ghana. Funded by the Rockefeller Foundation, the project will focus on Business Process Outsourcing and assess these countries’ potential roles in digital employment in the services sector, for example, in customer-related services such as call centres.

“We are at the stage now where we have a picture across the three countries and are talking to the Rockefeller Foundation about scaling up the project with possibilities for more policy-linked research,” says Valodia.

Valodia’s success in forging international partnerships and leading multi-country projects is based in part on his conviction that South Africans can learn a lot about their own country by doing research outside it. “We really do need to think outside the box, particularly when it comes to persistent problems such as unemployment. Conducting research beyond national borders often throws out new ideas and ways of thinking. We need to work more globally to help us better understand ourselves.”

Water, Environment and Biodiversity

The focus area is home to two NRF A-rated researchers – seed expert Professor Patricia Berjak and evolutionary biologist Professor Steven Johnson. Johnson is also the holder of the SARChI Chair in Evolutionary Biology.



In an era framed by discussions around climate change and population growth, the areas of water, environment and biodiversity reveal their fragile interdependency. Understanding our environment, as a first step towards conserving and managing our natural heritage and resources, is not only critical to sustainable development but, ultimately, to our survival.

UKZN's strengths in water are evident in its nationally and internationally recognised researchers who have active research programmes in water related fields. These researchers have been involved in research projects supported by external organisations and government departments including the South African Water Research Commission, National Research Foundation and Department of Water Affairs, eThekweni Metro, Umgeni Water, South African Sugarcane Research Institute as well as international donors such as the European Union, FAO, CGIAR, IWMI, SIDA, START, UPARF-POWER and DFID.

In late 2012, the Centre for Water Resource Research (CWRR) was formed out of a cohesive group of academics

who have been active in research, teaching and capacity building related to hydrology and water resources research since 1984. The on-going importance and relevance of water resources related research and teaching and the sustained research output of the group provided the basis to formally establish a Centre of Excellence within the University of KwaZulu-Natal. The University has a wide range of water related expertise and, in support of its vision to be the Premier University of African Scholarship, is actively involved in water related teaching, research and outreach activities throughout Africa and beyond.

CWRR Research areas include:

- Hydrological Process Studies
- Measuring and Modelling
- Hydrological Model Development
- Agricultural Water Management

Waste, Water and Sanitation Management

As a result of a Memorandum of Agreement signed between the eThekweni Municipality's Water and Sanitation Department and UKZN, the University's Pollution Research Group (PRG) has expanded its activities into municipal water and wastewater management. These activities form the focus of a multi-disciplinary team of engineers, biologists, political scientists and community medical professionals concerned with best practice of water and sanitation supply to unserved communities.

Micrometeorology and Agrometeorology

Investigations are conducted into the energy and water balances between the soil, plants and atmosphere through the Soil-Plant-Atmosphere Continuum Research Unit (SACRU) which specialises in micrometeorology and agrometeorology. This internationally recognised Research Unit has a major research thrust in the investigation of energy and water balances and emphasises the use of and development of methods for the measurement of evaporation, sensible heat and, more recently, carbon dioxide fluxes above land surfaces. Most of this research is funded by the Water Research Commission.

Hydrological Engineering

The way in which engineering interacts with the natural environment and can be used to promote sustainable practices is consolidated in research conducted by the Centre for Research in Environmental, Coastal, and Hydrological Engineering (CRECHE). Projects include the management of landfill emissions, the dispersion of pollutants in the atmosphere and coastal waters, spatial rainfall modelling and estuary bio-hydrodynamics. The Centre also conducts leading national research into radar-rainfall relationships and flood forecasting through its Satellite Applications and Hydrology Group (SAHG).

Limnology

Biological limnology research, with particular focus on manmade lakes and integrated catchment management, is concentrated in the School of Biological and Conservation Studies. Members of the Grassland Science Group collaborate with communities in the Upper-Thukela on a pilot “Payment for Environmental Services” project funded by the Department of Water Affairs and Forestry. Here, indicators for the payment of water services are developed and tested. Applied research into and management of water resources, decision support tools for estuaries, fresh water management and water conservation is conducted by the Institute of Natural Resources, an associate institute of UKZN.

In addition to these larger water research groups there are several other initiatives, notably working on wetlands, soil erosion, community interactions and sanitation, estuary-related research, and water and public health.

Biodiversity

Research in this area is conducted in a number of research institutes and units:

The Research Centre for Plant Growth and Development which conducts research on plants concentrating in the following areas:

- Ethnobotany and Traditional African Medicines;
- Plant Biotechnology aimed at increasing plant production and the synthesis of secondary products of medicinal value;
- Plant hormone physiology and their regulation and control of growth processes to increase plant production;
- Smoke technology which studies the regulation of plant growth by fires and their products; and
- Microalgae and its effect on higher plant growth and potential use as biofuels.

Other groups involved in biodiversity research include:

- The Plant Germplasm Conservation research group on cryopreservation and seed storage;
- The Centre for African Parrot Conservation;
- The Plant Pollination Biology group devoted to research on evolutionary diversification of plants.



The Smallholder System Innovations (SSI) Research Project

This flagship research project cuts across and involves all UKZN groups. An applied and development oriented research programme, it aims at advancing knowledge on how to balance water for food and the environment with a particular focus on upgrading smallholder rain-fed agriculture in water-stressed catchments.

The multi-disciplinary research programme encompasses biophysical and social research themes, Grassland Science and the University's Farmers' Support Group, with the researchers working closely with other stakeholders, including local communities at two pilot catchments (Potshini and Makanya) in two river basins (Thukela and Pangani) in South Africa and Tanzania respectively.

The project is being implemented jointly by five research institutions: Sokoine University of Agriculture (Tanzania); Stockholm University (Sweden); the UNESCO-IHE Institute for Water Education (The Netherlands); the University of KwaZulu-Natal; and the International Water Management Institute. Funded by the Dutch and Swedish governments, the programme – notwithstanding its development orientation – is based on innovative and cutting-edge disciplinary science.

Professor Roland Schulze

Water research: Modelling the bigger picture

The current proliferation of climate change studies might conceivably infer that the field is a relatively new one – but there are scientists who have been tracking and analysing the phenomenon for decades.

One of these is UKZN Hydrologist and Emeritus Professor Roland Schulze, whose work on water and climate change over the past 40 years earned him world-wide recognition, and the title in 2012 of “South Africa’s Top Water Researcher” in the nationwide Water Research Futures Survey.

“Climate change is not new. Scientists, most notably the Swedish Nobel prize winner Svante Arrhenius, were aware of climate change and its causes in the late 1800s. What they got wrong was the pace at which it was likely to happen,” says Schulze.

As Schulze soon realised after completing his PhD in 1975, researching water resources in isolation from climate and climate change is a futile exercise.

“Water is arguably the primary medium through which climate change impacts will be felt in South Africa,” says Schulze, an observation he also makes in his weighty volume titled *A 2011 Perspective on Climate Change and the South African Water Sector*. Published in 2012 for the Water Research Commission, the report, one of a trilogy, is the culmination of a three-year Water Research Commission funded project assessing the likely impacts of projected climate changes on water availability as well as on socio-economic activities, particularly among South Africa’s more vulnerable (poor) communities. The report also makes practical suggestions for adapting to climate change.

“A major goal of the report was to take current knowledge on climate change to a new level, updating it and making it more relevant, particularly for water managers who are the ones who make decisions,” says Schulze.



The report followed quickly upon Schulze’s 400-page *Atlas of Climate Change and the South African Agricultural sector: A 2010 perspective*, produced for the Department of Agriculture, Forestry and Fisheries, and described as one of the most comprehensive reports on the relationship of climate to agriculture.

The atlas is the most recent in a series which can be traced back to 1983 when Schulze produced the first atlas on *Agrohydrology and Climatology of Natal*. Since then, these reports – which emerge from Schulze’s detailed mapping systems for climatology and hydrology – have served as indispensable reference guides for planners seeking the “big picture” as Schulze calls it.

“Climate change is not new. Scientists – most notably the Swedish Nobel prize winner Svante Arrhenius, were aware of climate change and its causes in the late 1800s. What they got wrong was the pace at which it was likely to happen.”

Rather than researching individual water-related processes, Schulze’s work over the years has focused on synthesising massive data sets by means of hydrological computer modelling. He and his team developed powerful agro-hydrological modelling systems, computer software that can be used to assess the impact of land use and climate change on hydrological systems. “One of my functions over the years has been to synthesise climate and other data sets, which means people don’t have to dig it up all over again for themselves,” he says modestly.

In particular, his integrated hydrological model called ACRU is used for a wide range of water-related applications, including water resource planning, irrigation planning, and design of structures. The model has been updated and applied in countries such as Germany, Cuba, Ghana, the Democratic Republic of Congo, Canada and neighbouring African countries.

Even with advanced computer technology, however, no-one really knows exactly how the future global climate will develop and what the impact will be in the water sector. “The major challenge is the degree of certainty and making decisions in the context of uncertainty,” he says.

Schulze, who has extensive experience of working in partnership with government departments, regards the contribution of science to policy-making as integral to the business of academics who are able to provide a valuable “synoptic view”, particularly in the context of current shortages of technical expertise in government sectors.

Schulze’s standing as an international authority in the field of water and climate change gives him an increasingly larger role on the African continent. He serves on the Minister’s National Water Advisory Committee and was recently invited by the UNESCO Economic Commission on Africa to help agricultural negotiators prepare ahead of the next COP meeting in November 2013.

At a glance: Professor Roland Schulze

Professor Roland Schulze is Emeritus Professor of Hydrology and a Fellow of the University of KwaZulu-Natal. He is recognised internationally as a pre-eminent expert in the fields of hydrological modelling, integrated water resources modelling, agro-hydrological mapping and climate change impacts.

In 2012, Schulze was voted South Africa’s top water researcher in a nationwide survey.

He was instrumental in the early 1980s in the introduction to the then University of Natal of a degree course in Hydrology – a first for South Africa.

Schulze has wide international experience, having served on the Scientific Steering Committee for Hydrology for the International Geosphere-Biosphere Programme. He has been associated with International Dialogue on Water and Climate, the UNESCO-HELP (Hydrology for the Environment, Life and Policy) Initiative, and served on the UNESCO International Hydrology Programme’s Advisory Board. He was also a member of the Intergovernmental Panel on Climate Change.

In South Africa he has worked closely with a number of government departments and research institutions such as the Water Research Commission. He has also served on the South African National Committee of the International Association of Hydrological Sciences, the SA Scientific Committee for Global Change, the SA International Hydrological Programme Committee and the Minister of Water Affairs Advisory Committee on Hydrological Modelling

He is a member of the International Association of Hydrological Sciences and the European and American Geophysical Unions.

In 1990 he won the SA Institute of Agricultural Engineers Gold Medal for “outstanding contributions to hydrology in South Africa”, and was awarded a fellowship by the Royal Society of South Africa in 1993.

He holds life membership of the International Water Academy based in Norway and was Agricultural Researcher of the Year in KwaZulu-Natal in 2006.

Schulze has published over 570 scientific publications, of which over 130 appear in refereed journals.



WATER, ENVIRONMENT AND BIODIVERSITY

POLLUTION RESEARCH GROUP

**Professor
Chris Buckley**

Sanitation: Fertile grounds for research

By recovering nutrients from human urine it is possible to develop a dry sanitation system which is affordable, produces fertiliser for agriculture, and reduces pollution of scarce water resources.

That process – which effectively turns the concept of water-borne sanitation on its head – is currently being refined at the University's Pollution Research Group (PRG) in partnership with Swiss aquatic research institute EAWAG with funding from the Bill & Melinda Gates Foundation.

The research project is facilitated by the recent installation of nearly 80 000 urine diversion toilets in the eThekweni Municipality which separate liquid and solid waste at source, making both easier and safer to handle.

"Water-borne sanitation is a concept of ignorance," says PRG Head Professor Chris Buckley, who traces the concept to a belief, dating back to the Middle Ages, that diseases were caused by the presence in the air of a miasma, a poisonous vapour characterised by a bad smell.

"By depositing human excrement in water, it was believed you dealt with the miasma," says Buckley. Thus the modern waterborne sewage system and flush toilet was born which uses relatively large quantities of water to disperse small amounts of faeces.

In the developing world, where water-borne sanitation facilities have been unable to keep pace with rapid urbanisation, we have an opportunity to re-examine the way things are done, argues Buckley.

"In Durban in particular, where the PRG is based, we have progressive thinkers and one million underserved people. We also have willing funders, an innovative and supportive municipality and access to top university researchers from all disciplines. It's a great opportunity for research," he says.

The Pollution Research Group was established in 1973 with funding from the Water Research Commission to research

the closed-loop recycling of water, chemicals and energy in the textile industry. Although this remains a focus area, the Unit has extended its expertise into a wide range of water related areas, including municipal sanitation and waste water management.

"At heart remains a commitment to finding more productive uses of scarce water resources," says Buckley.

An agreement with eThekweni Water and Sanitation Unit signed in 2006 has seen the PRG initially receive R1 million a year for applied research projects and scientific support to the Unit. Current funding is R2.2 million per year.

The agreement gives the PRG researchers ready access to the excrement produced in the city's 80 000 pit latrines, and to sophisticated facilities such as the multi-million rand Amanzimtoti Wastewater Treatment works where a project examining co-digestion of high strength industrial concentrates and sewage sludge is being undertaken.

Another EWS facility is the Newlands-Mashu Permaculture Training Centre which is the site of a demonstration Decentralised Wastewater Treatment System (DEWATS) which treats and recovers wastewater for use in urban agriculture from more than 80 households. The project is being monitored by the PRG with collaboration from crop scientists, soil scientists and microbiologists from the University's Pietermaritzburg campus. "Water and sanitation are our gateway into the University and all its expertise," says Buckley.

In addition to the Vuna project, the PRG has a number of Gates-funded projects underway, the flagship project being "Reinvent the Toilet Challenge" launched in 2011 and aimed at attracting innovative designs for a water-free toilet which cost less than five US cents per person per day and which produces potable water, fertiliser and electrical energy. The PRG was one of eight finalists in the global competition – and the only team from an African university.

"As an institutional hub for sanitation research – certainly in Africa and even the rest of the world – our role in the project has since shifted away from prototype design towards the provision of scientific data and research expertise to other grantees," says Buckley.

In another Gates-funded project, the Group is conducting research on the mechanical properties of faecal sludge from different types of onsite sanitation facilities. "It sounds like grim work but these data are needed to inform the design and sizing of pit-emptying devices, transport and processing systems for the sludge and the design of future on-site sanitation facilities," says Buckley.

It is envisaged that a sludge classification system will be derived which will enable municipalities to describe the sludges in their area and to provide data for designers and operators to provide enhanced sanitation services.



At a glance: Professor Chris Buckley and the Pollution Research Group

Professor Chris Buckley is a Chemical Engineer and sanitation expert who heads the Pollution Research Group (PRG) at UKZN.

Formed in 1973, the PRG conducts contract research into urban and industrial water management.

The PRG's primary funding is received from the South African Water Research Commission, eThekweni Municipality, Eskom, Sasol and Umgeni Water, but is also derived from a number of international organisations, including the Bill & Melinda Gates Foundation.

The research of the PRG is grounded in the realities of service delivery to disadvantaged communities.

Buckley also co-ordinates the research and development for German NGO BORDA (Bremen Overseas Research and Development Organisation) which facilitates projects in decentralised sanitation, wastewater treatment, water and energy supply and solid waste disposal in Africa and Asia.

The Group has participated in a number of EU research projects and has collaborated with a range of international universities. Many of these projects and collaborations are ongoing.

Other Gates-funded projects include:

- An economic/cost-effectiveness evaluation of the award-winning pasteurisation technology developed by eThekweni Water and Sanitation division which undertakes dehydration and pasteurisation of pit latrine sludge and turns it into fertiliser pellets.
- A project with the London School of Hygiene and Tropical Medicine investigating new biological systems to reduce the content of improved (ventilated) and unimproved pit latrines.
- A project with Maryland University investigating the environmental impact of various aspects of menstrual hygiene methods in the context of local sanitation systems.



WATER, ENVIRONMENT AND BIODIVERSITY

Professor Colleen Downs

Top Published Female Researcher 2012

Animals: The victims and victors of changing landscapes

While accelerated climate change is a concern for biodiversity in the longer term, more direct threats to mammal and bird populations throughout the world come in the form of development, human population growth, urbanisation and change in land use resulting in habitat loss for species, according to biologist and terrestrial vertebrate specialist Professor Colleen Downs.

“Understanding the factors that influence biodiversity in areas of changing land use and urban areas, is essential to conservation of that biodiversity,” says Downs who leads a large team of postgraduate students researching the relationships between the physiology, behaviour and ecology of a range of southern African birds and small mammals in KwaZulu-Natal and the Eastern Cape.

“Changing land use and urbanisation are generally considered detrimental to the environment and its bird and mammal inhabitants, but some species are able to adapt in spite of the alteration and fragmentation of their habitat, and even increase their numbers,” says Downs.

Continued human population growth means that land use changes and urbanisation are set to continue. Thus a balance between development and environmental protection is recognised as essential to prevent further damage to the environment, argues Downs and understanding the factors that allow species to persist in these areas is critical to achieving that balance.

To that end, Downs leads a cluster of multi-disciplinary projects covering a number of small mammal and bird species which thrive in urban areas. Among these are small mammals such as porcupines, vervet monkeys, feral cats

“ Understanding the factors that influence biodiversity in areas of changing land use and urban areas, is essential to conservation of that biodiversity ”

and large-spotted genets, and bird species such as rose-ringed parakeets, hadedas, house sparrows and trumpeter hornbills. The interest includes indigenous and alien invasive species.

“It’s a broad area of work, but it takes me out in the field with my students, which is what I love,” says Downs.

In an attempt to understand the impact of farming activities on biodiversity, projects in the KwaZulu-Natal Midlands are focused on how the highly adaptable black-backed jackal and the less robust and endangered serval are affected by different farming activities.

Another study is investigating the persistence of crowned eagles in peri-urban areas of Pietermaritzburg and Durban, despite a decline in their numbers in open areas. Another is tracking the movements of the highly endangered Cape vulture populations in the Eastern Cape and KwaZulu-Natal in regards to land use and carrion availability.

Downs is the project leader of a large Water Research Commission-funded project studying the Nile crocodile, under threat from hunting, poaching, habitat loss and nesting area disturbance. Because it is a top aquatic predator, the crocodile is considered a sentinel species for environmental contaminants and the health of aquatic ecosystems. The study, based in the iSimangaliso and Lake St Lucia area, will construct valuable health and nutrition indexes of wild crocodiles and analyse the bioaccumulation of environmental pollutants such as DDT, lead and organo-chlorides.

Downs, who has been consistently recognised over the past 10 years for being among the University of KwaZulu-Natal’s top researchers and the top female researcher for four consecutive years (2009-2012), says her field of work attracts a steady stream of students and partnerships from individuals and institutions around the world. “Africa offers enormous opportunity for biodiversity research,” she says.

“In the past, South African natural scientists battled to publish in international journals because our research was considered too parochial, but that’s changed now. The challenges faced in South Africa are increasingly considered to have global relevance.”

Downs says her high publication rate is motivated by her belief in the importance of sharing her and her students’ findings, and grooming her students for academic careers. “If we don’t publish, the danger is that our work is unseen by the larger research community. Even if the research is descriptive, publishing it gives other researchers a chance to access it and build on our findings.

At a glance: Professor Colleen Downs

In 2012, Professor Colleen Downs was once again recognised as the University of KwaZulu-Natal’s top female researcher, and among the Institution’s 10 top published researchers.

Up to the end of 2012, she had produced 157 peer-reviewed publications on a variety of topics relating to vertebrate dietary aspects, vertebrate thermal biology, vertebrate conservation and ecology, and science education. Over the course of her academic career, she has also produced a number of popular articles, helping to raise awareness in particular of the plight of the endangered Cape Parrot, under threat from disease and the bird trade.

Another major contribution has been in the development of research capacity among students. She initiated a Department of Water Affairs and Forestry-funded apprenticeship programme for undergraduate Biology students, many of whom have continued with postgraduate studies. She has supervised more than 75 postgraduate students, including 11 PhDs, reviewed numerous papers for a broad range of international journals, and examined theses for UKZN and other universities.

She is on the editorial boards and committees of various scientific bodies and has participated in review panels. Downs presented a plenary at the 2010 Frugivory and Seed Dispersal Symposium in France and is to convene the 2015 conference in South Africa. She was the Scientific Chair of the Pan African Ornithological Congress held in Arusha, Tanzania in October 2012.

Downs has organised the annual national Cape Parrot Counting Day for the past 16 years which brings together birders, conservation bodies, conservancies and landowners involved in monitoring Cape Parrots from KwaZulu-Natal to the Eastern Cape. She is currently the Chairperson of the Cape Parrot Working Group based at UKZN.

Professor Johannes van Staden

*Top Published
Researcher 2012*

The healing properties of plants

The status of plants in South Africa is improving, but not before some significant losses have been suffered to the country's natural heritage, says UKZN Botanist Professor Johannes van Staden.

"Plants are not as dramatic as the big herbivores and carnivores of South Africa, so they do not attract quite the same attention, particularly when it comes to conservation efforts," he says. "But it remains a fact that the only places some plants are found in the whole world are on mountains of the Cape."

Van Staden was raised in the Little Karoo where his love of plants was aided by his family who had been using local plants for medicinal purposes for centuries by the time he was born. He grew up with a conviction he still holds today: the major solutions to human diseases lie in products and compounds to be found in plants.

While van Staden's initial research interests lay in plant hormones and biotechnology, in a career spanning over 50 years, he has conducted research on a broad range of subjects and is a global authority on many of them.

His is internationally acknowledged for his expertise in plant tissue culture, and he conducted pioneering research on smoke-stimulated seed germination, research which has commercial application. He is widely published on topics related to proteas, algal biotechnology, plant biotechnology, molecular biology and ethnobotany and ethno pharmacology.

Van Staden has authored or co-authored 1 164 (2012) papers published in ISI-rated journals. For almost 20 years he has been the top researcher at the University of KwaZulu-Natal and its predecessor and, since 2002, has fallen within the top 0.5% of most cited authors in the world.

In 1999 van Staden established his own Research Unit for Plant Growth and Development which has attracted students



from around the world and has contributed to his successfully graduating around 100 PhD candidates.

All students are expected to manage a laboratory, and all students, including those at masters-level, are encouraged to publish the findings of their research. "I believe we owe it to our communities to tell them the results of our work; that means publishing them," he says.

It's an ethos that saw his research group produce more than 50 papers in 2012. Research covers topics in broad areas ranging from plant physiology to molecular biology and ethnobotany.

Van Staden's longstanding interest in medicinal plants saw him establish pioneering University courses on plant uses long before the current interest in traditional African medicine. He also founded the University's botanical garden for research purposes.



At a glance: Professor Johannes van Staden

Professor Johannes van Staden is Director of the Research Centre for Plant Growth and Development at the University of KwaZulu-Natal. He is recognised as one of the world's most cited researchers of the past two decades by Thomson Reuters ISI.

Van Staden has received many accolades and awards throughout his career.

In 1988 he was awarded the Senior Captain Scott Memorial Medal by the South African Biological Society. In 1990 he was elected a Fellow of the Royal Society of South Africa and in 1992 he was awarded the Havenga Prize for outstanding research in Biological Sciences as well the Silver Medal from the South African Association of Botanists (SAAB). In 1994 he was elected Founder Member of the Academy of Science of South Africa as well as receiving the SAAB Gold Medal, the highest award given by the Association for Excellence in Botany.

In 2000 van Staden was awarded an Honorary Doctorate from the University of West Hungary and elected an Honorary Member of the Hungarian Academy of Sciences in 2004. In 2007 he was awarded the Gold Medal for Technological Innovation of the Suid-Afrikaanse Akademie vir Wetenskap en Kuns.

In 2010 he received two prestigious awards: the Gold Medal of the Southern African Association for the Advancement of Science; and the MT Steyn Medal by the Suid Afrikaanse Akademie vir Wetenskap en Kuns.

In late 2012 it was announced that van Staden is to be the recipient of the Herschel Medal Award for 2013 from the Royal Society of SA. The medal is awarded to researchers who are outstanding in either a field of research that straddles disciplines or in more than one closely related field.

Professor van Staden has been a Research Fellow at the University College of Wales, the University of California, the Hebrew University of Jerusalem, Broom's Barn Experimental Station in the United Kingdom, and the University of West-Hungary, where he was awarded an Honorary DSc. He was also a Visiting Lecturer at the National Australian University.

He is the author and co-author of 1 164 (2012) papers which have been published in ISI-rated journals. Professor van Staden is the Editor-in-Chief for the *South African Journal of Botany* and an Associate Editor of the *Journal of Ethnopharmacology*; *Plant Cell, Tissue and Organ Culture* and *Acta Physiologia Plantarum*. He serves on the Editorial Board of six other journals.

Ethnobotany remains a significant focus of the Unit and gives rise to a wide range of research projects. The research is informed not only by the need to scientifically understand the medicinal value of phytochemical agents and their impact, but by the value of the plants within the broader context of South Africa's biodiversity, says van Staden.

Projects undertaken in 2012 included an evaluation of the efficacy of certain plants in the treatment of asthma and chest infections. The Unit also investigated the pharmacological properties of *Buddleja salvifolia* in the treatment of eye infections, and the anti-mycobacterial activity of selected plants traditionally used to treat tuberculosis. Other studies included an evaluation of plants used to treat sexually transmitted infections and an attempt to identify phytochemical agents that could be effective in treating neurodegenerative conditions.

Because information on the safety of most medicinal plants used locally is inadequate another project examined the safety of the use of some plants and their extracts, while another assessed the microbiological contamination of herbal preparations sold in urban areas. Screening for elemental contamination in herbal materials obtained from shops around Pietermaritzburg was also conducted.

Against the backdrop of overharvesting, being able to cultivate medicinal plants for future use and to preserve biodiversity is critical. Whether cultivated plants show exactly the same properties as their wild counterparts is another area of ongoing investigation.

Professor David Ward

Bush encroachment: Grassland under siege



At a glance: Professor David Ward

Encroachment of arid and semi-arid savannas by native woody plants such as the black thorn (*Acacia mellifera*) and camphor bush (*Tarchonanthus camphoratus*) is a major phenomenon affecting the agricultural productivity and biodiversity of millions of hectares of South African grassland. Do we really know what is giving these trees the edge over grass?

Not really, argues UKZN Professor of Botany David Ward. While conventional wisdom suggests that local drivers such as heavy grazing by domestic livestock or fire are sole causes of bush encroachment – by giving trees a competitive edge on grasses – recent research by Ward points to the need to move away from single-factor explanations. Significantly, recent research findings suggest that global drivers such as climate change may have a role to play.

“A number of factors may explain the causes of bush encroachment but some of the most important factors may include increased CO₂ induced by global climate changes, as well as factors such as rainfall, physical disturbance and soil nutrients,” says Ward. He advocates a move away from an emphasis on observational studies towards “mechanistic models and multi-factorial experiments to tease out the interactions among causal factors”.

His own work in the field has established that encroachment still takes place where fuel load (the amount of combustible material in a defined area) is insufficient for fires to be an important causal factor. And by comparing historical fixed-point photographs taken near Kimberley at the time of the Second Anglo-Boer War (circa 1900) with more recent photographs, Ward and his co-researchers have shown that large increases in woody plant encroachment have occurred, even on the Magersfontein battlefield where little or no grazing has taken place since its declaration as a national monument in 1927.

Of particular interest – and concern – is the substantial increase – evident from aerial photographs – in the rate of encroachment since 1993, raising the possibility of global drivers in the form of increased atmospheric CO₂ levels.

“Climate change models predict that C3 plants such as trees that can thrive under increased carbon dioxide levels and will grow faster than C4 plants such as grasses,” says Ward. “Acacia trees in particular will benefit from being able to invest in carbon-based defences such as condensed tannins – all of which will give trees the competitive advantage on grasses and lead to further encroachment.”

One of UKZN's top-published researchers for 2011 and 2012, Professor David Ward is a Botanist with primary research interests in the field of the ecology and genetics of plant-animal interactions.

In particular, he is concerned with the effects of herbivory by large mammals on the population biology, population genetics and conservation of plant populations, especially trees.

Most of his work focuses on savanna ecology – Acacia trees in particular – although he maintains an interest in desert studies, an interest which led to his 2009 book titled: *The Biology of Deserts*, published by Oxford University Press. The book has a strong emphasis on evolutionary aspects of desert biology and an updated edition is due out in 2014.

Ward completed postdoctoral training at the University of Port Elizabeth, Ben Gurion University of the Negev and the University of British Columbia before taking up a faculty position in 1994 at the Blaustein Institute for Desert Research in Sede Boqer, a campus of Ben Gurion University.

He was the Director of the Ramon Science Centre (Ben Gurion) and was awarded the Paula and David Ben Gurion prize for outstanding contributions to desertification and desert research.

Ward has published more than 175 papers in peer-reviewed journals and 15 chapters in books, and is the co-ordinating editor of three international journals.

He has graduated 36 MSc and PhD students and has had 11 post-doctoral fellows working with him. He has raised over \$1.5 million (R12 million) from foreign funding bodies plus over R2 million from various South African sources.

While local drivers such as grazing intensity or frequency of fires can be controlled by land management interventions, CO₂ levels cannot, suggesting that dealing with bush encroachment is likely to be even more difficult than previously believed. “It may be a case of a bad situation getting worse,” says Ward.

It's a situation that clearly calls for more research. To this end Ward and three of his students are currently involved in an NRF-funded research project looking at the role of encroaching savannas in carbon sequestration across a rainfall gradient from Richards Bay to the Namib. Several other projects looking at bush encroachment are being conducted with a range of institutions including the University of Cape Town and the Agricultural Research Commission (ARC).

Professor Graham Jewitt

Biofuels and the great water debate



At a glance: Professor Graham Jewitt

Professor Graham Jewitt holds the Umgeni Water Chair of Water Resources Management and is the Director of the Centre for Water Resources Research at the University of KwaZulu-Natal.

He leads several water and earth system science-related initiatives, both in South Africa and abroad, with a focus on the relationship between land and water.

He is the South African contact point for the International Association of Hydrological Sciences (IAHS), is on the editorial board of the journal *Hydrology and Earth System Sciences* and co-leader of the water theme in The Applied Centre for Climate and Earth System Science (ACCESS).

He has been elected to the management board of Waternet and is active in several other national and international fora.

Recent work has been focused on the effective use of science in management systems and to better inform land and water resources policy development, especially in developing countries.

South Africa, like the rest of the world, is under intense pressure to develop alternative fuels to meet the growing demand for energy in the form of biofuels – ethanol and diesel – derived from vegetable biomass and oils. But do we have enough water to grow these plants?

For a water-scarce country, this is a critical question. It becomes even more important if one considers the potential impacts of climate change. South Africa's water reserves are protected by a variety of mechanisms, including legislation such as the South African National Water Act of 1998, which states that any land use activity, including farming, that is likely to significantly reduce the availability of water in a watercourse, is subject to regulation. Where does that leave biofuels?

Recognising the need to chart a way forward, the Water Research Commission has commissioned a study on the water use of biofuel crops in South Africa, a study it describes as “urgently required for both local and national water resource planning”.

The six-year R7.4 million project, due to end in 2015, is led by UKZN Hydrologist and Director of the Centre for Water Resources Research, Professor Graham Jewitt, and Mr Richard Kunz, also from UKZN's Centre for Water Resources Research. The project also involves researchers from the University of Pretoria and the CSIR.

In the context of global change, research focused on land use change is becoming increasingly topical, says Jewitt. “This particular project aims to identify suitable crop and tree feedstocks for biofuel production in South Africa and, using GIS-based studies, identify areas optimally suited to their production. Measuring the water use and yield of potential feedstocks takes place through field trials conducted at Ukulinga (UKZN) and in Pretoria. Data is then used to estimate water use and yield through hydrological and crop yield simulation modelling,” says Jewitt.

Although there are sensitivities around using arable land for bio-fuel crops – instead of food crops – evidence suggests that South Africa does have the 13 million hectares of arable land estimated by the FAO to be necessary to feed a population of 52 million (at 0.25 ha per person).

The largest unknown when quantifying the water used in biofuel production, according to Jewitt, is water use in the feedstock production phase, especially in the case of dry land [non-irrigated] crop production, which is the method favoured by the Department of Water Affairs for biofuel production. Water use by

several plants is the subject of several field trials currently under way at the University's Ukulinga Research Farm. The biofuels project is one of several currently underway at the behest of the Water Research Commission. According to Jewitt, the WRC has invested significant research funds over the years into UKZN, in a partnership which has supported novel and relevant research production, and has provided learning and research opportunities to large numbers of undergraduate and postgraduate students.

In addition to the biofuels feedstock project, Jewitt is leading a number of other large research projects including the design of a management tool for the Inkomati Basin with particular focus on an improved hydrological understanding of risk-based operational water management (also funded by the Water Research Commission); and a European Union-funded regional project on water harvesting with a focus on small-scale agriculture and domestic supply with partners in Tanzania, Burkina Faso and Ethiopia.

Professor Renzo Perissinotto

Putting unknown species on the map

In 2012, the iSimangaliso Wetland Park celebrated the discovery of *Edwardsia isimangaliso*, an unusual burrowing anemone with a surprisingly low number of tentacles and high tolerance for salt, believed to be micro-endemic to Lake St Lucia.

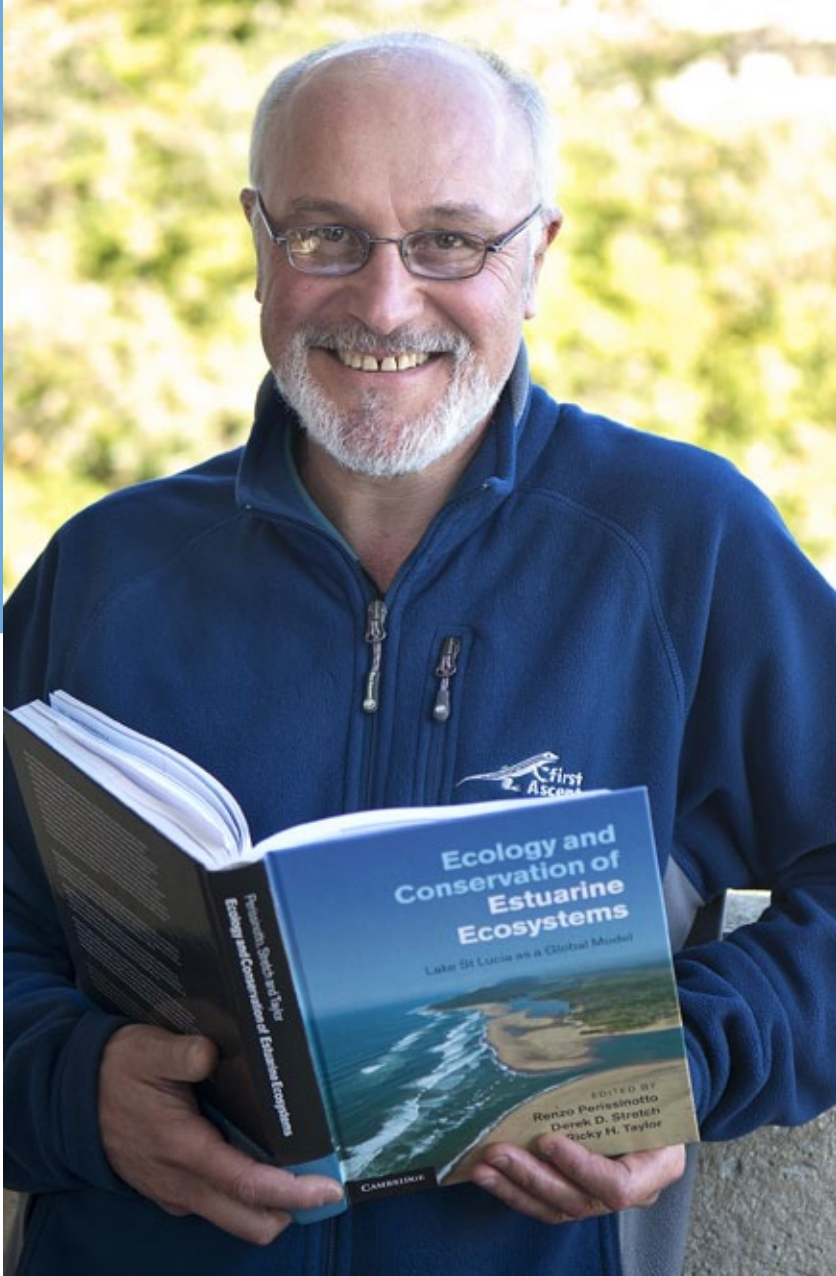
The discovery was made by Estuarine Ecologist Professor Renzo Perissinotto who for the past 10 years has been researching the biodiversity and ecological functioning of Lake St Lucia with the aim of generating new knowledge towards our understanding of the ecological functioning of Africa's largest estuarine lake.

Perissinotto has also been actively involved in the description and biology/ecology of species that have remained unknown to science. There are still many examples of unknown species in southern Africa, despite the region having long been regarded as a "hot-spot of biodiversity", he says. "Undescribed species can be found in all invertebrate phyla, even those that have received large attention in the past, both in the aquatic and terrestrial environment. This is an untenable situation in the era of biodiversity awareness, when species undergo extinction even before they are described and 'put on the map'".

According to Perissinotto, the discovery of *Edwardsia isimangaliso* is arguably of special conservation importance because it is the only one in the genus (and among only a few anemones) able to survive salinity levels (56 parts of salt per thousand parts of sea water) in excess of sea water (usually about 35 parts per thousand).

"What makes it even more unusual is that survival in Lake St Lucia would also require it to be able to survive periods of freshwater. It may be a relic of the lake's lineage that diversified millions of years ago," he says.

Edwardsia was not the only discovery of 2012. According to Perissinotto, nine new species of invertebrates, ranging from tiny copepod crustaceans to true anemones, bivalve molluscs and fruit/flower beetles were described afresh or revised in their taxonomic position by his research team during 2012, resulting in a number of ISI-rated publications.



Although species descriptions have a much lower research impact in the short term, species names are forever and, therefore, in the long to medium term they have a strong impact on research and knowledge, he says. Thus, the discovery of *Edwardsia* can be seen in the context of broader rehabilitation and protection initiatives taking place at the Lake which is currently undergoing an "unprecedented crisis" in terms of its conservation and management.

St Lucia is the largest estuarine lake in Africa and a core feature of the UNESCO World Heritage Site – the iSimangaliso Wetland Park established in 1999. Ecologically, the estuary plays a crucial role in the provision of goods and services, not only to the park, but also to the broader surrounding region.

"It is the most important fish and prawn nursery along the southeast coast of Africa. It also hosts some of the largest populations of hippos and Nile crocodiles in southern Africa, a large diversity of aquatic birds and important mangrove forests," says Perissinotto.

According to Perissinotto, a combination of prolonged drought, freshwater abstraction and catchment/mouth manipulations in tributary rivers (especially the Mfolozi) has resulted in 10 years of nearly continuous mouth closure in the estuary, desiccation and fragmentation of most of the lake region as a result of water levels falling below mean sea level, and the development of extreme hyper-saline conditions which have prevailed for almost a decade in the northern lakes of the system.

Cycles of drought and anomalous wet conditions are not new to the estuary and have been documented since the early 1900s. But indications are that climate change will make these worse.

"Projections of climate change for the next 50-100 years indicate that this situation will possibly deteriorate even further, with the most likely scenario being an alternation of extreme droughts followed by severe floods. Indeed during the past two years, the system has shifted to freshwater dominance, in the wake of the floods experienced since the end of 2011," he says.

Under these circumstances, research that aids our understanding of the estuarine system is critical. In 2012, Perissinotto and his team were involved in the first comprehensive survey of the meiofauna (small invertebrates) of the Lake St Lucia estuarine system. Perissinotto also set out to clarify and identify the main processes and components involved in the hypersaline state, as well as the trophic dynamics of key indigenous organisms and alien species introduced into the system.

Out of this work, six peer-reviewed articles in ISI-rated journals were published in 2012, while a book on the St Lucia system, titled *Ecology and Conservation of Estuarine Ecosystems: Lake St Lucia as a Global Model* was also completed for publication in 2013 by Cambridge University Press.

The book project started in 2010, with 44 authors from five different countries and with the involvement of 19 institutions. Co-edited by Professor Derek Stretch and Dr Ricky Taylor, the publication is a scientific compendium summarising all information available for this complex estuarine system to date.

"Although it is most suitable as a scientific reference for researchers and students in the areas of marine, estuarine and inland water sciences, it is also an indispensable source of information and guidance for environmental managers, resource planners, tourism operators and even ecotourists visiting the iSimangaliso Wetland Park," says Perissinotto.



At a glance: Professor Renzo Perissinotto

Estuarine Ecologist Renzo Perissinotto is Professor Emeritus of the School of Life Sciences of the University of KwaZulu-Natal. He is regarded as one of the University's top-published researchers and his work is considered to have made a large impact on the knowledge development in the area of shallow lakes ecology and management.

Perissinotto earned his PhD from Dalhousie University, Halifax, Canada. His current research interests cover integrated ecosystem functioning of estuarine and coastal systems, with focus on invertebrate diversity; zooplankton grazing and phytoplankton production; food webs and benthic-pelagic coupling; alien invasive species; anthropogenic eutrophication; and biological-physical-chemical interactions.

He has published over 107 peer-reviewed journal articles, several book chapters and two books.

He has authored a number of technical reports and contributed towards policy-making in the areas of marine ecosystems and estuaries for a range of government departments and institutes such as the Department of Water Affairs and Forestry, the Department of Environmental Affairs and Tourism, the Water Research Commission and the CSIR.

Two of his 2012 Marine Biology Honours students won the KwaZulu-Natal Premier's Award at the Contemporary Conservation Symposium held in Eshowe in November 2012.

Research Centres

Research Centres include:

- African Vision Research Institute (AVRI)
- African Centre for Crop Improvement (ACCI)
- Centre for African Literary Studies
- Astrophysics and Cosmology Research Unit (ACRU)
- Centre for Critical Research on Race and Identity (ccrri)
- Centre for Quantum Technology (CQT)
- Ujamaa Centre for Contextual Hermeneutics
- Africa Centre for Health and Population Studies
- Pollution Research Group (PRG)
- info4africa
- Centre for the AIDS Programme of Research In South Africa (CAPRISA)
- Health Economics and HIV/AIDS Research Division (HEARD)
- KwaZulu-Natal Research Institute for Tuberculosis and HIV (K-RITH)



South African Research Chairs Initiative (SARChI)



The South African Research Chairs Initiative (SARChI) is a national intervention aimed at improving research and innovation capacity at public universities while at the same time responding to national social and economic challenges.



Established in 2006 to address the “brain drain” in South African universities, the initiative is intended to attract and retain excellent researchers and scientists, and increase the numbers of postgraduates in South African universities.

As at March 2013, a total of 157 Chairs had been awarded across 21 universities. Research Chairs are tenable for five years, renewable for two further five-year periods, giving a total life span of 15 years. Eligibility for renewal is performance-based.

The University of KwaZulu-Natal has been awarded 11 Chairs, which is the fourth highest in the country.

Economic Development

Professor Dorrit Posel

The Research Chair in Economic Development is held by Professor Dorrit Posel, an Economist who specialises in the micro-econometric analysis of household survey data.

The Chair was established with an intention to explore the interface between households and labour markets in South Africa, advancing knowledge across a range of socio-economic areas, including those relating to union formation, mobility, child care, household survival strategies and resource sharing, labour force participation and employment.

The research is integral to evaluating the experiences of economic development among individual South Africans and to assessing economic and social policy that seeks to reduce poverty and increase well-being.

Professor Posel is also using the opportunities afforded by the Research Chair both to strengthen quantitative research skills in the analysis of South African micro datasets, and to foster inter-institutional research on socioeconomic issues.

Professor Posel's recent research investigates specific characteristics of the post-apartheid period in South Africa, including marriage and cohabitation in the context of bride wealth payments.

Evolutionary Biology

Professor Steve Johnson

The Research Chair in Evolutionary Biology is intended to strengthen a field of study pivotal for understanding and conserving South Africa's rich biodiversity.

Professor Steven Johnson is an NRF A-rated scientist and leading specialist in the field of plant pollination with particular interest in plant-pollinator interactions. He has contributed significantly to current understandings of the evolutionary diversification of plants in southern Africa and the ecological requirements that plants have for their reproduction.

Professor Johnson's interest in orchids, effective illustrators of adaptation processes, culminated in 2012 in the publication of a two-volume monograph, *The Cape orchids: a regional monograph of the orchids of the Cape Floristic Region*, which comprises over 1 000 pages of scientific information about the classification and ecology of all 241 orchid species (some endangered or virtually extinct) native to the Cape Floristic Region – a top international biodiversity hotspot.

During 2012, he also published research on colour signalling between plants and animals and co-published a major synthesis of pollinator driven plant speciation.

Quantum Information Processing and Communication

Professor Francesco Petruccione

The Research Chair in Quantum Information Processing and Communication (QIPC) is intended to promote an emerging area of research, which has the potential to revolutionise several areas of science and technology.

A Theoretical Physicist, Professor Francesco Petruccione is working on the theory of open quantum systems, which is the basis of many recent quantum technological applications that were unthinkable within classical physics. Quantum computing promises immense computing power, while Quantum Key Distribution guarantees completely secure communication.

More recently, Professor Petruccione has started to apply the theoretical methods of open quantum systems and quantum information processing to quantum biology. To understand how living systems, which are highly complex, warm and in constant interaction with the environment, can sustain and exploit quantum coherence, has huge implications for quantum engineering of technological devices.

Fluorine Process Engineering and Separation Technology

Professor Deresh Ramjugernath

As Chair of Fluorine Process Engineering and Separation Technology and Director of the Thermodynamics Research Unit at UKZN, Professor Deresh Ramjugernath leads a large team of productive researchers and postgraduate students which conducts research geared towards chemical process development and optimisation.

Research also covers the areas of chemical thermodynamics and separation technology and in this regard the Unit has one of the best equipped laboratories in the Southern Hemisphere and is one of the largest groups working in this field.

The team has a prolific publication record, publishing more than 80 peer-reviewed journal articles in 2012. Ramjugernath himself is one of the most highly cited chemical engineering researchers on the African continent.

The group actively contributes to the South African government's Fluorochemical Expansion Initiative (FEI) by researching and developing South Africa's fluorinated products. The group's activities are integral to the development of a fluorochemicals industry in the country and are directly linked to the South African Nuclear Energy Corporation (NECSA) and SASOL.

Although South Africa possesses the world's second largest reserves of fluorspar (starting material for all fluorochemicals), it currently imports almost all of its fluorinated products. Thus the activities under the Chair are intended to develop technology and human capacity to drive development and expansion of a fluorochemical cluster.

“ The University of KwaZulu-Natal was awarded three new South African Research Chairs in 2011 in the College of Agriculture, Engineering and Science. ”

Systems Biology of HIV and AIDS

Professor Thumbi Ndung'u

Professor Thumbi Ndung'u is a Molecular Virologist whose particular research interests lie in host-virus interactions underlying HIV/AIDS pathogenesis and antiviral immune responses.

The goals under the auspices of this Chair are to understand virus interactions with the host immune system and ultimately to inform or develop an HIV-1 vaccine. The laboratory studies HIV-1 exposed or infected people who show heterogeneity in their clinical outcomes to understand the complex interplay between the host genetic system, immune responses and the virus. Part of the effort is also devoted to improving the effectiveness of currently available antiretroviral treatments. Ndung'u has special interest in the training of globally competitive African scientists. His group focuses on both HIV and TB immunopathogenesis research.

Ndung'u is an Investigator and Max Planck Institute for Infection Biology Research Group Leader at the KwaZulu-Natal Research Institute for Tuberculosis and HIV (K-RITH), Professor and Victor Daitz Chair in HIV/TB Research at UKZN and is Director of the HIV Pathogenesis Programme (HPP), a collaborative initiative between the University, Harvard Medical School and the University of Oxford.

Gravitating Systems

Professor Sunil Maharaj

Professor Sunil Maharaj is a UKZN Fellow and Director of the Astrophysics and Cosmology Research Unit in the School of Mathematics, Statistics and Computer Sciences. His primary research focuses on the modelling of astrophysical processes in relativistic stars and the mathematics of large scale dynamics in cosmology.

Models of gravitating systems are necessary for the description of phenomena that arise in astrophysical and cosmological scenarios. Principal applications include inhomogeneous cosmological models and the early universe; gravitational collapse and black holes; the formation of singularities; processes involved in the evolution of relativistic stars; the thermodynamics of matter under intensely strong gravitational fields; super-dense relativistic stars with high core densities; and radiating relativistic stars.

His contribution, in collaboration with many MSc and PhD students, and postdoctoral fellows, to science and technology is manifest in his work on gravitational forces within the context provided by Einstein's Theory of General Relativity.

Professor Maharaj and his team have found several new solutions to the Einstein equations in this context by using a variety of advanced mathematical techniques including Liepoint and contact transformations. These new models will help to obtain a deeper insight into the behaviour of gravity and the underlying geometry of space-time.

Land Use Planning and Management

Professor Mathieu Rouget

Professor Mathieu Rouget was appointed in 2012. Rouget is a botanist and an internationally recognised expert in conservation planning. His research work focuses on the interaction between biodiversity conservation and human activities in the areas of conservation planning, alien plant invasions, climate change and ecosystem services.

The work of the Chair will focus on the following:

- The protection and enhancement of environmental assets and natural resources;
- The development of vibrant, equitable, sustainable rural communities and food security for all; and
- Sustainable human settlements and improved quality of households.

The Chair fits into the land use planning, land management and sustainable development strategic thrust which draws the Life Sciences disciplines together in a new way that will unlock a step-change in research and human capital development capacity. The Chair also forms a hub for interaction across private and public research institutions.

Intelligent Real Time Power Systems (Vacant)

Intelligent Real Time Power Systems (IRTPS) consider the utilisation of computational intelligence techniques for use on power systems in a smart grid utilising wireless networked systems for monitoring and control.

The Chair will consider utilisation of intelligence embedded in the grid to perform dynamic optimisation of power grid resources to ensure grid stability, energy efficiency, among other issues.

IRTPS is essential for the control and intelligence (and learning) needed for the electricity grid to become “smart”. South Africa is facing considerable challenges in terms of energy and there are significant market opportunities which can be exploited by developing a core capability in IRTPS and a linked capability in advanced sensor networks (ASN). Examples include: smart grid and the green economy.

Rural Agronomy and Development (Vacant)

The focus of the Chair in Rural Agronomy and Development and its thematic areas are aligned with the key strategic areas and thrusts of the SA National Agriculture and Development Strategy (DoA 2008), particularly human capital development; innovation and transfer of technology; and collaboration and partnerships.

The work of the Chair will involve contributing to community development through research, agricultural innovation and agricultural extension. The work will be conducted in partnership with public institutions and other agriculture-supporting bodies.

The Chair will contribute to the development of new technology to support smallholder farmers in agriculture, and the agricultural industry in general. It will also contribute towards human capital development through training of postgraduate students at MSc and PhD levels.

Applied Poverty Reduction Impact Assessment (Vacant)

The purpose of the Chair is to promote and undertake research on government, private sector and civil society interventions that have been designed to reduce poverty. Studies build on existing research at UKZN on the impact of land reform, the provision of social grants, access to health care and food security. New opportunities for poverty reduction will also be examined such as access to information and communication technologies.

Recognising the need for a trans-disciplinary approach to impact assessment, the approach will build on the comparative advantages of UKZN and will combine quantitative and qualitative methods. Studies will build on and contribute towards the monitoring and evaluation activities of government.

Econometric analysis of impact can be undertaken using quasi-experimental methodologies already applied by UKZN researchers on land reform, the impact of the child support grant and the provision of tele-centres. The Chair will source additional technical support from universities and Research Chairs. Although the primary focus will be on South Africa, research will also be undertaken in other parts of Africa, building on UKZN involvement in studies in the continent and developing South-South learning and facilitating the identification of best practice.

Indigenous Health Care Systems (Vacant)

The major aim of the Chair is to provide a platform for research and development in the field of traditional medicine, providing an essential academic link between national policy and implementation.

Through research the Chair will contribute to developing scientifically proven African traditional medicines and also to the institutionalisation of the African traditional health care system. Various projects currently exist and include the United States government-funded Biomedical and Traditional Healing Collaboration on HIV and AIDS; the NIH/NCCAM-funded traditional medicine clinical trial at Edendale Hospital in Pietermaritzburg, and the Department of Science and Technology IKS Bioprospecting Programme.

Importantly, the Indigenous Health Care Systems Research Chair will enhance scientific knowledge on traditional medicine and attract young scientists to this field.

National Research Foundation (NRF) A-rated researchers

National Research Foundation (NRF) A-rated researchers are defined as “researchers who are unequivocally recognised by their peers as leading international scholars in their field for the high quality and impact of their recent research outputs”.

Professor Patricia Berjak

Seed preservation – A lifelong scientific mandate



Since A-rated seed scientist Professor Patricia Berjak published her groundbreaking research on “flash-drying” in 1989 – a discovery which for the first time made possible the long-term preservation

of the germplasm from recalcitrant (wet) seeds – the significance of her work continues to grow, particularly in the face of global concerns about climate change and food security.

As a global expert in recalcitrant seed biology and cryopreservation, Berjak was recently commissioned by the United Nations Food and Agricultural Organisation (FAO) to contribute towards its *Genebank Standards for Plant Genetic Resources for Food and Agriculture* document, described as a “major accomplishment” for the current and future preservation of plant diversity for food security.

On the African continent in particular – where plant species face a number of threats ranging from unreliable rainfall and climate change, to habitat loss, land degradation and, in the case of the country’s medicinal plants, over-harvesting – the capacity to store seeds and seed-derived material has now become an imperative.

Berjak describes her work with seeds – the basis for commercial agriculture and a repository for biodiversity – as a “scientific mandate” dating back to her graduate student years at the University of Natal in the 1960s when she moved from animal-oriented biochemistry into seed-focused cell biology.

Her PhD research, from which she produced five papers published in international literature, was devoted to understanding the inherent causes of deterioration of stored maize seeds. So valuable was her work in the field that she was invited in 1980 to an international meeting in the United Kingdom on recalcitrant seeds.

“I left that meeting with the conviction that no-one properly understood the seeds they were trying to store. The challenge as I saw it was to understand the science first,” recalls Berjak.

Once back in Durban, where there was an abundance of available seed specimens such as *Avicennia marina* (White Mangrove), *Trichilia emetica* (Natal Mahogany) and others, she set about to characterise the basis of seed recalcitrance. This research in itself was regarded as the first meaningful explanation of the basis of recalcitrant seed behaviour.

Out of this scientific base came the development of flash-drying, then a novel process which involves the rapid removal of water from a seed’s excised embryonic axis which is then stored in a frozen state (down to minus 196°C) in liquid nitrogen – a condition known as cryo-storage. The technique minimises damage to the axis tissue, and, once the many problems are resolved, allows for healthy seedlings to emerge from the axes recovered from cryo-storage.

Berjak’s work has put South Africa on the global map when it comes to understanding the biology of seeds, their storage and conservation. As reflected by the award of the National Order of Mapungubwe (Silver) and in her NRF A-rating (which she has been awarded three times in a row since 2000), she is considered an international leader in her field.

From her laboratories on the Westville campus, Berjak and her team comprising her major collaborator, husband Professor Norman Pammenter, and a number of graduate students, continue to pursue an active research programme which is making continuous improvements to the cryostorage process and in our understanding of recalcitrant seed behaviour.

In the near future, Berjak and her team will be offering advice and mentoring aimed at providing cryobanking services for recalcitrant-seeded indigenous and other African species. “It would be our contribution to combating genetic erosion and extinction of the continent’s most valuable and sought-after plants,” she says.

At a glance: Professor Patricia Berjak

Professor Patricia Berjak has been recognised nationally and internationally for her work in seed storage and conservation. Her first A-rating from the National Research Foundation was awarded in 2000 and has since been reinstated twice.

An indication of her global reputation, Berjak was commissioned in 2011-12 to contribute towards the FAO’s Genebank Standards document which aims to facilitate germplasm conservation on an international level.

In 2010 she received the eThekweni Living Legend Award which recognises exceptional individuals and in 2006 received the National Order of Mapungubwe (Silver) bestowed by the President of South Africa.

Other major accolades include a major competitive grant from the Darwin Initiative of the United Kingdom government in collaboration with the Millennium Seed Bank of the Royal Botanic Gardens in Kew, England in 2005. She was named 2004’s Distinguished Woman Scientist by the South African Department of Science and Technology. She is also the recipient of the Silver and Gold Medals of the South African Association of Botanists.

Berjak is a Fellow of the Third World Academy of Sciences and in an academic career spanning some 40 years has published 173 peer-reviewed papers in international literature and 61 book chapters and full-length peer-reviewed conference proceedings. Since 1978 she has supervised 42 MSc students and 18 PhD students.

She is currently a Professor Emeritus and Senior Research Associate at the University of KwaZulu-Natal where she teaches seed biology and leads a large and productive group of postgraduate students.

Professor William “Bill” Bishai

Science at the Epicentre



So few and far between were cases of tuberculosis infections in the United States during the 1970s and '80s that the problem was considered largely solved. But a sudden resurgence during 1986 to 1993 took medical scientists by surprise and led to renewed interest in the subject and increased the funding available for new research.

For Bill Bishai, then a young Harvard Medical School graduate with an interest in infectious diseases, those conditions produced fertile grounds for his own research. “It was a case of being in the right place at the right time,” recalls Bishai, who is Professor of Medicine in the Department of Medicine, Division of Infectious Diseases at Johns Hopkins University and became the first permanent Director of the KwaZulu-Natal Research Institute for Tuberculosis and HIV (K-RITH) in 2010.

Over the course of his career, Bishai has remained focused on tuberculosis pathogenesis, animal models of pulmonary infections, and bacterial respiratory tract infections. This work is particularly relevant in South Africa where control of the spread of diseases such as TB (and its drug-resistant forms) and HIV are literally a matter of life and death.

While TB, along with HIV/AIDS and malaria, is one of the world’s top three killer diseases, it remains one of the least understood. One of Bishai’s central research concerns has been to understand how *Mycobacterium tuberculosis* so successfully infects humans – to the extent that it is able to resist immune systems, send false signals to macrophages, and create an intracellular environment in which the microbe is able to flourish. Understanding this process is critical to developing improved biomarkers, diagnostics and drugs as well as improving the clinical management of disease.

According to Bishai, even at the height of the rise in TB in the United States, numbers were still low – approximately five to six cases per 100 000 people – and 200-400 times lower than current KwaZulu-Natal rates of around 1 000 infections per 100 000 people. Significantly, South Africa also accounts for about one-third of cases of HIV/TB co-infection in the world, which makes understanding more about both diseases a national priority.

In the establishment of the KwaZulu-Natal Research Institute for Tuberculosis and HIV (K-RITH) on the UKZN Medical School campus, Bishai recognised a unique opportunity to conduct top-level research, with some of the world’s best scientists and most advanced laboratory facilities, at the epicentre of the global TB and HIV epidemic.

Being based in the province of KwaZulu-Natal – hardest hit nationally by both TB and HIV – meant having access to samples from large groups of patients attending state hospitals and clinics within close proximity to K-RITH. “It’s been a moving experience to move from non-human research to interact with our patients and to know that we can actually help them,” said Bishai.

Bishai describes his 2012 A-rating from the NRF as an “endorsement of the K-RITH mission” and its integral place in the South African research landscape. “K-RITH is a joint project between UKZN and the US-based Howard Hughes Medical Institute, but it is important that it becomes fully integrated into South African research and part of the South African research infrastructure,” he says.

“Each of the K-RITH scientists has the potential to change the world”

Bishai encapsulates the critical significance of the Institute when he states: “Each of the K-RITH scientists has the potential to change the world with the experiments they might do this afternoon. We have reason to be optimistic.”

Housed in a custom-built, eight-storey building on the UKZN Medical School campus, the Institute contains some of the most up-to-date scientific equipment available worldwide and at present is currently peopled by seven full-time scientists and their staff. The facility comprises both standard laboratories and specialised spaces, known as biosafety level 3 facilities, which allow scientists to handle dangerous pathogens such as TB.

Officially opened in October 2012, K-RITH represents a new approach to scientific research in global health. Jointly founded by the University of KwaZulu-Natal and the Howard Hughes Medical Institute in Maryland, United States, it facilitates basic scientific research, the ultimate aim being to develop improved diagnostic, treatment and prevention tools to fight two of the world’s most deadly diseases.

“It’s an attractive building, but what’s inside is designed specifically around the needs of scientists”, says Bishai who participated in the building’s design. “It is without doubt one of the top research facilities for HIV and TB in the world and many of its people are internationally renowned; its capabilities are enormous.”

One of K-RITH’s core goals is contributing to the growth of a strong core of young African scientists. All students and staff benefit from the Institute’s strong emphasis on international collaboration, which sees K-RITH hosting international lecturers on a regular basis and potentially serving as a hub linking scientists in South Africa with those in Europe and the US, including the Johns Hopkins University, the University of Alabama, the Albert Einstein College of Medicine and the Max Planck Institute.

At a glance: Professor Bill Bishai

Professor Bill Bishai is a renowned Infectious Diseases Specialist and Scientist in the Pathogenesis of Tuberculosis. After receiving his MD and PhD degrees from Harvard Medical School in 1989, he did his internship and residency at the Brigham and Women’s Hospital in Boston, Massachusetts, and received fellowship training in the Division of Infectious Diseases at the Johns Hopkins School of Medicine.

He was a Howard Hughes Postdoctoral Research Fellow in the laboratory of Nobel Laureate, Dr Hamilton Smith. He joined the Johns Hopkins faculty in 1994 and is Professor of Medicine in the Department of Medicine, Division of Infectious Diseases and serves as Co-Director for the JHU Center for Tuberculosis Research.

Bishai has authored over 150 papers in peer-reviewed journals, and receives grant support from the National Institutes of Health. He has given extensive service on international conference planning committees, study sections, editorial boards, and review panels including three years on the WHO Stop TB Partnership Co-ordinating Board.

Professor Michael Chapman

The social cost of sidelining literature



Does literature have value? Can it improve the functioning of society? In a society in which much of the vitality of post-apartheid social and political discourse has tended to settle into “wooden” orthodoxy, A-rated researcher Professor Michael Chapman makes a convincing case for literary education as a key to a more perceptive, creative and ultimately more humane society.

Such conviction drives one of Chapman’s recent initiatives: an NRF blue skies project titled *Uses of Literature in Society: South African Case Studies*, which is intended to be published as a book, accessible to a wide readership, made up of about 15 chapters from various academic contributors.

“One of the consistent concerns of my work is how to talk about art in a politically demanding society,” explains Chapman. Linked to this is the need to enrich public language through “literature thinking”. According to Chapman, current public discourse is debased, avoids complexities and entrenches polarities – often with fatal and divisive consequences: think the 2012 Marikana Massacre and the Brett Murray painting debacle which took place earlier in the same year.

At the heart of Chapman’s project is an appeal for an interrogation of the role of literature in university education – not only within literature departments, but all academic disciplines. The context for this interrogation is the increasingly pervasive view that literary education has limited purchase in a vocationally-oriented world, and in institutions of higher learning which incline towards more pragmatic and narrowly-conceived professional degrees.

“ According to Chapman, current public discourse is debased, avoids complexities and entrenches polarities – often with fatal and divisive consequences ”

But at what cost to society? asks Chapman. Such streamlining comes at the same time as professional societies such as the South African Law Society are expressing unease about the quality of legal graduates; there is also concern from educationists that “professionally-oriented” education students have no serious academic foundation in the subject they will eventually teach.

In a 2012 presentation titled *Whither/wither L/literature?* delivered to the Stellenbosch Institute for Advanced Study where Chapman is a Fellow, he elucidates some of these concerns and makes a case for the “uses” of literature. Quoting Richard J Frank, he shows that literature holds the potential to train future business leaders to “experiment with ideas, learn to take risks and change their minds when new information or insights emerged”. Paul A Cantor suggests that Mary Shelley’s *Frankenstein* offers medical students a reminder that science might tell us how to do something, but not whether we should do it. And, following the suggestions of Martha C Nussbaum, what might Charles Dickens’s *Hard Times* teach law students about the ethics of empathy within utilitarian or rational-choice systems, including the legal profession?

Since January 2011 when he became Professor Emeritus at UKZN, Chapman has continued to play the role of public intellectual, incisively exploring the real and potential value of literature through a range of initiatives.

In 2012, he contributed to two national investigations of humanities/socialscience education in South Africa: the Charter Group for the Humanities and the Association of Science of South Africa “Consensus Report” on the Humanities. In an attempt to engage a wider public in debates about literature and education, he has written a number of topical articles on the issues for the mainstream print media. As an expert in his academic field, he has featured on radio programmes and he delivered the English Academy of Southern Africa Guest Lecture at the Durban University of Technology on the topic, “Lewis Nkosi: Commemorating the Exile at Home”. The paper was published in *English Academy Review*.

Chapman is currently involved in a Canadian-based project examining the oral in literary history and has been asked by a Norwegian university to be part of a project on aesthetics in literature. As a Fellow of the Stellenbosch Institute for Advanced Study, he is involved in another literary project: a collection of essays using South African novelist J M Coetzee as a way of moving towards a “literary understanding of literature” and to further his quest for a “return to literary thinking”.

“In my career, I’ve tried to keep literature as close as possible to the world in which we function, which is a political world. Like people, texts don’t always comply with the big systems imposed upon them. The voice of the text often fights back to assert its independence and creativity against conformity, or, at certain times in history, against tyranny. Ultimately, literature offers experientially-based insights into life, indeed into the ethics of our conduct.”

At a glance: Professor Michael Chapman

Emeritus Professor and Fellow at UKZN, Michael Chapman is a world leader in the field of southern African and postcolonial literature and has received the NRF A-rating three times in succession since 2003. He is a holder of the English Academy of Southern Africa Medal for Service to English Studies and is a member of the Association of Science of South Africa.

In an academic career dating back to 1979, Chapman has produced major works on, among others, the poets Roy Campbell and Douglas Livingstone, the new Black poets of the 1970s and the Drum short-story writers of the 1950s. His study, *South African English Poetry: A Modern Perspective* (1984) won the Sanlam Award for literary criticism. It was the first of many accolades. In 1996, his book *Southern African Literatures* won both the University of Natal Book Prize (1996) and the prestigious Bill Venter Prize for academic writing. His collection of essays *Art Talk, Politics Talk* won the 2006/7 University of KwaZulu-Natal Book Prize.

Chapman also edited the collection of essays *Postcolonialism: South/African Perspectives* (2008) and, together with his late colleague Professor Margaret Lenta, compiled a major collection of essays titled *SA Lit: Beyond 2000* (2011).

Chapman is a Fellow of the Stellenbosch Institute for Advanced Study and Editor of the journal *Current Writing*, now in its 25th year of publication.

Professor Rob Gous

Modelling a path to innovation



In an academic career spanning more than 40 years, the name of Professor Rob Gous has become nationally and internationally synonymous with simulation modelling and research in poultry.

Currently one of only a clutch of poultry simulation modellers in the world, this A-rated scientist and life member of the South African Poultry Association is a frequent guest speaker at poultry science conferences around the world and is serving his third term on the board of the World’s Poultry Science Association as one of five Vice-Presidents.

Gous’s simulation models – increasingly being adopted around the world by the poultry industry as a basis for making nutritional decisions, and by academic and research institutions as a basis for research – enable food intake and growth of animals to be predicted thus allowing the process of producing broilers for human consumption to be optimised.

Although having officially retired from the University of KwaZulu-Natal in 2007, Gous has remained attached to the Institution, working from the University’s Ukulinga Research Farm, and continues to actively pursue an abiding passion for research.

In 2012 his ongoing efforts were again rewarded with his third A-rating from the National Research Foundation.

After establishing himself on the international stage as a poultry expert, Professor Rob Gous has more recently widened the scope of his contributions to animal science and is now applying his simulation models to turkeys, ostriches and even pigs.

“Gous’s simulation models are increasingly being adopted around the world by the poultry industry as a basis for making nutritional decisions”

“The principles and parameters of modelling are the same – whether it concerns the nutrition of chickens or pigs”, explains Gous.

Working with the research portfolio committee of the South African Pork Producers’ Organisation (SAPPO) which receives and administers part of the statutory levy contributed by pig producers and intended for industry-specific research, Gous assists in the development of postgraduate students conducting research with pigs at universities throughout South Africa.

He is also working with ostrich nutrition expert Professor Tertius Brand from Stellenbosch University on modelling the feed intake of growing and breeding ostriches so as to optimise production.

“It’s the same kind of experiments I did with broilers and hens, and I do it largely for the love of research,” he says.

Gous has also found a partner in the Czech Republic willing to conduct trials on turkeys – a comparatively large and therefore expensive bird to “waste” on scientific experiments – to whom he has recently sent the second trial protocol. These experiments are set to answer critical questions about the way that turkeys eat and grow, so that optimal models can be generated to maximise production.

As a sign of their growing credibility, Gous’s simulation models are currently being used by the University of New England and the University of Sydney as a basis for research. He has also worked closely over the past eight years with the University of Sao Paulo in Brazil where he supervises students who are producing data that will improve these models further.

Gous describes his work as “lively, new and innovative”.

“My modelling has helped to identify areas of important research, and having postgraduate students to work with over the years has given me endless opportunities to conduct unique and useful experiments – which of course led to my being rated by the NRF, and I’m grateful for that.”

At a glance: Professor Rob Gous

Professor Rob Gous received his third A-rating from the NRF in 2012.

Internationally known for his poultry research, Gous was elected in 2012 for the second time to be one of five Vice-Presidents of the World’s Poultry Science Association (WPSA) at its congress in Salvador, Brazil. This followed his 2008 election to the position of WPSA Senior Vice-President and his initial election in 2000 as a WPSA Vice-President.

He is currently serving his third term as Chairman of the South African branch of the WPSA.

Over his career, Gous has published over 164 scientific papers in SAPSE-accredited journals, presented over 99 papers at international conferences and 90 papers at local conferences. He has successfully supervised 48 MSc Agric students and 14 PhDs.

Gous has also developed 10 software programmes and a curriculum for training poultry management students at the KwaZulu-Natal Poultry Institute.

In 1988 he received the South African Society for Animal Production Silver Medal for Research and in 1992 received a Diploma of Excellence from the WPSA on presentation of a scientific paper at the XIX World’s Poultry Congress in Amsterdam.

In 1997, he was appointed a Fellow of the then University of Natal, one year after receiving Life Membership of the South African Poultry Association in 1996.

In 2003 he received the South African Society for Animal Production Gold Medal for Research.

More accolades followed in 2005 when he became a member of the Academy of Science of South Africa and was nominated for the National Science and Technology Forum (NSTF) Science and Technology Award for 2005.

Professor Steven Johnson

The secret language of flowers



Evolutionary biologist Professor Steven Johnson’s interest in pollination can be traced back to his 1994 doctoral degree on “Pollination and the evolution of floral traits in the Cape flora”.

Since then, his research on the interactions between flowers and their pollinators has enriched our collective understanding of southern Africa’s rich and often fragile biodiversity. Not only are these interactions important for seed production of wild plants and crops but have also been instrumental in the evolution of the spectacular diversity of the world’s flowering plants.

“Adaptations of flowers are a critical part of the process of evolution, and can tell us a great deal about how a new plant species can arise as a result of selection imposed by their pollinators,” explains Johnson.

Johnson’s work also has important ecological and conservation implications, which highlight how plants and their pollinators are affected by environmental change and human activities such as forestry and agriculture.

Johnson’s long-standing interest in orchids, which are highly effective illustrators of adaptation processes, culminated in 2012 in the publication of a two-volume monograph on the orchids of the Cape Floral region. Co-authored with William Liltved, the book comprises over 1 000 pages of scientific information about the classification and ecology of all 241 orchid species (some endangered or virtually extinct) native to the Cape Floristic Region – an area recognised as one of the top international biodiversity hotspots.

“ Following significant investment in technology for a laboratory dedicated to chemical ecology research, Johnson and his team of postgraduate students continued their focus during 2012 on understanding the diversity of volatile chemical signals that plants use to communicate with their pollinators, as well as their herbivore enemies. ”

Intended to be an “indispensible reference work”, *The Cape orchids: a regional monograph of the orchids of the Cape Floristic Region*, represents Johnson’s second formal foray into writing and publishing for readers outside of the academy. In 1999, Johnson co-authored the visually appealing *Table Mountain: a Natural History*, which earned book awards from the Universities of KwaZulu-Natal and Cape Town.

Following significant investment in technology for a laboratory dedicated to chemical ecology research, Johnson and his team of postgraduate students continued their focus during 2012 on understanding the diversity of volatile chemical signals that plants use to communicate with their pollinators, as well as their herbivore enemies.

Another current research area is that of colour signalling between plants and animals, which resulted in papers in journals such as *Proceedings of the Royal Society (London): Biological Sciences* and *Functional Ecology*. Johnson and his team demonstrated that flower colour change in the *Disa ferruginea* orchid is in fact adaptive and driven by local colour preference in its butterfly pollinator.

Together with his postdoctoral student Timo van der Niet, Johnson also published a major synthesis of pollinator driven plant speciation in the high impact review journal *Trends on Ecology and Evolution*, bringing to 26 the total number of peer-reviewed papers published by Johnson and his research team during 2012.

Johnson says he regards his A-rating by the National Research Foundation as confirmation that his work “has reached a global audience of peers and has influenced the thinking of others, which is always gratifying”.

But at the same time, he is not complacent. “I realise that constant innovation is required if one’s science is to remain influential,” he adds.

At a glance: Professor Steve Johnson

Professor Steve Johnson holds the South African Research Chair in Evolutionary Biology sponsored jointly by the National Research Foundation (NRF) and the Department of Science and Technology.

He received the NRF President’s Award in 1999 and was awarded his first A-rating by the NRF 10 years later, in 2009.

A prolific researcher, Johnson has published over 220 peer-reviewed articles, book chapters and books, and written a number of popular science articles. He has successfully supervised or co-supervised 11 PhDs, six of whom completed their degrees in 2012.

He currently serves on the board of two international journals, *Oecologia* and *Arthropod-plant Interactions* and was Guest Editor for a special edition of the *South African Journal of Botany* in 2009.

His contributions to the understanding of evolutionary diversification of plants in southern Africa and the ecological requirements for plant reproduction have been recognised in a variety of ways. In 2001 his book *Table Mountain: a Natural History* was awarded the University of Cape Town Merit Book Award. The book also earned the University of Natal Book Prize in 2002, the same year he received the University of Natal Vice-Chancellor’s Research Award. This was followed more recently by the UKZN Deputy Vice-Chancellor’s Research Award in 2010.

In 2003, he was awarded the Botanical Society of South Africa’s Percy Sergeant Medal for his promotion and conservation through photography of the flora of Southern Africa.

Professor Linda Richter

A healthy start



Research has shown that growth and parenting during the first two years of life has a significant impact on the kind of adults that children become.

In a world in which millions of children face inadequate care – in addition to poverty, ill health, social inequality and violence – their chances of reaching their full potential are seriously challenged. Recent studies show, for example, that children who grow poorly in their first two years of life achieve roughly a grade less of schooling in their lifetime than their peers and earn less as adults (Marotell, et al, 2010).

A-rated researcher Professor Linda Richter is a Developmental Psychologist who has spent her four-decade career trying to understand and to remediate the effects of social, economic and other types of adversity on children.

As a Distinguished Research Fellow at the Human Sciences Research Council, Richter is concerned with social science that maximises human potential and advances the rights of vulnerable populations.

Over the years she has drawn attention to the way in which destitution can “grind the heart out of family commitment and parenting and leave children unprotected and vulnerable to exploitation, loss of potential and untold suffering”.

Research conducted by Richter in the 1990s on mother-child interactions confirmed her own understanding of the significance of the mother-infant relationship, and overturned the dominant idea of the time that “mother-infant conversation was a population specific pattern particularly rare among non-Western agricultural societies”.

“What has been invaluable...is the growing body of scientific evidence on the long-term health and human capital outcomes of early development”

“My policy-related activities have been driven by the conviction that, provided they are not mentally ill or abusing substances, all parents, even the poorest, want the same things for the children that I want for mine – survival, safety, friends and acceptance, achievements,” she says.

Subsequent work on postnatal depression in poor contexts and on maternal wellbeing and its effects on the care and nutrition of children is now widely recognised and informs global interventions. In collaboration with the World Health Organization, Richter has worked on ways to promote caring relationships between parents and children and to integrate psychosocial care into the health agenda and services for children in developing countries.

What has been invaluable, she says, is the growing body of scientific evidence on the long-term health and human capital outcomes of early development. This includes data from birth cohort studies such as the *Birth to Twenty* study involving over 2 000 children and their families in Soweto-Johannesburg over a period of 24 years.

“It has been a fascinating scientific and personal journey,” she says. “We are starting to reap the rewards of long-term commitment as we explore relationships between birth weight, maternal stress or depression, blood lead levels at birth or early growth and later educational achievement, behavioural problems, pubertal timing and body mass index.”

Another major initiative is Project Accept based in Vulindlela in KwaZulu-Natal, a randomised community trial which aims to increase the number of people, especially youth, who know their HIV status. Other current HSRC projects include improving prevention of mother-to-child-transmission of HIV outcomes through community support, the Wellbeing of South African Children Affected by HIV/AIDS and Poverty study, and a project on home-based palliative care for children.

Richter has published extensively in the fields of child and adolescent development, HIV/AIDS, women’s issues, and the status of the psychology profession in South Africa. She is the co-author, with Oscar Barbarin, of the 2001 book, *Mandela’s Children: Growing up in post-apartheid South Africa* and in 2006 she co-edited with Robert Morrell *Baba: Men and Fatherhood in South Africa*.

At a glance: Professor Linda Richter

A distinguished research Fellow at the Human Sciences Research Council and Honorary Professor in Psychology and an elected Fellow of the University of KwaZulu-Natal, Professor Linda Richter received her A-rating from the NRF in 2012.

Richter is an Honorary Professor in the Department of Paediatrics and Child Health at the University of the Witwatersrand, and a Research Associate in the Department of Psychiatry at the University of Oxford.

In 2012 she led the team commissioned by the Department of Performance Monitoring and Evaluation in the Presidency to conduct the Early Child Development Diagnostic Review. She is also leading the team commissioned by the Department of Social Development and UNICEF to develop the National Early Child Development Policy and the National Early Child Development Programme.

Richter is the founding researcher of the *Birth to Twenty* longitudinal birth cohort study, started in 1990, which is now the largest and longest running study of children’s health and development in Africa, and one of only five such studies in low and middle income countries

From 2003-2006, she was a Visiting Researcher at the University of Melbourne, and from 2007-2010 a Visiting Scholar at Harvard University. From 2010-2012 she was on a two-year contract from the Human Sciences Research Council to the Global Fund to Fight AIDS, Tuberculosis and Malaria in Geneva, as Senior Specialist for half of her time.

Richter has published more than 300 papers and chapters in the fields of child, adolescent and family development, infant and child assessment, protein-energy malnutrition, street and working children, and the effects of HIV/AIDS on children and families, including HIV prevention among young people. Her papers have appeared in, among others, *Science*, *The Lancet*, and the *Journal of the American Medical Association*. She is the author of several books and monographs.

For three years Richter was a member of and chaired the Technical Steering Committee of the Department of Child and Adolescent Health at the World Health Organization in Geneva. She also chaired Future Think, a roundtable to anticipate threats to children’s wellbeing in preparation for the United Nations General Assembly Special Session on Children in 2001.

She is a member of the Academy of Science of South Africa.

NRF-Rated Researchers

College of Agriculture, Engineering and Science			
Title	Surname	Initial	School /Research Unit
Professor	Bob	U	Agricultural, Earth and Environmental Sciences
Professor	Chimonyo	M	Agricultural, Earth and Environmental Sciences
Professor	Derera	J	Agricultural, Earth and Environmental Sciences
Professor	Green	JM	Agricultural, Earth and Environmental Sciences
Professor	Hill	T	Agricultural, Earth and Environmental Sciences
Professor	Hughes	JC	Agricultural, Earth and Environmental Sciences
Professor	Maharaj	B	Agricultural, Earth and Environmental Sciences
Professor	Modi	AT	Agricultural, Earth and Environmental Sciences
Professor	Muchaonyerwa	P	Agricultural, Earth and Environmental Sciences
Professor	Mutanga	O	Agricultural, Earth and Environmental Sciences
Professor	Nsahlai	IV	Agricultural, Earth and Environmental Sciences
Professor	Ortmann	GF	Agricultural, Earth and Environmental Sciences
Professor	Proches	S	Agricultural, Earth and Environmental Sciences
Professor	Savage	MJ	Agricultural, Earth and Environmental Sciences
Professor	Andersson	PG	Chemistry and Physics
Professor	Bharuth-Ram	K	Chemistry and Physics
Professor	Coombes	PH	Chemistry and Physics
Professor	Ford	TA	Chemistry and Physics
Professor	Friedrich	HB	Chemistry and Physics
Professor	Hellberg	MA	Chemistry and Physics
Professor	Hey	JD	Chemistry and Physics
Professor	Jaganyi	D	Chemistry and Physics
Professor	Jonnalagadda	SB	Chemistry and Physics
Professor	Konrad	T	Chemistry and Physics
Professor	Kruger	HG	Chemistry and Physics
Professor	Mace	RL	Chemistry and Physics
Professor	Mola	GT	Chemistry and Physics
Professor	Moyo	T	Chemistry and Physics
Professor	Munro	OQ	Chemistry and Physics
Professor	Nyamori	VO	Chemistry and Physics
Professor	Owaga	BO	Chemistry and Physics
Professor	Pellicane	G	Chemistry and Physics
Professor	Petruccione	F	Chemistry and Physics
Professor	Robinson	RS	Chemistry and Physics
Dr	Sergi	A	Chemistry and Physics
Dr	Sinayskiy	IV	Chemistry and Physics
Professor	van Heerden	FR	Chemistry and Physics
Professor	Venkatamaran	S	Chemistry and Physics
Dr	Zunckel	CL	Chemistry and Physics
Professor	Adali	S	Engineering
Professor	Afullo	TJO	Engineering

NRF-Rated Researchers

Title	Surname	Initial	School /Research Unit
Professor	Bezuidenhout	CN	Engineering
Professor	Boje	ES	Engineering
Professor	Bright	G	Engineering
Professor	Carsky	M	Engineering
Professor	Meikap	BC	Engineering
Professor	Mwithiga	G	Engineering
Professor	Pegram	GGs	Engineering
Professor	Ramjugernath	D	Engineering
Professor	Smithers	JC	Engineering
Professor	Trois	C	Engineering
Professor	Workneh	T	Engineering
Professor	Xu	H	Engineering
Professor	Ariatti	M	Life Sciences
Professor	Beckett	RP	Life Sciences
Dr	Brown	M	Life Sciences
Dr	Bytebier	BLG	Life Sciences
Dr	Chenia	HY	Life Sciences
Professor	Downs	CT	Life Sciences
Dr	Elburg	MA	Life Sciences
Professor	Glassom	D	Life Sciences
Professor	Goldring	JPD	Life Sciences
Dr	Griffiths	ME	Life Sciences
Dr	Gueguim Kana	GKEB	Life Sciences
Professor	Hart	RC	Life Sciences
Dr	Islam	MS	Life Sciences
Dr	Juergens	A	Life Sciences
Dr	Light	ME	Life Sciences
Professor	Lin	J	Life Sciences
Professor	Lovegrove	BG	Life Sciences
Professor	Mukaratirwa	S	Life Sciences
Professor	Naidoo	G	Life Sciences
Professor	Niesler	CU	Life Sciences
Professor	Olaniran	AO	Life Sciences
Professor	Ovechkina	MN	Life Sciences
Professor	Pammenter	NW	Life Sciences
Professor	Perissinotto	R	Life Sciences
Professor	Perrin	MR	Life Sciences
Professor	Pillay	B	Life Sciences
Dr	Scharler	UM	Life Sciences
Professor	Schmidt	S	Life Sciences
Professor	Shrader	AM	Life Sciences
Dr	Singh	M	Life Sciences
Dr	Singh	N	Life Sciences

NRF-Rated Researchers

Title	Surname	Initial	School /Research Unit
Professor	Slotow	RH	Life Sciences
Dr	Smit	AJ	Life Sciences
Dr	Stirk	WA	Life Sciences
Professor	van Staden	J	Life Sciences
Professor	Ward	DM	Life Sciences
Professor	Watt	MP	Life Sciences
Professor	Baboolal	D	Mathematics, Statistics and Computer Science
Professor	Banasiak	J	Mathematics, Statistics and Computer Science
Professor	Govinder	KS	Mathematics, Statistics and Computer Science
Dr	Keet	CM	Mathematics, Statistics and Computer Science
Professor	Leach	PGL	Mathematics, Statistics and Computer Science
Professor	Maharaj	SD	Mathematics, Statistics and Computer Science
Professor	McKenzie	JF	Mathematics, Statistics and Computer Science
Professor	Moodley	KS	Mathematics, Statistics and Computer Science
Professor	Motsa	SS	Mathematics, Statistics and Computer Science
Professor	Mukwembi	S	Mathematics, Statistics and Computer Science
Professor	Raftery	JG	Mathematics, Statistics and Computer Science
Professor	Ray	S	Mathematics, Statistics and Computer Science
Professor	Rodrigues	BG	Mathematics, Statistics and Computer Science
Professor	Sibanda	P	Mathematics, Statistics and Computer Science
Dr	Varzincak	IJ	Mathematics, Statistics and Computer Science
Dr	Zloschastiev	K	Mathematics, Statistics and Computer Science
College of Health Sciences			
Title	Surname	Initial	School /Research Unit
Professor	Newell	MS	Africa Centre
Professor	Tanser	FC	Africa Centre
Professor	Singh	JA	CAPRISA
Professor	Bhimma	R	Clinical Medicine
Dr	Biccard	BM	Clinical Medicine
Professor	Coutsoudis	A	Clinical Medicine
Professor	Madiba	TE	Clinical Medicine
Professor	Moodley	J	Clinical Medicine
Professor	Mosam	A	Clinical Medicine
Professor	Musabayane	CT	Clinical Medicine
Professor	Naidoo	DP	Clinical Medicine
Professor	Naidoo	N	Clinical Medicine
Professor	Daniels	WMU	Health Sciences
Professor	Essack	SY	Health Sciences
Professor	Govender	T	Health Sciences
Professor	Govender	T	Health Sciences
Professor	Mackraj	I	Health Sciences

NRF-Rated Researchers

Title	Surname	Initial	School /Research Unit
Professor	McKune	AJ	Health Sciences
Professor	Naidoo	S	Health Sciences
Professor	Oduntan	OA	Health Sciences
Professor	Satyapal	KS	Health Sciences
Professor	Suleman	F	Health Sciences
Professor	Ndung'u	PT	Laboratory Medicine and Medical Sciences
Professor	Pillay	M	Laboratory Medicine and Medical Sciences
Dr	Bland	RM	Nursing and Public Health
Professor	Brysiewicz	P	Nursing and Public Health
Professor	Burns	J	Nursing and Public Health
Professor	Kvalsig	JD	Nursing and Public Health
Professor	Taylor	M	Nursing and Public Health
Professor	Uys	LR	Nursing and Public Health
College of Humanities			
Title	Surname	Initial	School /Research Unit
Professor	Collings	SJ	Applied Human Sciences
Professor	Durrheim	K	Applied Human Sciences
Professor	Henzi	SP	Applied Human Sciences
Professor	Potgieter	CA	Applied Human Sciences
Professor	Singh	SB	Applied Human Sciences
Professor	Teer-Tomaselli	RE	Applied Human Sciences
Professor	Tomaselli	KG	Applied Human Sciences
Professor	Ballantine	CJ	Arts
Professor	Coullie	JE	Arts
Professor	De Meyer	BAMS	Arts
Professor	Dimitriu	I	Arts
Professor	Green	MM	Arts
Professor	Leeb-du Toit	JC	Arts
Professor	Stiebel	E	Arts
Professor	Stobie	C	Arts
Professor	Turner	NS	Arts
Professor	Ballard	RJ	Built Environment and Development Studies
Professor	Bond	P	Built Environment and Development Studies
Dr	Casale	DM	Built Environment and Development Studies
Professor	Maharaj	P	Built Environment and Development Studies
Professor	Posel	D	Built Environment and Development Studies
Professor	Scott	DM	Built Environment and Development Studies
Professor	Valodia	IAK	Built Environment and Development Studies
Professor	Xaba	T	Built Environment and Development Studies
Professor	Bhana	D	Education
Professor	Buthelezi	MT	Education
Dr	Chikoko	V	Education
Professor	de Villiers	MD	Education
Dr	Deacon	RA	Education

Title	Surname	Initial	School /Research Unit
Professor	Moletsane	R	Education
Professor	Muthukrishna	A	Education
Professor	Preece	J	Education
Professor	Ramrathan	P	Education
Dr	Wessels	MA	Education
Professor	Wildsmith-Cromarty	R	Education
Professor	Christiansen	IM	Religion, Philosophy and Classics
Professor	Collier	JD	Religion, Philosophy and Classics
Professor	Denis	PMBR	Religion, Philosophy and Classics
Professor	Draper	JA	Religion, Philosophy and Classics
Professor	Ebrahim	AFM	Religion, Philosophy and Classics
Dr	Efthimiadis-Keith	H	Religion, Philosophy and Classics
Professor	Hilton	JL	Religion, Philosophy and Classics
Professor	Lenta	PJP	Religion, Philosophy and Classics
Professor	Murove	M	Religion, Philosophy and Classics
Professor	Nadar	S	Religion, Philosophy and Classics
Professor	Penumala	PK	Religion, Philosophy and Classics
Professor	Spurrett	DJ	Religion, Philosophy and Classics
Professor	West	GO	Religion, Philosophy and Classics
Professor	Ayee	JRA	Social Sciences
Professor	Khan	S	Social Sciences
Professor	Maistry	SM	Social Sciences
Professor	Mare	PG	Social Sciences
Professor	Marks	M	Social Sciences
Professor	Marschall	S	Social Sciences
Professor	McCracken	DP	Social Sciences
Professor	Mutula	SM	Social Sciences
Professor	Sooryamoorthy	R	Social Sciences
Professor	Steyn	J	Social Sciences
Professor	Stilwell	C	Social Sciences
Professor	Vahed	GH	Social Sciences

College of Law and Management Studies			
Title	Surname	Initial	School /Research Unit
Professor	Harris	GT	Accounting, Economics and Finance
Professor	Whiteside	AW	HEARD
Professor	Couzens	EWf	Law
Professor	Kidd	MA	Law
Professor	McQuoid-Mason	DJ	Law
Professor	Mubangizi	JC	Law
Professor	Reddy	PS	Management, Information Technology and Governance
Dr	Ruggunan	SD	Management, Information Technology and Governance
Professor	Stainbank	LJ	Management, Information Technology and Governance

FELLOWS OF THE UNIVERSITY IN 2012

Professor Peter Dankelmann

Mathematics

Mathematician Peter Dankelmann rates the opportunity to train the next generation of mathematicians as one of his most “rewarding” contributions to academia and society.

“Being named as a Fellow of the University of KwaZulu-Natal is a wonderful recognition of the work I have done at UKZN, in research as well as in teaching,” he says.

Dankelmann’s commitment to teaching in particular and to raising the quality of mathematics in South Africa is highlighted through his role as national organiser from 2001-2010 of the interprovincial Mathematics Olympiad. Originally established in the late 1950s as an attempt to rectify gaps in school mathematics, the Olympiad continues to contribute towards developing maths talent and promoting a positive image of maths among young people.

The main focus of Dankelmann’s research is in Graph Theory, a branch of Discrete Mathematics, which has a number of potential modern applications.

“Graph Theory is concerned with the analysis and design of network structures, ranging from transportation networks and information networks to structures of chemical compounds. Examples of such structures are the London Underground, systems of pipelines to transport oil or gas, or the World Wide Web,” explains Dankelmann.

An NRF B-rated researcher, Dankelmann conceives of his career as a “steady growth from a researcher active in a particular branch in mathematics to an internationally recognised specialist whose research counts internationally among the very best in his field”.

“I am particularly grateful to Professor Emeritus Henda Swart from whom I not only learned a lot of mathematics, but who also infected me with her lifelong desire to push the boundaries of mathematical knowledge further and further,” he says.



At a glance: Professor Peter Dankelmann

Born and educated in Germany where he attained his PhD at the Rheinisch-Westfaelische Technische Hochschule Aachen, Professor Peter Dankelmann joined the former University of Natal in 1993 as a post-doctoral researcher, working his way up to become a highly respected academic in his field.

Dankelmann has a B2 rating from the National Research Foundation, having being rated by the organisation since 1996.

He is a member of the prestigious Academy of Science of South Africa, a fellow of the Institute of Combinatorics and its Applications, and a Member of the South African Mathematical Society.

In 2005 the University nominated Dankelmann for the national NSTF Science and Technology Award in Category B, which is for the Best Contribution of an Individual over Five Years.

Since 1996 Dankelmann has been a member of the editorial board of the international ISI-rated journal: *Utilitas Mathematica*, and has accepted an invitation to be a member of the editorial board of another international journal: *Electronic Journal of Graph Theory and its Applications*.

He has published over 75 journal papers, made 41 conference presentations, among other achievements. He has supervised 10 post-graduate students, five of whom were PhDs.

Professor Sreekantha Jonnalagadda

Chemistry

In addition to acting as a filter to ultraviolet radiation from the troposphere, ozone is a powerful oxidant and as such has many industrial and consumer applications, including wastewater treatment, industrial bleaching and disinfection of drinking water.

How to develop competitive technologies and value-added conversions using catalysed ozonation and advanced oxidation processes (AOP) is one of the key challenges occupying the mind of Chemistry Professor Sreekantha Jonnalagadda, one of UKZN's most productive researchers.

According to Jonnalagadda, one of the benefits of a process using ozone is that it minimises the use and production of hazardous substances. In this sense it is "green chemistry".

"Ozone is preferred as an oxidant because it is produced from oxygen. Ozone is not stable in water for long periods, but when it decomposes it simply gives off oxygen. Thus, the starting materials and end products are clean materials."

"Normally, when chlorinated oxidants like hypochlorite or chlorine are used, there is a chance of the formation of chlorinated organics due to chlorination of the organic impurities in water. Those chlorinated hydrocarbons are toxic and unwanted in water systems.

"Some chlorinated organics are carcinogenic and toxic. Due to toxicity, those are non-biodegradable by microorganisms and many are refractory compounds resistant to oxidation. Those compounds cannot be incinerated, as they generate many toxic dioxins at high temperatures," explains Jonnalagadda.

Jonnalagadda is also working with colleagues in the field of environmental analytical chemistry on a number of studies researching the elemental uptake by edible plants to identify the health risks of consuming vegetation grown in polluted soils.

"In our studies on edible vegetation, nuts and indigenous fruits, the focus is on their elemental content and to assess the impact of their consumption on dietary intake by humans," he says.

The studies cover topics such as the impact of arsenic-rich mine dumps on elemental uptake by grass species, and the effect of coal mine soil and metal contamination on elemental uptake by the edible *Amaranthus* herbs and spinach, and the soil quality on elemental uptake by black jack, mushrooms, African potato, ginger rhizomes, yams and sweet potato, etc. His research group has also investigated the elemental distribution in edible seaweeds grown



along the KwaZulu-Natal Coast. The impact of soil quality on the chemical and physical properties of indigenous fruits and nuts is also among his research interests, as is the elemental uptake and speciation in indigenous mushrooms and edible vegetation as a function of soil quality.

"All of these projects are significant given the difficulty of managing waste products in today's world, the need for environmentally sustainable industrial processes, and the global crisis around access to safe water," says Jonnalagadda.

At a glance: Professor Sreekantha Jonnalagadda

Chemistry Professor Sreekantha Jonnalagadda is an NRF-rated scientist whose research interests include reactions dynamics, catalysis, computer modelling and simulation and environmental analytical chemistry.

He has frequently appeared among the University's Top 30 most productive researchers and in 2009 was 11th out of the University's top 15. Over his career, he has published over 150 articles in peer-reviewed journals.

Jonnalagadda is regularly invited to international conferences as a plenary/invited speaker and to act as a reviewer for international journals. He is on the editorial advisory boards of two journals, *International Journal BiochemPhysics*, (Nairobi) and the *International Journal of Chemistry* (Mumbai).

He is a member of the South African Chemical Institute, the NRF-Rating Evaluation panel - Chemistry (2003-2005), and the NRF panel - Evaluation of PhD bursary applications since 2007.

Since 2008 he has supervised three PhD and five MSc students. Jonnalagadda has completed a number of National Research Foundation (NRF)-funded research projects and he is currently working on a three-year project under the South Africa-India Research Initiative.

Professor Gerald Ortmann

Agricultural Economics

Most urban-based South Africans take farmers for granted. Yet the work done by farmers – pursued under unpredictable conditions marked by a number of economic, climatic and political variables – is essential to our health and survival.

For Professor Gerald Ortmann, improving the competitiveness of the South African agricultural sector in the context of a dynamic economic and political environment has been a central and ongoing concern.

Over the past two decades, South African farmers have faced a relatively unique set of challenges: in addition to having to deal with globalisation, technological advances and the deregulation of domestic agricultural markets in the 1990s, they have had to adapt to a number of politically-driven policies. These include land reform, black economic empowerment in agriculture, new labour legislation and property taxes, amongst others.

Ortmann's current research – now mainly conducted through postgraduate students – examines both commercial and small-scale farmers – each of whom form important components of the agricultural industry, and each facing a particular set of challenges. Shared by the industry as a whole, however, is a vested interest in raising productivity levels in the face of rising production costs, and improving South Africa's competitive edge in the global marketplace.

Commercial farmers in particular – of which South Africa has less than 40 000 remaining – are increasingly forced to take advantage of economies of size to achieve a competitive edge. Since 1996, when control boards were abolished, commercial farmers have by and large adapted to less state-sponsored support, but now face additional responsibilities in the form of the triple bottom line: profits, social responsibility, and environmental sustainability issues.

"We are increasingly demanding more of farmers – can they continue to meet these expectations?" asks Ortmann. "As agricultural economists, we look at the rules of the game. How can we influence government policy or the institutional framework in which farmers operate? In a world where investors shy away from uncertainty, it is very important for government to create an environment conducive to investment in agriculture. Quality research has a critical role to play."

According to Ortmann, the Discipline of Agricultural Economics at UKZN is a popular choice for students who readily find employment in commercial banking, government and non-governmental agencies, farming, agribusiness, and other sectors. "Taking advantage of the trans-disciplinary and collaborative possibilities presented by UKZN



and its School of Agricultural, Earth and Environmental Sciences, many of our students are pursuing research agendas which take into account pressing global challenges of our time such as food security and climate change adaptation," he says.

At a glance: Professor Gerald Ortmann

A Senior Professor in Agricultural Economics, Gerald Ortmann's contribution to academic achievement was recognised when he was named as a Fellow of the University of KwaZulu-Natal where he has been an academic staff member since 1979.

The Fellowship award, made by the University Council, recognises distinguished academic achievement from a staff member, whose work is of such high quality it merits special recognition. "I am very honoured to have been awarded the Fellowship," says Ortmann who, by the end of 2012, had published 113 peer-reviewed journal papers and won a number of publication awards. Under his supervision or co-supervision, 34 students have graduated with Masters degrees and six students with PhDs. He has also been internal or external examiner for 46 Masters dissertations and 17 PhD theses.

Ortmann dedicated five sabbaticals to conducting research at overseas universities – four in the United States and one in Germany – all of which produced published papers.

From 2003-2007, he was B-rated by the National Research Foundation (NRF) and served on the NRF Assessment Panel for Economics, Management, Administration and Accounting for three years to evaluate academics for rating purposes. From 2008-2012 he enjoyed a C1-rating.

Ortmann is a member of the Agricultural Economics Association of South Africa (AEASA), the International Association of Agricultural Economists (IAAE), the International Farm Management Association (IFMA) and the Economics Society of South Africa (ESSA), and has served as a referee for various local and international journals. He served as President of AEASA from September 1999 to September 2001, and has been an honorary member of AEASA since 2005.

Vice-Chancellor's Research Award

Professor Michael Chimonyo

For centuries, livestock has made an invaluable contribution to the food security of rural households in Africa and their value as such, is increasing in the face of climate change, drought and persistent poverty.

There are many challenges facing small-scale livestock producers, and it is their turn to benefit from the attentions of the scientific research community. That's the view of UKZN animal scientist Professor Michael Chimonyo who says the primary goal of his research in sustainable livestock agriculture is to reduce poverty among small-holder farmers.

Chimonyo, who received the 2012 Vice-Chancellor's Research Award, received his PhD in pig breeding from the University of Zimbabwe. His current research focus is the genetic and phenotypic characterisation of cattle, chickens, goats, pigs and guinea fowls in southern Africa. As a result of a combined grant of R1.5 million from the Southern African Development Community and the National Research Foundation, he is conducting research on the topic in Malawi and Zimbabwe as well as South Africa.

According to Chimonyo, the key to helping small-scale farmers improve their productivity is understanding their needs. "As scientists, we often come to them with preconceived ideas about their challenges and priorities, but we need to take time to understand the socio-economic, cultural and physical context in which they operate," he says.

"When rural farmers own cattle, for example, the emphasis is on numbers in the herd with the likelihood that pastures are insufficient. From a scientific perspective, we might advise the farmer to reduce his numbers, but realistically, that's not likely to happen."

Where scientific research can play a major role is the identification of qualities such as disease resistance for the purposes of genetic selection.

In this regard, tick resistance in cattle farmed in low-input settings is currently under investigation. "Most rural farmers don't dip their cattle very often and some breeds have developed a natural resistance to ticks. By investigating this

phenomenon we are in a better position to influence genetic selection of the best quality cattle for breeding purposes," says Chimonyo.

Understanding the science behind the markings which manifest on a cow's hide may also assist in producing cattle which have a higher value, particularly when it comes to dowry-related exchanges in traditional Zulu marriages, he says.

For Chimonyo, there are ample reserves of indigenous knowledge that are detectable in the practice of traditional livestock rearing, although there is also room to improve some practices. "The insistence in traditional slaughters that the cow should bleed while it is alive is correct; but what is debateable is whether that cow should suffer pain. We need to look at ways to reduce suffering in animals and yet still meet the requirements for the traditional ceremonies."

However, to intervene in traditional practices is difficult. "We need to be involved first, without dismissing views outright, as has happened in the past," he says.

There is also a great deal of genetic value in indigenous livestock. "There is extensive evidence that animals in rural areas have adapted to their low-input environments very effectively," says Chimonyo. "For example, chickens bred in the rural areas are very tough and might go for days without water, but still survive. Not only are these qualities desirable in poor-resource settings, they are increasingly desirable in the commercial livestock sector, particularly as pressure to move towards free-range and more humane farming practices is felt."

In response to increased competition between humans and livestock around maize as a source of nutrition, Chimonyo is also investigating alternative feeds such as acacia leaves and other sources of dietary fibre for commercially-reared pigs.



At a glance: Professor Michael Chimonyo

Animal scientist Professor Michael Chimonyo has specialist expertise in pig breeding but has a broad understanding of all types of African livestock. A highly productive researcher, Chimonyo published 14 journal articles in 2012 and received the 2012 Vice-Chancellor's Research Award.

His major research interests lie in understanding the production principles of livestock and how livestock can adapt to new challenges, such as climate change, droughts and diseases.

He has led projects on inheritance and genetic potential of indigenous pigs, beef quality from Nguni cattle, potential of cows in draught power provision,

use of forages in meat quality, resistance of goats to Haemonchus parasites, tick prevalence in Nguni cattle and diet selection and nutrition of indigenous goats.

Chimonyo has a strong team of institutional collaborators, including Stellenbosch University, the Agricultural Research Council of South Africa, Bunda College of Agriculture, Malawi, University of Zimbabwe, Marinsee Agricultural Institute, Hanover, Germany and Cornell University, Ithaca.

He has raised over R10 million for his research projects and (co)authored over 120 articles in internationally-recognised, peer-reviewed journals.

DST Women in Science Awards - 2012

Six UKZN women scientists received several national awards in various categories at the prestigious annual Department of Science and Technology's Women in Science Awards (WISA). The announcement was made by Minister of Science and Technology, Naledi Pandor for outstanding scientific contributions to advance science and build the knowledge base in their respective disciplines. The awards are made annually to recognise and reward the achievements of South African women scientists. "WISA winners are profiled as role models for younger scientists and researchers," said Minister Pandor.

Awards in the following categories were made to:

- Professor Relebohile Moletsane, the winner of the Distinguished Women Scientists: Social Sciences and Humanities;
- Professor Sarojini Nadar, winner in the Distinguished Young Women Scientists: Social Sciences and Humanities;
- Dr Sengeziwe Sibeko, first runner-up in the category Awards for the Development of Rural Women: Emerging Researchers;
- Dr Joyce Chitja, the second runner-up in the category Award for the Development of Rural Women: Emerging Researchers;
- Ms Prudy Manoko Mashika Seepe in the DST Fellowships Doctoral Studies category;
- Ms Bongiwe Goodness Ndlovu in the DST Fellowships for Doctoral Studies category.



Ms Prudy Manoko Mashika Seepe

Professor Relebohile Moletsane

Professor Sarojini Nadar

Dr Joyce Chitja

Ms Bongiwe Goodness Ndlovu

Dr Sengeziwe Sibeko

Prolific Researchers

These are researchers at the University of KwaZulu-Natal who have obtained three or more author units in DoHET accredited, peer-reviewed journals.

Title	Surname	First Name
College of Agriculture, Engineering and Science		
Professor	Adali	Sarp
Professor	Afullo	Thomas
Dr	Bala	Muhammad Dabai
Professor	Banasiak	Jacek
Dr	Beck-Pay	Sascha
Professor	Bob	Urmilla
Professor	Bright	Glen
Professor	Domanska	Urszula
Professor	Downs	Colleen Thelma
Professor	Finnie	Jeffrey Franklin
Professor	Forbes	Andrew
Professor	Ford	Thomas Anthony
Professor	Friedrich	Holger Bernhard
Professor	Govinder	Keshlan Sathasiva
Dr	Gubba	Augustine
Professor	Gutev	Valentin Goutev
Dr	Islam	Shahidul
Professor	Jewitt	Graham Paul Wyndham
Professor	Johnson	Steven Dene
Professor	Jonnalagadda	Sreekantha Babu
Dr	Koorbanally	Neil Anthony
Professor	Kruger	Hendrik Gerhardus
Professor	Londt	Jason
Dr	Maguire	Glenn Eamonn Mitchel

Prolific Researchers

Professor	Maharaj	Sunil Dutt
Professor	Manning	John
Professor	Mneney	Stanley Henry
Dr	Mohammadi	Amir
Professor	Motsa	Sandile Sydney
Dr	Mukwembi	Simon
Professor	Mutanga	Onesimo
Dr	Nyamori	Vincent Onserio
Dr	Olickers	Terence
Dr	Owaga	Bernard Omondi
Professor	Perissinotto	Renzo
Professor	Petruccione	Francesco
Professor	Ramjugernath	Deresh
Professor	Richon	Dominique
Professor	Savage	Michael John
Professor	Schmidt	Stefan
Professor	Seyoum Workneh	Tilahun
Professor	Sibanda	Precious
Professor	Slotow	Robert Hugh
Professor	Stretch	Derek Dewey
Dr	Tong-Viet	Hung Phi
Professor	van Staden	Johannes
Dr	Van Zyl	Werner Ewald
Professor	Ward	David Mercer
Dr	Worth	Steven Hugh
Professor	Xu	Hongjun
Dr	Zegeye	Wale Edilegnaw
College of Health Sciences		
Professor	Abdool Karim	Salim Safurdeen
Dr	Barnighausen	Till Winfried
Professor	Biccard	Bruce McClure
Professor	Bishai	William
Professor	Essack	Sabiha Yusuf
Professor	Govender	Thavendran
Professor	Mars	Maurice
Professor	Moodley	Jagidesa
Professor	Newell	Marie-Louise
Professor	Peters-Futre	Edith Margret
Dr	Ramlall	Suvira
Dr	Rodseth	Reitze Nils
Dr	Ross	Andrew John

Prolific Researchers

College of Humanities		
Professor	Ballantine	Christopher John
Dr	Bansilal	Sarah
Professor	Bhana	Deevia
Professor	Bond	Patrick Martin
Professor	Collings	Steven John
Professor	Denis	Philippe Marie Berth
Professor	Durrheim	Kevin Locksley
Professor	Khan	Sultan
Professor	Maharaj	Pranitha
Professor	Maistry	Suriamurthee Moonsam
Professor	Marschall	Sabine
Dr	Morojele	Pholoho Justice
Professor	Muthukrishna	Anbanithi
Professor	Nadar	Sarojini
Dr	Naidu	Maheshvari
Professor	Nurnberger	Klaus Bilfried
Dr	Ojong	Vivian Besem
Professor	Okeke-Uzodike	Nwabufu Ikechukwu
Professor	Petersen	Inge
Professor	Phiri	Isabel Apawo
Professor	Potgieter	Cheryl-Ann
Professor	Stilwell	Christine
Professor	Stobie	Cheryl
Professor	Tomaselli	Keyan Gray
Professor	Vahed	Goolam Hoosen Mohamed
Dr	Van Laren	Linda
Dr	Wessels	Michael Anthony
Professor	West	Gerald Oakley
College of Law and Management Studies		
Professor	Brijball Parumasur	Sanjana
Professor	Carnelley	Marita
Professor	Cohen	Tamara Jodi-Ann
Mrs	Couzens	Meda Mihaela
Professor	Devenish	George Edwin
Dr	Govender	Pathmavathie
Professor	Govender	Krishna
Professor	Hocor	Shannon Vaughn
Professor	Mcquoid-Mason	David Jan
Professor	Mubangizi	John Cantius
Professor	Sing	Deoram
Ms	Strode	Ann Elaine
Professor	Tewari	Devi Datt
Professor	Vigar-Ellis	Deborah Ann
Ms	Whitear-Nel	Nicola Jane

Researchers at work in a laboratory at the KwaZulu-Natal Research Institute for Tuberculosis and HIV (K-RITH). The institute was launched in October 2012 at UKZN's Nelson R Mandela School of Medicine campus.



Top Published Researchers

These are the Top Published Researchers in DoHET accredited, peer-reviewed journals. Researchers who have accumulated the most amounts of author units are ranked from highest to lowest to establish the top 30 published researchers.

Position	Title	First Name	Surname	College
1	Professor	Johannes	van Staden	College of Agriculture, Engineering and Science
2	Professor	Steven Dene	Johnson	College of Agriculture, Engineering and Science
3	Professor	Sreekantha Babu	Jonnalagadda	College of Agriculture, Engineering and Science
4	Professor	Colleen Thelma	Downs	College of Agriculture, Engineering and Science
5	Dr	Amir	Mohammadi	College of Agriculture, Engineering and Science
6	Professor	Precious	Sibanda	College of Agriculture, Engineering and Science
7	Professor	Sandile Sydney	Motsa	College of Agriculture, Engineering and Science
8	Professor	Maurice	Mars	College of Health Sciences
9	Professor	Holger Bernhard	Friedrich	College of Agriculture, Engineering and Science
10	Professor	Andrew	Forbes	College of Agriculture, Engineering and Science
11	Professor	Keyan Gray	Tomaselli	College of Humanities

Top Published Researchers

12	Professor	Sanjana	Brijball Parumasur	College of Law and Management Studies
13	Professor	Deresh	Ramjugernath	College of Agriculture, Engineering and Science
14	Dr	Vivian Besem	Ojong	College of Humanities
15	Professor	Hendrik Gerhardus	Kruger	College of Agriculture, Engineering and Science
16	Dr	Sarah	Bansilal	College of Humanities
17	Professor	Francesco	Petrucione	College of Agriculture, Engineering and Science
18	Professor	Christopher John	Ballantine	College of Humanities
18	Professor	Derek Dewey	Stretch	College of Agriculture, Engineering and Science
18	Professor	Philippe Marie Berth	Denis	College of Humanities
19	Professor	John	Manning	College of Agriculture, Engineering and Science
20	Dr	Andrew John	Ross	College of Health Sciences
21	Dr	Neil Anthony	Koorbanally	College of Agriculture, Engineering and Science
22	Professor	Goolam Hoosen Mohamed	Vahed	College of Humanities
22	Professor	Isabel Apawo	Phiri	College of Humanities
22	Professor	Patrick Martin	Bond	College of Humanities
23	Professor	Urmilla	Bob	College of Agriculture, Engineering and Science
24	Professor	Renzo	Perissinotto	College of Agriculture, Engineering and Science
25	Professor	Shannon Vaughn	Hector	College of Law and Management Studies
26	Dr	Werner Ewald	van Zyl	College of Agriculture, Engineering and Science
27	Professor	Onesimo	Mutanga	College of Agriculture, Engineering and Science
28	Ms	Nicola Jane	Whitear-Nel	College of Law and Management Studies
29	Professor	David Mercer	Ward	College of Agriculture, Engineering and Science
30	Dr	Pholoho Justice	Morojele	College of Humanities

Emerging Researchers

These are researchers at the University of KwaZulu-Natal who are below the Professorial level, and beginning to make a significant contribution in their field and who have the potential to become prolific researchers. They are 40 years and younger and have accumulated one or more author units in DoHET accredited, peer-reviewed journals.

Title	Surname	First Name
College of Agriculture, Engineering and Science		
Dr	Akerman	Matthew Piers
Dr	Baiyegunhi	Lloyd James Segun
Dr	Booyesen	Irvin
Dr	Brown	Mark
Dr	Chitja	Joyce Magoshi
Dr	Collier	Andrew
Dr	Foxon	Katherine Maria
Dr	Green	Andrew Noel
Ms	Harinarain	Nishani
Dr	Keet	Maria
Dr	Mukwembi	Simon
Dr	Naidoo	Paramespri
Dr	Ojwach	Stephen
Dr	Pillay	Narushan
Dr	Pillay Carpanen	Rudy
Dr	Ramdhani	Syd

Emerging Researchers

Dr	Ramroop	Shaun
Dr	Ramsay	Lisa Frost
Dr	Rivers-Moore	Nick
Dr	Shaik	Shakira
Dr	Sinayskiy	Ilya
Dr	Stopforth	Riaan
Dr	Titshall	Louis William
Dr	Tong-Viet	Hung Phi
Dr	Tyler	Nicola Claire
College of Health Sciences		
Dr	Azu	Onyemaechi Okpara
Dr	Diab	Paula
Dr	Ferreira	Nando
Ms	Grobler	Anna Christina
Dr	Hansraj	Rekha
Ms	Lazarus	Lelika
Dr	Mabandla	Musa Vuyisile
Dr	Marais	Leonard Charles
Mr	Moodley	Yoshan
Dr	Oosthuizen	Frasia
Dr	Rodseth	Reitze Nils
Dr	Soliman	Mahmoud
Dr	Taylor	Jenna
College of Humanities		
Dr	Casale	Daniela Maria
Dr	Couper	Scott
Ms	Essack	Zaynab
Dr	Le Bruyns	Clint
Ms	Mammotte	Nicole
Dr	Mgqwashu	Emmanuel Mfanafuthi
Dr	Morojele	Pholoho Justice
Mr	Msibi	Thabo Perceviarence
Ms	Nagy	Szerdi
Dr	Naidoo	Jayaluxmi
Dr	Ojong	Vivian Besem
Dr	Palma	Adriano
Ms	Pillay	Kathryn

Emerging Researchers

Title	Surname	First Name
Dr	Pithouse-Morgan	Kathleen Jane
Dr	Quayle	Michael Frank
Ms	Rossmann	Jean
Dr	Scott	Claire
Ms	Sharife	Khadija
Ms	Thabethe	Nompumelelo Cynthia
Dr	Xulu	Nomkhosi
Dr	Young-Jahangeer	Miranda Eleanor
College of Law and Management Studies		
Ms	Bhamjee	Suhayfa
Ms	Bosch	Shannon Joy
Mr	Buthelezi	Michael Celumusa
Dr	Chasomeris	Mihalis Georgiou
Dr	Chitakunye	Pepukayi
Ms	Forere	Malebakeng Agnes
Mr	George	Gavin Lloyd
Mr	Gibbs	Andrew Robert
Dr	Goosen	Samantha
Ms	Lewis	Melissa
Dr	Louw	Andre' Mouton
Mr	Mbhele	Thokozani Patmond
Dr	Muller	Colette Lynn
Dr	Ngalawa	Harold
Ms	Proches	Cecile
Dr	Ruggunan	Shaun Denvor
Mr	Singh	Yashik
Mr	Subramanien	Darren Cavell
Dr	Vermaak	Claire Lauren

Doctoral Graduates

College of Agriculture, Engineering and Science			
Surname	First Name	Qualification	Thesis Title
Abdallah	Hafiz Mohammed Ibrahim	Doctor of Philosophy	Synthesis, Magnetic and Electrical Characterizations of Nanoparticle Ferrites
Abebe	Abush Tesfaye	Doctor of Philosophy	Genetic analysis of quantitative traits in soybean (<i>Glycine max</i> L. Merrill) under low and high phosphorus conditions
Adjorlolo	Clement	Doctor of Philosophy	Remote Sensing of the Distribution and Quality of Subtropical C3 and C4 Grasses
Ahmed	Mawahib Alhag Ali	Doctor of Philosophy	Integrated control of gastrointestinal nematodes of sheep using plant extracts and biocontrol agents
Aremu	Adeyemi Oladapo	Doctor of Philosophy	The role of meta-topolins on the physiology of micropropagated 'Williams' bananas (<i>Musa spp.</i> AAA)
Ayers	Morag Jane	Doctor of Philosophy	Ecosystem Modelling of the Data-limited, Oligotrophic KwaZulu-Natal Bight
Bame	Irene Bongsiysi	Doctor of Philosophy	A laboratory and glasshouse evaluation of an anaerobic baffled reactor effluent as a nutrient and irrigation source for maize in soils of KwaZulu-Natal, South Africa
Basdew	Iona Hershna	Doctor of Philosophy	Biological and molecular characterisation of South African Bacteriophages infective against <i>Staphylococcus aureus</i> subsp. aureus Rosenbach 1884, causal agent of bovine mastitis
Basheer	Ayoub Basheer Mohammed	Doctor of Philosophy	Clifford-Fischer Theory Applied to Certain Groups Associated with Symplectic, Unitary and Thompson Groups
Beyene Assefa	Amelework	Doctor of Philosophy	Genetic Diversity Analysis of Lowland Sorghum (<i>Sorghum bicor</i> (L.) Moench) Landraces under Moisture Stress Conditions and Breeding for Drought Tolerance in North Eastern Ethiopia
Bosman	Charl	Doctor of Philosophy	The Marine Geology of the Aliwal Shoal, Scottburgh, South Africa

Doctoral Graduates

Caister	Karen Fern	Doctor of Philosophy	Moving beyond subsistence: systemic integrity in commercialising homestead agriculture, with the Ezemvelo Farmers Organisation, KwaZulu-Natal
Chalwe	Able	Doctor of Philosophy	Manipulating morphological traits of cassava to enhance host plant resistance and biological control of cassava green mite in Zambia
Chikamai	Lucy Walingo	Doctor of Philosophy	Linear Codes Obtained from 2-Modular Representations of some Simple Groups
Chikoti	Patrick Chiza	Doctor of Philosophy	Development of cassava (<i>Manihot esculenta Crantz</i>) cultivars for resistance to cassava mosaic disease in Zambia
Chintu	Justus Mtendere Martin	Doctor of Philosophy	Breeding groundnut for resistance to rosette disease
Chuntharpursat	Eulashini	Doctor of Philosophy	Quantitative imaging of tyrosine kinase-drug interactions in cells
Corbella	Stefano	Doctor of Philosophy	Predicting Shoreline Responses to Wave and Sea Level Trends
Dasireddy	Venkata Durga Bapayya Chowdary	Doctor of Philosophy	Oxidation and Oxidative Dehydrogenation of n-Octane using V2O5 Supported on Hydroxyapatites
Delcros	Gwenaëlle Simone Ida	Doctor of Philosophy	The Influence of Abiotic Processes, Competition and Predation on the Community Structure of Rodents and Shrews
Delport	Brett	Doctor of Philosophy	Whistlers and Other VLF Phenomena
Druce	Heleen Coba	Doctor of Philosophy	Effects of Management Interventions on Elephant Behaviour in a Small, Enclosed Populations
Dudley	Angela Louise	Doctor of Philosophy	Superpositions of Light Fields Carrying Orbital Angular Momentum
Gabaitiri	Lesego	Doctor of Philosophy	Likelihood based statistical methods for estimating HIV incidence rate
Goetsch	Kyle Peter	Doctor of Philosophy	Extracellular matrix regulates myoblast migration during wound healing
Hastie	Warwick William	Doctor of Philosophy	Rock Fabric Study of the Northern Lebombo and Rooi Rand Dyke Swarms - Regional and Local Implications
Ikhile	Monisola Itohan	Doctor of Philosophy	N-Heterocyclic Carbene Iron(II) Complexes: Chemistry and Application as Transfer Hydrogenation Catalysts
John	Anslyn James	Doctor of Philosophy	Stellar Structure and Accretion in Gravitating Systems
Karpoormath	Rajshekhar	Doctor of Philosophy	Design, Synthesis and Biological Evaluation of Novel Pentacuclo Undecane Derived Peptides/Peptoids as Potential HIV-1 Protease Inhibitors
Khan	Faiza Bibi	Doctor of Philosophy	Oxidative Reactions to form Ethyl Methacrylate via Phase Specific Iron Phosphate Catalyst

Doctoral Graduates

Khidir	Ahmed Abdalmgid Hasbalrasol	Doctor of Philosophy	On convection and flow in porous media with cross-diffusion
Khoeli	Makhala Bernice	Doctor of Philosophy	Statistical Modelling of Availability of Major Food Cereals in Lesotho: Application of Regression Models and Diagnostics
Knoesen	Darryn Marc	Doctor of Philosophy	Integrating Hydro-Climatic Hazards and Climate Change as a Tool for Adaptive Water Resources Management in the Orange River Catchment
Korir	Erick Kipkoech	Doctor of Philosophy	The Extractives from <i>Sophora Velutina</i> and <i>Calpurnia Aurea</i> and their Biological Activity
Lekha	Prabashni	Doctor of Philosophy	Ultrastructural Localisation of the Hemicelluloses Xylan and Mannan in a Range of Eucalyptus Wood and Dissolving Pulp Fibres during Processing
Loufouma Makala	Narcisse Roland	Doctor of Philosophy	Normality-like Properties, Paraconvexity and Selections
Mabhaudhi	Tafadzwanashe	Doctor of Philosophy	Drought tolerance and water-use of selected South African landraces of Taro (<i>Colocasia esculenta</i> L. Schott) and Bambara groundnut (<i>Vigna subterranean</i> L. Verdc)
Martinez De Lecea	Ander	Doctor of Philosophy	Isotopic Ecosystem Studies in the KwaZulu-Natal Bight
Mathaba	Nhlanhla	Doctor of Philosophy	The Cascade of Physiological Events Leading to Chilling Injury: The Effect of Post-Harvest Hot Water and Molybdenum Applications to Lemon (<i>Citrus limon</i>) Fruit
Mbugua	John Mwai	Doctor of Philosophy	Hydrogeochemical Modeling of the Speciation and Leaching of Fly Ash Co-disposed with Brines and Organics: A Case Study of Sasol-Eskom Coal Ash Disposal, South Africa
Mirza	Abdul Rahim	Doctor of Philosophy	Optimizing Quantum Communication Through Hybrid Technology
Momin	Mehbub	Doctor of Philosophy	Synthesis and Biological Evaluation of Fluorinated Derivatives of 2-Styrylchromones and 2-Thioxo Imidazole Dicarboxylate Esters
Moodley	Roshila	Doctor of Philosophy	Phytochemical and Analytical Studies on Two Indigenous Medicinal Plants Found in KwaZulu-Natal; <i>Carissa macrocarpa</i> and <i>Harpephyllum caffrum</i>
Moodley	Suren	Doctor of Philosophy	Monte Carlo Molecular Simulation of Binary Fluid-Phase Equilibrium Using Heterogeneous Mixing Parameters
Moodley	Jothi	Doctor of Philosophy	Applications of Embedding Theory in Higher Dimensional General Relativity

Doctoral Graduates

Mopipi	Keletso	Doctor of Philosophy	The roles of competition, disturbance and nutrients on species composition, light interception and biomass production in a South African semi-arid savanna
Morgan	Megan Jane	Doctor of Philosophy	Bounds on Distance-based Topological Indices in Graphs
Mosimane	Alfons William	Doctor of Philosophy	Collective identity and collective action in the management of common pool resources: a case study of Doro !Nawas Conservancy in Namibia
Mouatcho Moualeu	Jules Merlin	Doctor of Philosophy	Cooperative Diversity Techniques for Future Wireless Communications Systems
Muddenahalli Nagendrappa	Thippeswamy	Doctor of Philosophy	Energy Efficient Medium Access Protocol for DS-CDMA based Wireless Sensor Networks
Mutunga	Nancy Muthoni	Doctor of Philosophy	Can livelihood approaches adequately evaluate the determinants of food insecurity to inform interventions in Kenya?
Namayanja	Proscovia	Doctor of Philosophy	Transport on Network Structures
Ndoile	Monica Mbaraka	Doctor of Philosophy	Structure, Synthesis and Biological Activities of Biflavonoids Isolated from <i>Ochna serrulata</i> (Hochst.) Walp
Nelson	Wayne Michael	Doctor of Philosophy	Separation of Trichlorosilane:Measurement, Modeling and Simulation
Ngidi	Mjabuliseni Simon Cloapas	Doctor of Philosophy	Do African country investment plans mitigate high food prices through improved household risk management? A five-country comparative analysis
Okelola	Michael Oyesola	Doctor of Philosophy	Lie Group Analysis of Exotic Options
Oluwafemi	Ilesanmi Banjo	Doctor of Philosophy	Super-orthogonal Space-Time Turbo Coded OFDM Systems
Ongoma	Peter Olengo	Doctor of Philosophy	Tuning Reactivity of Platinum(II) Complexes
Otanga	Reannah Ruth Nyakoah	Doctor of Philosophy	Evaluation of free living diazotrophic bacteria for plant growth promotion and biological control of damping-off fungi
Oumar	Zakariyyaa	Doctor of Philosophy	Remote sensing of forest health: The detection and mapping of <i>Thaumastocoris peregrinus</i> damage in plantation forests
Owen	Cailey Rhys	Doctor of Philosophy	Habitat Quality Effects on the Ecology of Leopard on a Small Enclosed Reserve
Pillay	Charlene	Doctor of Philosophy	Microbiologically Influenced Corrosions of Steel Coupons in Stimulated Systems: Effects of Additional Nitrate Sources
Pillay	Narushan	Doctor of Philosophy	Eigenvalue-Based Spectrum Sensing for Cognitive Radio Networks

Doctoral Graduates

Pillay	Karen	Doctor of Philosophy	Synthesis and Aggregation Dynamics of Amylin
Pillay Carpanen	Rudiren	Doctor of Philosophy	Analysis of the Impact of a Facts-Based Power Flow Controller on Subsynchronous Resonance
Ramlall	Nigel Valentino	Doctor of Philosophy	An Investigation of the Effects of UG2 Ore Variability on Froth Flotation
Sanjika	Thawani Mpatama	Doctor of Philosophy	Development of network theory approaches to analyse cause and effect relationships in complex integrated sugarcane supply and processing systems
Satty Ali Hassan	Ali	Doctor of Philosophy	Comparative approaches to handling missing data, with particular focus on multiple imputation for both cross-sectional and longitudinal models
Scussel	Dario	Doctor of Philosophy	A New Approach to the Polyaxial Stress Numerical Analysis of Underground Openings
Shaik	Ahmed Asif	Doctor of Philosophy	Design, Modelling and Simulation of 2 Novel 6 DOF Hybrid Machines
Singh	Atheesha	Doctor of Philosophy	Surveillance of Microbial Pathogens in the Umgeni River, South Africa
Sivparsad	Benice Jenine	Doctor of Philosophy	The development of transgenic sweet potato (<i>Ipomoea batatas</i> L.) with broad virus resistance in South Africa
van Zuydam	Jason Peter	Doctor of Philosophy	Development of a bioreactor system using a pine bark matrix for the removal of metal ions from synthetic aqueous solutions
Wanderi	Susan Wothaya	Doctor of Philosophy	Genetic analyses for resistance in soybean rust (<i>Phakopsora pachyrhizi</i>) and yield stability among soybean genotypes in Kenya
Warburton	Michele Lynn	Doctor of Philosophy	Challenges in Modelling Hydrological Responses to Impacts and Interactions of Land Use and Climate Change
Wilson	Colin Rylott	Doctor of Philosophy	Synthesis, Physical, Structural and Biological Properties of Some Gold (III) Amide Complexes: Towards Novel Metallotherapeutic Drugs

Doctoral Graduates

College of Health Sciences			
Surname	First Name	Qualification	Thesis Title
Angula	Penehafo	Doctor of Philosophy	Developing and evaluating a community-based HIV/AIDS stigma reduction intervention in Ongenga Constituency of Ohangwena Region, Namibia
Bester	Linda Antionette	Doctor of Philosophy	Antibiotic resistance in the food chain - a case study of <i>Campylobacter</i> spp. in poultry
Chipps	Jennifer Anne	Doctor of Philosophy	The development of a model for the implementation of Telepsychiatry in a resource constrained environment
Cleland	Kathlyn Elena	Doctor of Philosophy	On becoming a confident Occupational Therapist
Govender	Nalini	Doctor of Philosophy	The role of soluble fms-like tyrosine-kinase-1, vascular endothelial growth factor and placental growth factor in HIV associated pre-eclamptic pregnancies: A South African perspective
Haffejee	Firoza	Doctor of Philosophy	The Role of Leptin in HIV associated pre-eclampsia
Horwood	Christiane Marianne	Doctor of Philosophy	Assessing the implementation of an integrated approach for identifying and catling for HIV-infected children at primary heath care facilities in KZN
Jack-Ide	Izibeloko Omi	Doctor of Philosophy	Policy Implementation: Implication on caregiving experiences of families and persons living with serious mental health problems in Nigeria
Kindra	Gurpreet	Doctor of Philosophy	Effect of nutritional supplements on lean muscle mass, general health and diseases progression of HIV positive lactating mothers and the ensuing effects on their infants including the impact of feeding mode on disease progression of the infected infants
Moodley-Govender	Eshia Stephany	Doctor of Philosophy	CTL mediated immune response in pediatric HIV infected and its influence on mother to child transmission
Naicker	Dshanta Dyanedi	Doctor of Philosophy	Effects and mechanisms of interleukin-10 promoter polymorphisms on HIV-1 susceptibility and pathogenesis
Naiker	Suhashni	Doctor of Philosophy	A pharmacokinetic study of Rifabutin and its interaction with anti-retrovirals in patients with TB-HIV Co-infection
Patel	Vinod B	Doctor of Philosophy	Diagnostic value and performance outcomes of the newer technologies (interferon gamma release assays (IGRA) and TB antigen detection test) in patients with tuberculosis meningitis (TIGRA Study)

Doctoral Graduates

Pawar	Sachin Ambadas	Doctor of Philosophy	Synthesis and computational studies of novel peptidomimetic HIV protease inhibitors
Phulukdaree	Alisa	Doctor of Philosophy	Molecular mechanisms in coronary artery disease and the effect of atorvastatin <i>in vitro</i>
Ramautar	Atishkar Samdeo	Doctor of Philosophy	An investigation into the effects of picolinic acid (PA) and fusaric acid (FA) on HIV-1 tat protein-induced neurotoxicity <i>in vitro</i>
Ramsuran	Duran	Doctor of Philosophy	The spectrum of HIV related nephropathy in KwaZulu-Natal: A pathogenetic appraisal and impact of HAART
Rasool	Mahomed Noor	Doctor of Philosophy	Histopathological characteristics of the skin in severe club foot deformation in children
Rodseth	Reitze Nils	Doctor of Philosophy	Post operative nausea and vomiting amongst patients in Inkosi Albert Luthuli Central Hospital
Selmer	Colette A	Doctor of Philosophy	An investigation of psychological stress, coping styles and strategies, and psychological adjustment in a sample of Indian South African women with breast cancer in different development stages of the life-cycle
Singh	Yashik	Doctor of Philosophy	A Physician administered artificial intelligence based decision support system tool that facilitates the management of patients on Antiretroviral Therapy
Singh	Ravesh	Doctor of Philosophy	Regulation of TRIM E3 ligases and Cyclophilin A and the impact on HIV-1 replication and pathogenesis
Singh	Navin Runjit	Doctor of Philosophy	Customised fluid replacement needs in endurance athletes: An artificial neural network approach
Vermaak	Kerry Pam	Doctor of Philosophy	The relationship of geographic area and socio-economic status to the prevention of mother to child transmission in a high HIV prevalence setting

Doctoral Graduates

College of Humanities			
Surname	First Name	Qualification	Thesis Title
Alberts	Charl	Doctor of Philosophy	Construction of threat: Afrikaansness as an identity in crisis in post-Apartheid South Africa
Atujuna	Millicent	Doctor of Philosophy	Church Based Social Spaces and HIV/ AIDS in Rural South Africa
Bargate	Karen	Doctor of Philosophy	Managerial Accounting and Financial Management students' experiences of learning in a Writing Intensive Tutorial Programme
Bengesai	Annah Vimbai	Doctor of Philosophy	Critiquing representation: The case of an academic literacy course in an Engineering Faculty in a South African University
Chang	Chiou-Hsioung Walis	Doctor of Philosophy	A Convocation House (<i>Prrngawan</i>): Biblical interpretation and TYCM tribal post-Colonial concerns reading Genesis 2:4b-25 with TYCM ordinary tribal readers
Chappell	Paul Ian	Doctor of Philosophy	The social construction of the sexual identities of Zulu-speaking youth with disabilities in KwaZulu-Natal, South Africa, in the context of the HIV pandemic
Egbe	Catherine Oritsebemigho	Doctor of Philosophy	Risk influences for smoking among the youth in Southern Nigeria.
Eze	Chika Eucharia	Doctor of Philosophy	Identity construction of Roman Catholic Religious Sisters in the church in Nigeria
Gabaitse	Rosinah Mmannana	Doctor of Philosophy	Towards an African Pentecostal feminist biblical hermeneutic of liberation: Interpreting Acts 2:1-47 in the context of Botswana
Gaillard-Thurston	Claire	Doctor of Philosophy	Raw girls? A gender study at an urban co-educational KwaZulu-Natal high school
Govender	Rajendran	Doctor of Philosophy	Constructions and justifications of a generalization of Viviani's Theorem
Govender	Rosaline	Doctor of Education	Narratives of self-directed professional development: practices, learning and change of teachers in South African schools
Govender	Muniamma	Doctor of Philosophy	The road safety education programme: A journey into the school curriculum
Hall	Louise Gillian	Doctor of Philosophy	Drawing as a generative medium in art making
Harley	Anne	Doctor of Philosophy	'Unlearning' hegemony: An exploration of the applicability of Alain Badiou's theory of the event to informal learning through an examination of the life histories of South African social movement activists

Doctoral Graduates

Jagarnath	Vashna	Doctor of Philosophy	From South Africa to the World: The Politics of Writing and the Making of the Mahatma, 1893-1914
Jaggernath	Jyotikumarie	Doctor of Philosophy	A Socio-Economical and Spatial Investigation into the Health Implications of Air Pollution in Richards Bay, KwaZulu-Natal
Kamba	Micheline Kasongo	Doctor of Philosophy	Developing a holistic educational programme through Contextual Bible Study with people with disabilities in Kinshasa, Democratic Republic of Congo: IMAN'ENDA as case study
Kaunda	Chammah Judex	Doctor of Philosophy	"Imagining a just and equitable African Christian Community": A critical analysis of the contribution of Theological Education Fund/Ecumenical Theological Education (1910-2012)
Kirby	Nicola Frances	Doctor of Philosophy	Exploring Foundation Life Science student performance: Potential for remediation?
Lalla	Sharitha	Doctor of Philosophy	Woman middle managers in schools: Narratives about capabilities and transformational leadership.
Langa	Phumzile Nokuthula	Doctor of Philosophy	Exploring school underperformance in the context of rurality: An ethnographic study
Lawal	Victoria Ladi	Doctor of Philosophy	A contextual study of the information literacy of aspirant barristers in Nigeria
Longwe	Molly	Doctor of Philosophy	A paradox in a theology of freedom and equality: The experiences of pastors' wives (<i>Amayi Busa</i>) in the Baptist Convention of Malawi (BACOMA)
Maharaj	Nuthan	Doctor of Philosophy	Governance and Service Delivery: A Case Study of Sanitation in Inanda, Durban
Marie	Rowanne Sarojini	Doctor of Philosophy	Towards a gendered theology of work : A case study of the paid and unpaid work experiences of Indian Christian women in Pietermaritzburg
Mbona	Michael	Doctor of Philosophy	The response of the Roman Catholic, Anglican and United Methodist Churches to HIV and AIDS in Manicaland, Zimbabwe (1985-2007)
Mndolwa	William Fabian	Doctor of Philosophy	From Anglicanism to African Socialism: The Anglican Church and Ujamaa in Tanzania 1955-2005
Moodley	Nalini	Doctor of Philosophy	Culture, politics and identity in the visual art and education of Indian South African graduates from the University of Durban-Westville in KwaZulu-Natal, 1961-1999

Doctoral Graduates

Moyo	Herbert	Doctor of Philosophy	The investigation of the theological implications for the practical pastoral ministry of the Evangelical Lutheran Church in Zimbabwe posed by the political and socio-economic decline in Zimbabwe (1980-2008)
Mpofu	Bhekimpilo	Doctor of Philosophy	The contours of disadvantage and academic progress: Analysis of perceptions of students from disadvantaged schools at the University of KwaZulu-Natal
Mugabo	Rugema Leon	Doctor of Philosophy	Introduction of inquiry-based science teaching in Rwandan lower secondary schools: Teachers' attitudes and perceptions
Mukansengimana	Rose Nyirimana	Doctor of Philosophy	Women and peace building: A contextual approach to the Fourth Gospel and its challenge to women in post-Genocide Rwanda
Musvoto	Godfrey Gombana	Doctor of Philosophy	Towards a Framework for Assessing Settlement Patterns and Trends to guide Sustainable Development Planning in South Africa - A Case Study of KwaZulu-Natal Province
Naidoo	Renuka	Doctor of Philosophy	Experiences and practices of school principals in creating, leading and governing democratic schools
Naidu	Thirusa	Doctor of Philosophy	Home-based care volunteer identity and participation in HIV/AIDS care and support in rural KwaZulu-Natal, South Africa
Ndlovu	Siyanda Sabelo	Doctor of Philosophy	Questioning Constructions of Black Identities in Post-Apartheid South Africa: Cross-generational Narratives
Ndokweni	Mimi Faith	Doctor of Philosophy	Informality and Urban Agricultural Participation in KwaZulu-Natal: 1993-2004
Ngidi	Evangeline Bonisiwe	Doctor of Philosophy	The use of personal names in respect of the living dead within traditional polygynous families in KwaMambulu, Kranskop
Ngwenya	Jabulisile Cynthia	Doctor of Philosophy	Formative assessment in accounting: Exploring teachers' understanding and practices
Nkambule	Thabisile Carol	Doctor of Philosophy	A meta-analysis of South African Postgraduate Education research on literacy and literacy education in the first post-apartheid decade (1995-2004)
Nkani	Frances Nomvuyo	Doctor of Philosophy	An ethnographic study of teenage pregnancy: femininities and motherhood among pregnant girls and young mothers at schools in Inanda
Nsibirwa	Zawedde	Doctor of Philosophy	Preservation of, and access to, legal deposit materials in South Africa

Doctoral Graduates

Ntsimane	Radikobo Phillip	Doctor of Philosophy	An historical evaluation of the Lutheran Medical Mission services in Southern Africa with special emphasis on four hospitals: 1930s-1978
Nyegenye	Rebecca Margaret Ajambo	Doctor of Philosophy	A study of discipleship in Mark 10:35-52: A model for leadership development of clergy in the Church of Uganda (Anglican)
Otu	Monica Njanjokuma	Doctor of Philosophy	The Role played by Foreign African Migrants in the Promotion of African Scholarship in the Faculty of Humanities, Development and Social Sciences at the University of KwaZulu-Natal
Rajput	Daxita Ishwarlal	Doctor of Philosophy	Tracking sporting excellence in a transforming society
Reuben	Shanya	Doctor of Philosophy	Exploring employees' social constructions of affirmative action in a South African Organisation: A discursive perspective
Reynolds	James Jemeyira	Doctor of Philosophy	A critical analysis of the interpretation of the Doctrine of Justification by faith alone by the Lutheran Church of Christ in Nigeria, Gongola Diocese
Sibisi	Zwelithini Leo	Doctor of Philosophy	Conscientisation: A Motive behind the selected Poems of Sepamla, Serote, Gwala and Mtshali
Sommerville	Thomas Edward	Doctor of Philosophy	People and pedagogy: problem-based learning in the MBChB curriculum at University of KwaZulu-Natal Medical School
Sone	Enongene Mirabeau	Doctor of Philosophy	Symbolism of the Mountain in Bakossi - Cameroon Mythology
Sucheran	Reshma	Doctor of Philosophy	Environmental Management in the Hotel and Lodge Sector in KwaZulu-Natal
Uwimbabazi	Penine	Doctor of Philosophy	An analysis of <i>Umuganda</i> : The policy and practice of community work in Rwanda
Vally	Salim	Doctor of Philosophy	Social class and community in post-Apartheid South African education policy and practice
Van Heerden	Kirsten Helen	Doctor of Philosophy	An exploration of athletic identity and its influence on the salience and centrality of other identities in elite outh African athletes
Watson	Adrienne Patricia	Doctor of Philosophy	Reconceptualising adolescent literacies as textual assemblages
Yagoub	Abdallah Ibrahim Adam	Doctor of Philosophy	A policy analysis of curative health service delivery in North Darfur State, Sudan
Zinn	Sandra Edna	Doctor of Philosophy	Information literacy in the classroom: Assessing the competency of Western Cape teachers in information literacy education

Doctoral Graduates

College of Law and Management Studies			
Surname	First Name	Qualification	Thesis Title
Angom	Sidonia	Doctor of Philosophy	Women's Involvement in Peacemaking and Peacebuilding in Northern Uganda
Bester	Willem Abraham	Doctor of Business Administration	A Comparison of Management Style Before and After Retrenchment
Denny	Peter John	Doctor of Philosophy	Maximising Return on Investment in IT Training: A South African Perspective
Dlamini	Thandi	Doctor of Administration	A Model to Manage Staff Turnover: A Case Study of the Distribution Division at Eskom
Hardman	Stanley George	Doctor of Business Administration	Using Creative Holism to Inform New Partnerships as a Component of responsivity in the FET Sector.
Henkeman	Sarah Rosaline	Doctor of Philosophy	Restorative Justice as a Tool for Peacebuilding : A South African study
Hildbrand	Sandra	Doctor of Philosophy	Systemic Approaches to Improvement in Sugarcane Production and Supply: Umfolozi & Felixton Mill Area
Kachingwe	Lasting Ketsile	Doctor of Philosophy	Action Strategies for Enhancing the Implementation of Performance Improvement Initiatives within the Health Sector in Botswana
Khan	Moonira Banu Mahomed	Doctor of Administration	Student Governance in Higher Education Institutions in the Western Cape, South Africa: A Case Study
Kimmie	Riedwaan Rudi	Doctor of Philosophy	A Constructivist Approach to Theory U as a Transformation Model in Academic Development within South African Higher Education
Kooblal	Moonilall	Doctor of Administration	Poverty Alleviation Strategies in Phoenix ,Mount Moriah and Mount Royal, KwaZulu-Natal: A Community Perspective
Malahlela	Tebogo	Doctor of Administration	The Study of Land Reform and its Impact in the Greater Letaba Local Municipality of the Mopani District in the Limpopo Province
Naidoo	Vannie	Doctor of Philosophy	Investigating Service Quality Perceptions in Tertiary Institutions - The Case of University of KwaZulu-Natal
Ndlovu	Simphiwe Emmanuel	Doctor of Philosophy	Evaluating Public Sector Service Delivery In Provincial Hospitals: A Case Study of the Durban Metropolitan and Ilembe Regions

Doctoral Graduates

Oodith	Devina	Doctor of Philosophy	The Effectiveness of the Call Centre in Managing Customers and their Needs
Pillay	Gengatharen	Doctor of Administration	Implementing the National Curriculum Statement:A Case Studyof FET History Educators in the Umlazi District, KwaZulu-Natal
Pillay	Kirubagaran Jagathesan	Doctor of Philosophy	Do Web 2.0 Social Media Impact Transnational Social Advocacy? A Study of South African Civil Society and Greenpeace
Schwegmann	David	Doctor of Business Administration	Performance Benchmarking and Strategic Homogeneity. Nedbank Retail Case Study.
Sibanda	Mabutho	Doctor of Philosophy	The Influence of Institutional Investors on Financialization in South Africa: An Empirical Analysis

Research Grants and Contracts 2012

1 January 2012 to 31 December 2012

College of Agriculture, Engineering and Science			
Principal Investigator	Project Title	Funder	Amount Awarded
Mukaratirwa, Samson	Advocacy for the fight against Neglected Zoonotic Diseases	European Commission	R 6 035 244
Buckley, Christopher Andrew	Mechanical properties of faecal sludge	Bill & Melinda Gates Foundation	R 5 667 260
Gebreyohannis, Ayalneh Bogale	Support to DAFF's Directorate Policy Research to provide leadership with regard to policies and research in the implementation of Zero Hunger Strategy	Department of Agriculture, Forestry and Fisheries	R 3 053 490
Mudhara, Maxwell	Empowerment of women in rural areas through water use security and agriculture skills training	North West University	R 1 500 000
Buckley, Christopher Andrew	Characterisation of on-site sanitation materials and products: VIP latrines and pour-flush toilets	Water Research Commission	R 1 281 500
Buckley, Christopher Andrew	Menstrual management and sanitation systems	University of Maryland	R 1 094 453
Buckley, Christopher Andrew	Menstrual management and sanitation systems	Columbia University	R 974 913
Schulze, Roland Edgar	The development of climate change mitigation and adaptation and mitigation plan	Department of Agriculture, Forestry and Fisheries	R 894 786
Downs, Colleen Thelma	Determination of the status of the Nile crocodiles in north eastern KwaZulu-Natal and conservation management recommendations	Water Research Commission	R 884 000
Gebreyohannis, Ayalneh Bogale	Research assistance in support of DAFF's strategic plan for smallholder producers.	Department of Agriculture, Forestry and Fisheries	R 800 000
Tanser, Frank Courtney	Elimination of urinary schistosomiasis infection in children	Discovery Fund	R 750 000

Research Grants and Contracts 2012

Mutanga, Onesimo	Applied Centre for Climate and Earth Systems Science Implementation Framework - Theme 5: Land use and land cover change in rural and urban environments	Council for Scientific and Industrial Research	R 735 000
Derera, John	Introgression of host plant resistance to aflatoxin and fumonisins contamination into adapted and elite line parents of maize hybrids	International Maize and Wheat Improvement Center	R 646 500
Lorentz, Simon Antony	Groundwater study for surface water, groundwater and vadose zone interactions project	Water Research Commission	R 518 810
Schulze, Roland Edgar	Hydrological modelling of the Waterberg catchment area incorporating the new pipeline from the Hartebeespoortdam transporting water to Lephalale, and the climate change impacts on water resources in the Waterberg area.	Eskom	R 500 000
Brouckaert, Christopher John	Integration of aquatic chemistry with bio-process models	Water Research Commission	R 480 000
Ramjugernath, Deresh	Framework Research Agreement to conduct the Headspace Analyses and to determine the Vapour Pressure Curve for each sample	Sasol Technology (Pty) Ltd	R 480 000
Bezuidenhout, Carel Nicolaas	Assessments of viable length of milling season options at different sugar milling areas in South Africa	South African Sugarcane Research Institute	R 462 364
Warburton, Michele Lynn	Population and maintenance of surface water theme	Council for Scientific and Industrial Research	R 440 560
Smithers, Jeffrey Colin	Senior Research Fellowship	South African Sugarcane Research Institute	R 420 000
Jewitt, Graham Paul Wyndham	Applied Centre for Climate and Earth Systems Science - Theme 3: Understanding the effects of global change on water resources through long-term catchment monitoring	Council for Scientific and Industrial Research	R 400 000
Everson, Theresa Mary	Africa at Meso-scale: Adaptive and integrated tools and strategies on natural resources management	European Commission	R 316 800
Smithers, Jeffrey Colin	Sugarcane trash recovery for cogeneration	South African Sugarcane Research Institute	R 266 800
Jarmain, Caren	Water use efficiency of irrigated agricultural crops determined with satellite imagery	Water Research Commission	R 241 500

Research Grants and Contracts 2012

Lorentz, Simon Antony	The effect of long-term fire frequency and season treatments on the soil hydraulic properties and soil water balance within semi-arid savannas in the Kruger National Park	South African National Parks	R 240 400
Mudhara, Maxwell	uMkhanyakude Food Security and Livelihoods Innovation Development Program	Oxfam Australia	R 225 000
Bezuidenhout, Carel Nicolaas	Detection of sugarcane deterioration	South African Sugarcane Research Institute	R 204 176
Willows-Munro, Sandi	Molecular diagnosis and evolution of the Cape Parrot (Poicephalus robustus)	The South African National Biodiversity Institute	R 187 027
Warburton, Michele Lynn	Applied Centre for Climate and Earth Systems Science - Theme 2: Climate Change and Impacts	Council for Scientific and Industrial Research	R 178 000
Kirkman, Kevin Peter	Convergence and contingencies in savanna grasslands	Colorada State University	R 173 259
Kirkman, Kevin Peter	The Savanna Convergence Project: A comparative examination of the role of fire and herbivory in South African and North African savannas	Yale University	R 172 745
Gous, Robert Mervyn	The development of simulation model to optimise the feeding of broiler or breeder hens during lay	Protein Research Foundation	R 160 000
Pillay, Balakrishna	Antimicrobial test against Staphylococcus epidermidis	Unilever South Africa (Pty) Ltd	R 150 000
Munro, Orde Quentin	Development and assessment of metal containing drugs for cancer treatment using radiolabelling	South African Nuclear Energy Corporation Limited	R 140 000
Ramjugernath, Deresh	Investigation of absorption and adsorption techniques for the separation of close boiling components	Sasol Technology (Pty) Ltd.	R 140 000
Zegeye, Wale Edilegnaw	Award of partial PhD Fellowship	African Economic Research Consortium	R 120 680
Martincigh, Bice Susan	An investigation of the photo stability, photochemistry and DNA interactions of sunscreen absorbers and other active ingredients in topical skin preparations	Council for Scientific and Industrial Research National Laser Centre	R 108 000
Laing, Mark Delmege	Use of potassium silicate and biocontrol agents to reduce post-harvest disease and chilling injury in citrus fruit	Citrus Research International (Pty) Ltd	R 105 514
Buckley, Christopher Andrew	Protocol for the quantitative assessment of industrial effluents for discharge permitting	Water Research Commission	R 100 000

Research Grants and Contracts 2012

Tyler, Nicola Claire	The effects of dietary crude protein on the fertility of broiler breeder males	Protein Research Foundation	R 100 000
Gous, Robert Mervyn	The effect of lighting on the efficiency of utilisation of dietary protein by Cobb and Ross Broiler strains used in South Africa.	Protein Research Foundation	R 99 160
Everson, Colin	Agroforestry systems for improved food production through the efficient use of water	Council for Scientific and Industrial Research	R 90 000
Buckley, Christopher Andrew	Technical assistance in the assessment of urban and peri-urban sanitation systems	Program for Appropriate Technology in Health	R 44 065
Mudhara, Maxwell	Farmer access to innovation resources	ETC Foundation	R 40 000
			R 31 622 007
College of Health Sciences			
Principal Investigator	Project Title	Funder	Amount Awarded
Newell, Marie-Louise	Core funding to support the Africa Centre for Health and Population Studies	The Wellcome Trust	R 157 311 246
Herbst, Abraham Jacobus	Informing global efforts to improve the health and well-being of low and middle-income populations	The Wellcome Trust	R 28 336 457
Newell, Marie-Louise	Antiretroviral treatment as HIV prevention: A cluster-randomized trial in Hlabisa sub-district	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	R 15 312 000
Newell, Marie-Louise	Informing global efforts to improve the health and well-being of low and middle-income populations	The Wellcome Trust	R 13 622 670
Naidu, Kevindra Krishna	Model HIV Prevention, treatment and care programme for southern Umkhanyakude Municipality	Pact South Africa	R 12 068 000
Newell, Marie-Louise	A cluster randomised trial comparing the impact of immediate versus WHO recommendations guided anti-retroviral initiation on HIV incidence in Hlabisa sub-district, KwaZulu-Natal, South Africa	French National Agency for Research on AIDS and Viral Hepatitis	R 10 421 366
Bland, Ruth Margaret	The effect of an exclusive breastfeeding support intervention on subsequent development of children in the context of HIV	Grand Challenges	R 9 513 756
Chhagan, Meera Kurson	20,000+ Partnership nutrition and child survival project in Ilembe district	ELMA Foundation	R 6 900 000

Research Grants and Contracts 2012

Newell, Marie-Louise	African-European HIV vaccine development network	Imperial College London	R 4 459 763
Gqaleni, Nceba	Research on indigenous knowledge systems bio-prospecting and Marula diabetes product development in the area of African traditional medicines	Department of Science and Technology	R 4 000 000
Ndung'u, Peter Thumbi	Establishment and long-term follow up of a cohort of young mothers identified from Prince Mshiyeni Memorial Hospital Antenatal Clinic	International AIDS Vaccine Initiative	R 3 789 169
Ndung'u, Peter Thumbi	Pathogenesis of Clade C HIV infection	Massachusetts General Hospital	R 3 627 192
Newell, Marie-Louise	Implement HIV/AIDS program in South Africa	Pact South Africa	R 2 732 066
Horwood, Christiane Marianne	Implementation of Unicef's programme of co-operation with the government of South Africa	United Nations Children's Fund	R 2 242 159
Bishai, William	Biomarkers and signaling in Tuberculosis	Johns Hopkins University	R 2 106 737
Kasprowicz, Victoria	Tuberculosis-HIV co-infection cohort	Harvard University	R 1 985 227
De Oliveira, Tulio Paiva N Andrade	Bio-informatics resource development for important health-related pathogens	Council for Scientific and Industrial Research	R 1 916 873
De Oliveira, Tulio Paiva N Andrade	Expand and provide capacity building to health care workers in order to strengthen the South African government Antiretroviral Program	Centre for the AIDS Programme of Research in South Africa	R 1 894 659
Ndung'u, Peter Thumbi	Support of South African Based Acute Cohort: Recruitment of persons with acute HIV infection	Massachusetts General Hospital	R 1 855 682
Newell, Marie-Louise	Well-being in older persons study Wave 2 looking at HIV impact and related caregiving in South Africa	World Health Organization	R 1 819 714
Ndung'u, Peter Thumbi	Establishment of cohorts to support studies of HIV antigens and immune responses required for control of HIV	International AIDS Vaccine Initiative	R 1 737 350
Padayatchi, Nesri	Columbia University-Southern African AIDS International Research Program	University of Columbia	R 1 361 563
Ndung'u, Peter Thumbi	Innate immunity in HIV-1 infection	Massachusetts General Hospital	R 1 343 168
Ndung'u, Peter Thumbi	Mechanisms of HLA-associated control and lack of HIV infection: Optimizing CD8+ T-cell responses against C Clade HIV infection in sub-Saharan Africa	University of Oxford	R 1 318 519

Research Grants and Contracts 2012

Newell, Marie-Louise	Award to cover the open access publishing costs of any Wellcome Trust-funded research paper arising from work undertaken at Africa Centre	The Wellcome Trust	R 1 004 058
Newell, Marie-Louise	Aid for poverty-related diseases (HIV/AIDS, Tuberculosis and Malaria) in developing countries	Medical Research Council	R 929 606
Moodley, Indhrasen	Implementation of the Moringa national research project as part of the Indigenous Knowledge Systems technology transfer initiative	Department of Science and Technology	R 900 000
Bishai, William	Innovative approach to basic science Masters and PhD training with a research focus on human infectious diseases in Durban, South Africa	Johns Hopkins University	R 862 000
Moodley, Indhrasen	Indigenous Knowledge Systems (IKS) bio-prospecting and product development in the area of cosmeceuticals	University of Pretoria	R 820 948
Barnighausen, Tillwinfried	Integrating realistic cost functions in epidemiological models of treatment and prevention in Ghana	Imperial College London	R 731 209
Ndung'u, Peter Thumbi	Development of a youth cohort for multi-disciplinary HIV research studies in Durban, South Africa	Simon Fraser University	R 644 345
Mahomed, Ozaye Haroon	Primary care 101 clinical guidelines evaluation	Pact South Africa	R 643 596
Newton, Keith	Diet and gastrointestinal cancer risk in African Americans and rural Africans	University of Pittsburgh	R 586 669
Naidoo, Rajen	Research training on chronic lung diseases in Southern Africa	University of Michigan	R 578 626
Newell, Marie-Louise	The art in global health	The Wellcome Trust	R 556 364
Ndung'u, Peter Thumbi	Support for one Fogarty International Center research fellow to participate as a research trainee in Durban	Fogarty International Center	R 521 338
Horwood, Christiane Marianne	Effectiveness of an HIV adapted Community Integrated Management of Childhood Illness training and supervision program for community caregivers to support and improve delivery of interventions to reduce mother-to-child HIV transmission and other essential newborn and child survival interventions	World Health Organization	R 517 200
Pillay, Basil Joseph	Risk and Resilience in South Africa: An international research collaboration	Virginia Commonwealth University	R 511 998

Research Grants and Contracts 2012

Ndirangu, James Nganga	International epidemiological databases to evaluate AIDS - The observational antiretroviral studies in Southern Africa	National Institutes of Health	R 496 003
Burns, Jonathan Kenneth	Incidence and early course of psychosis in an African setting	Columbia University	R 465 480
Tanser, Frank Courtney	Implementation of couples voluntary HIV counseling and testing services in Durban SA, for HIV prevention and intervention	International Development Research Centre	R 452 000
Padayatchi, Nesri	Support for one Fogarty International Center research fellow to participate as a research trainee in Durban	Columbia University	R 383 556
Treffry-Goatley, Astrid Jane	Public engagement with HIV drug adherence through audiovisual media	The Wellcome Trust	R 350 903
Ndung'u, Peter Thumbi	Healthcare workers reproductive counseling knowledge, views and practices for people living with HIV	Wits Health Consortium	R 340 797
Frohlich, Janet Ann	HIV prevention trials network leadership group	Family Health International	R 317 288
Ndung'u, Peter Thumbi	Ragon imunogen design initiative	Massachusetts General Hospital	R 297 390
Blanchard, Catherine Phyllis	Data analysis and writing of the report on the documentation of primary health care good practice conducted in KwaZulu-Natal	Health Systems Trust	R 252 000
Taylor, Myra	Towards a common destination: Developing best practices through shared experience of institutional responses to HIV and AIDS in selected Universities in Southern Africa	National University of Lesotho	R 245 060
Ndung'u Peter Thumbi	Support for the South African-based acute cohort	Massachusetts General Hospital	R 169 159
Bobat, Raziya Ahmed	A multicenter, open-label, noncomparative study for the international maternal, pediatric, adolescent AIDS clinical trials	Social & Scientific Systems, Inc.	R 149 238
Naidoo, Rajen	Health status of Stevedores and ship repairers working within the ports of Durban and Cape Town, South Africa	South African Maritime Safety Authority	R 132 099
Hoosen, Ebrahim	Livelihood impacts of climate-driven land use change	African Economic Research Consortium	R 120 680
Patel, Neeta	A multi-center, uncontrolled extension study evaluating efficacy and safety of SAR153191	Sanofi-Aventis South Africa (Pty) Ltd	R 105 003
Taylor, Myra	Female genital schistosomiasis project	University of Copenhagen	R 101 740

Research Grants and Contracts 2012

Ndung'u, Peter Thumbi	AIDS-restrictive innate immune mechanisms	Massachusetts General Hospital	R 101 057
Ndung'u, Peter Thumbi	Healthcare workers reproductive counseling knowledge, views, and practices for living with HIV	Higher Education South Africa	R 96 336
Frohlich, Janet Ann	HIV prevention trials network leadership group	Citrus Research International (Pty) Ltd	R 63 874
Hoosen, Ebrahim	A randomised, prospective, double-blind, placebo-controlled, group sequential multicenter study to assess efficacy, safety and tolerability of the pediatric formulation of bosetan in children with pulmonary arterial hypertension	Actelion Pharmaceuticals Ltd	R 39 418
			R 306 162 373
College of Humanities			
Principal Investigator	Project Title	Funder	Amount Awarded
Mare, Paul Gerhardus	Education and emancipation - a critical intervention-orientated investigation of obstacles and opportunities within the Higher-Education and training sector in South Africa	Higher Education South Africa	R 35 475 623
Petersen, Inge	Emerging mental health systems in low- and middle-income countries	European Commission	R 3 392 569
Valodia, Imraan Abdul Kader	Labour market analysis: creating employment opportunities for poor and vulnerable populations	Rockefeller Foundation	R 1 101 981
Ngcoya, Mvuselelo	The negotiation of knowledge for coastal governance	Council for Scientific and Industrial Research	R 412 817
Lindegger, Graham Charles	South African AIDS Vaccine initiative or training and resources in research ethics evaluation - developing an online module for adolescent trials	Medical Research Council	R 289 270
			R 40 672 260
College of Law and Management Studies			
Principal Investigator	Project Title	Funder	Amount Awarded
Kohler, Marcel Rene Anton Robert	The state of energy access and energy poverty in KwaZulu-Natal	Department of Economic Development and Tourism	R 3 150 000
Whiteside, Alan Walter	Stepping Stones plus study - how to make gender empowerment interventions work better	Project Empower	R 2 234 160
Whiteside, Alan Walter	Swaziland and Lesotho HIV/AIDS program sustainability analysis tool	Abt Associates Inc	R 1 355 617

Research Grants and Contracts 2012

Whiteside, Alan Walter	Provide support to the co-ordination of the women, girls and gender equality work in NSPs led by the Gender Programme at HEARD	Athena Network	R 220 172
Govender, Kaymarlin	To conduct research on inequality and how these impact on selected Oxfam Australia program areas (Health, Food Security and Gender)	Oxfam Australia	R 115 000
Whiteside, Alan Walter	Psychosocial care and support for children with or living with disability	Regional Psycho Social Support Initiative	R 32 298
			R 7 107 247
Research Office			
Principal Investigator	Project Title	Funder	Amount Awarded
Potgieter, Cheryl-Ann	An award to develop a training workshop for educators on teaching lesbian, gay, bisexual and transgender identities in the classroom	US Department of State	R 215 500
			R 215 500

Summary	
College	Amount
Agriculture, Engineering and Science	R 31 622 007
Health Sciences	R 306 162 373
Humanities	R 40 672 260
Law and Management Studies	R 7 107 247
Research Office	R 215 500
Total	R 385 779 386

Research Grants and Contracts exceeding R500 000 from Funders in 2012

1 January 2012 to 31 December 2012

College of Agriculture, Engineering and Science			
Principal Investigator	Project Title	Funder	Amount Awarded
Mukaratirwa, Samson	Advocacy for the fight against Neglected Zoonotic Diseases	European Commission	R 6 035 244
Buckley, Christopher Andrew	Mechanical properties of faecal sludge	Bill & Melinda Gates Foundation	R 5 667 260
Gebreyohannis, Ayalneh Bogale	Support to DAFF's Directorate Policy Research to provide leadership with regard to policies and research in the implementation of Zero Hunger Strategy	Department of Agriculture, Forestry and Fisheries	R 3 053 490
Mudhara, Maxwell	Empowerment of women in rural areas through water use security and agriculture skills training	North West University	R 1 500 000
Buckley, Christopher Andrew	Characterisation of on-site sanitation materials and products: VIP latrines and pour-flush toilets	Water Research Commission	R 1 281 500
Buckley, Christopher Andrew	Menstrual management and sanitation systems	University of Maryland	R 1 094 453
Buckley, Christopher Andrew	Menstrual management and sanitation systems	Columbia University	R 974 913
Schulze, Roland Edgar	The development of climate change mitigation and adaptation and mitigation plan	Department of Agriculture, Forestry and Fisheries	R 894 786
Downs, Colleen Thelma	Determination of the status of the Nile crocodiles in north eastern KwaZulu-Natal and conservation management recommendations	Water Research Commission	R 884 000
Gebreyohannis, Ayalneh Bogale	Research assistance in support of DAFF's strategic plan for smallholder producers.	Department of Agriculture, Forestry and Fisheries	R 800 000
Tanser, Frank Courtney	Elimination of urinary schistosomiasis infection in children	Discovery Fund	R 750 000

Research Grants and Contracts exceeding R500 000

Mutanga, Onisimo	Applied Centre for Climate and Earth Systems Science Implementation Framework - Theme 5: Land use and land cover change in rural and urban environments	Council for Scientific and Industrial Research	R 735 000
Derera, John	Introgression of host plant resistance to aflatoxin and fumonisins contamination into adapted and elite line parents of maize hybrids	International Maize and Wheat Improvement Center	R 646 500
Lorentz, Simon Antony	Groundwater study for surface water, groundwater and vadose zone interactions project	Water Research Commission	R 518 810
			R 24 835 956
College of Health Sciences			
Principal Investigator	Project Title	Funder	Amount Awarded
Newell, Marie-Louise	Core funding to support the Africa Centre for Health and Population Studies	The Wellcome Trust	R 157 311 246
Herbst, Abraham Jacobus	Informing global efforts to improve the health and well-being of low and middle-income populations	The Wellcome Trust	R 28 336 457
Newell, Marie-Louise	Antiretroviral treatment as HIV prevention: A cluster-randomized trial in Hlabisa sub-district	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	R 15 312 000
Newell, Marie-Louise	Informing global efforts to improve the health and well-being of low and middle-income populations	The Wellcome Trust	R 13 622 670
Naidu, Kevindra Krishna	Model HIV Prevention, treatment and care programme for southern Umkhanyakude Municipality	Pact South Africa	R 12 068 000
Newell, Marie-Louise	A cluster randomised trial comparing the impact of immediate versus WHO recommendations guided anti-retroviral initiation on HIV incidence in Hlabisa sub-district, KwaZulu-Natal, South Africa	French National Agency for Research on AIDS and Viral Hepatitis	R 10 421 366
Bland, Ruth Margaret	The effect of an exclusive breastfeeding support intervention on subsequent development of children in the context of HIV	Grand Challenges	R 9 513 756
Chhagan, Meera Kurson	20,000+ Partnership nutrition and child survival project in Ilembe district	ELMA Foundation	R 6 900 000
Newell, Marie-Louise	African-European HIV vaccine development network	Imperial College London	R 4 459 763
Gqaleni, Nceba	Research on indigenous knowledge systems bio-prospecting and Marula diabetes product development in the area of African traditional medicines	Department of Science and Technology	R 4 000 000

Research Grants and Contracts exceeding R500 000

Ndung'u, Peter Thumbi	Establishment and long-term follow up of a cohort of young mothers identified from Prince Mshiyeni Memorial Hospital Antenatal Clinic	International AIDS Vaccine Initiative	R 3 789 169
Ndung'u, Peter Thumbi	Pathogenesis of Clade C HIV infection	Massachusetts General Hospital	R 3 627 192
Newell, Marie-Louise	Implement HIV/AIDS program in South Africa	Pact South Africa	R 2 732 066
Horwood, Christiane Marianne	Implementation of Unicef's programme of co-operation with the government of South Africa	United Nations Children's Fund	R 2 242 159
Bishai, William	Biomarkers and signaling in Tuberculosis	Johns Hopkins University	R 2 106 737
Kasprowicz, Victoria	Tuberculosis-HIV co-infection cohort	Harvard University	R 1 985 227
De Oliveira, Tulio Paiva N Andrade	Bio-informatics resource development for important health-related pathogens	Council for Scientific and Industrial Research	R 1 916 873
De Oliveira, Tulio Paiva N Andrade	Expand and provide capacity building to health care workers in order to strengthen the South African government Antiretroviral Program	Centre for the AIDS Programme of Research in South Africa	R 1 894 659
Ndung'u, Peter Thumbi	Support of South African Based Acute Cohort: Recruitment of persons with acute HIV infection	Massachusetts General Hospital	R 1 855 682
Newell, Marie-Louise	Well-being in older persons study Wave 2 looking at HIV impact and related caregiving in South Africa	World Health Organization	R 1 819 714
Ndung'u, Peter Thumbi	Establishment of cohorts to support studies of HIV antigens and immune responses required for control of HIV	International AIDS Vaccine Initiative	R 1 737 350
Padayatchi, Nesri	Columbia University-Southern African AIDS International Research Program	University of Columbia	R 1 361 563
Ndung'u, Peter Thumbi	Innate immunity in HIV-1 infection	Massachusetts General Hospital	R 1 343 168
Ndung'u, Peter Thumbi	Mechanisms of HLA-associated control and lack of HIV infection: Optimizing CD8+ T-cell responses against C Clade HIV infection in sub-Saharan Africa	University of Oxford	R 1 318 519
Newell, Marie-Louise	Award to cover the open access publishing costs of any Wellcome Trust-funded research paper arising from work undertaken at Africa Centre	The Wellcome Trust	R 1 004 058
Newell, Marie-Louise	Aid for poverty-related diseases (HIV/ AIDS, Tuberculosis and Malaria) in developing countries	Medical Research Council	R 929 606
Moodley, Indhrasen	Implementation of the Moringa national research project as part of the Indigenous Knowledge Systems technology transfer initiative	Department of Science and Technology	R 900 000

Research Grants and Contracts exceeding R500 000

Bishai, William	Innovative approach to basic science Masters and PhD training with a research focus on human infectious diseases in Durban, South Africa	Johns Hopkins University	R 862 000
Moodley, Indhrasen	Indigenous Knowledge Systems (IKS) bio-prospecting and product development in the area of cosmeceuticals	University of Pretoria	R 820 948
Barnighausen, Tillwinfried	Integrating realistic cost functions in epidemiological models of treatment and prevention in Ghana	Imperial College London	R 731 209
Ndung'u, Peter Thumbi	Development of a youth cohort for multi-disciplinary HIV research studies in Durban, South Africa	Simon Fraser University	R 644 345
Mahomed, Ozaye Haroon	Primary care 101 clinical guidelines evaluation	Pact South Africa	R 643 596
Newton, Keith	Diet and gastrointestinal cancer risk in African Americans and rural Africans	University of Pittsburgh	R 586 669
Naidoo, Rajen	Research training on chronic lung diseases in Southern Africa	University of Michigan	R 578 626
Newell, Marie-Louise	The art in global health	The Wellcome Trust	R 556 364
Ndung'u, Peter Thumbi	Support for one Fogarty International Center research fellow to participate as a research trainee in Durban	Fogarty International Center	R 521 338
Horwood, Christiane Marianne	Effectiveness of an HIV adapted Community Integrated Management of Childhood Illness training and supervision program for community caregivers to support and improve delivery of interventions to reduce mother-to-child HIV transmission and other essential newborn and child survival interventions	World Health Organization	R 517 200
Pillay, Basil Joseph	Risk and Resilience in South Africa: An international research collaboration	Virginia Commonwealth University	R 511 998
			R 301 483 291

Research Grants and Contracts exceeding R500 000

College of Humanities			
Principal Investigator	Project Title	Funder	Amount Awarded
Mare, Paul Gerhardus	Education and emancipation - a critical intervention-orientated investigation of obstacles and opportunities within the Higher-Education and training sector in South Africa	Higher Education South Africa	R 35 475 623
Petersen, Inge	Emerging mental health systems in low- and middle-income countries	European Commission	R 3 392 569
Valodia, Imraan Abdul Kader	Labour market analysis: creating employment opportunities for poor and vulnerable populations	Rockefeller Foundation	R 1 101 981
			R 39 970 173
College of Law and Management Studies			
Principal Investigator	Project Title	Funder	Amount Awarded
Kohler, Marcel Rene Anton Robert	The state of energy access and energy poverty in KwaZulu-Natal	Department of Economic Development and Tourism	R 3 150 000
Whiteside, Alan Walter	Stepping Stones plus study - how to make gender empowerment interventions work better	Project Empower	R 2 234 160
Whiteside, Alan Walter	Swaziland and Lesotho HIV/AIDS program sustainability analysis tool	Abt Associates Inc	R 1 355 617
			R 6 739 777

Summary	
College	Amount
Agriculture, Engineering and Science	R 24 835 956
Health Sciences	R 301 483 291
Humanities	R 39 970 173
Law and Management Studies	R 6 739 777
Total	R 373 029 198

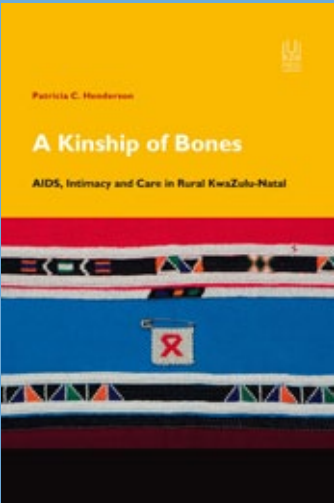
Statutory Income from the National Research Foundation 2012

COLLEGE	BS	CPRR	CSUR	ERSA	HCDMA	IFRR	IKS	IST	KIC	NEP	PDF	SANAP	SARChI	SABI	SEACChange	SKA	THRIP	TTK	GRAND TOTAL
Agriculture, Engineering and Science		R 5 113 100	R 1 054 200		R 1 077 000	R 4 974 000		R 2 533 033	R 21 000	R 25 000	R 1 160 000	R 195 000	R 7 577 500	R 185 000	R 883 233	R 350 000	R 3 476 666	R 609 550	R 29 234 282
Humanities	R 249 000	R 680 483		R 949 000		R 2 420 000	R 176 656				R 120 000		R 2 845 681						R 7 440 820
Health Sciences		R 890 520	R 300 200			R 1 100 000	R 3 660 710	R 557 900	R 32 000		R 320 000		R 625 000					R 680 950	R 8 167 280
Law and Management Studies						R 320 000													R 320 000
Other							R 8 170 000												R 8 170 000
GRAND TOTAL	R 249 000	R 6 684 103	R 1 354 400	R 949 000	R 1 077 000	R 8 814 000	R 12 007 366	R 3 090 933	R 53 000	R 25 000	R 1 600 000	R 195 000	R 11 048 181	R 185 000	R 883 233	R 350 000	R 3 476 666	R 1 290 500	R 53 332 382

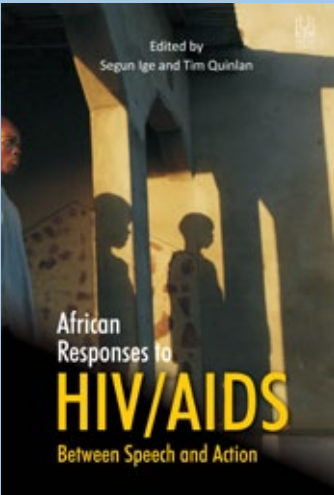
ABBREVIATIONS	
Blue Skies	BS
Competitive Programme for Rated Researchers	CPRR
Competitive Support for Unrated Researchers	CSUR
Education Research in South Africa	ERSA
Human Capital Development for Multi-Wavelength Astronomy	HCDMA
Incentive Funding for Rated Reseachers	IFRR
Indigenous Knowledge Systems	IKS
International Science and Technology Agreements	IST
Knowledge interchange and Collaborations	KIC

National Equipment Programme	NEP
Post Doctoral Fellows	PDF
South African Antarctic Programme	SANAP
South African Research Chairs Initiative	SARChI
South African Biosystematics Initiative	SABI
Society Ecosystems and Change	SEACChange
Square Kilometer Array	SKA
Technology and Human Resources for Industry Programme	THRIP
Thuthuka Programme	TTK

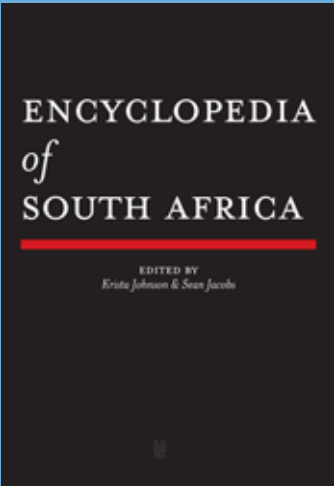
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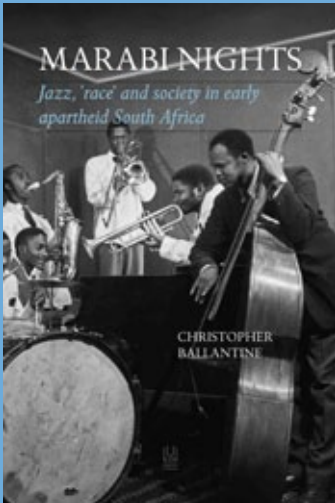
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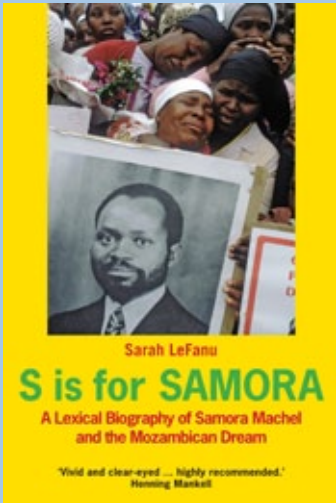
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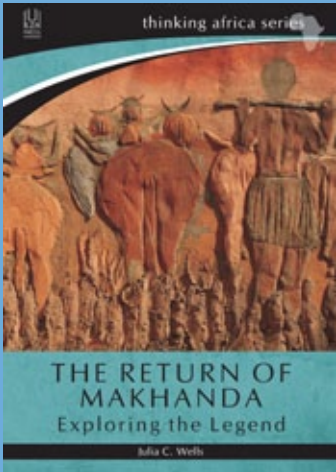
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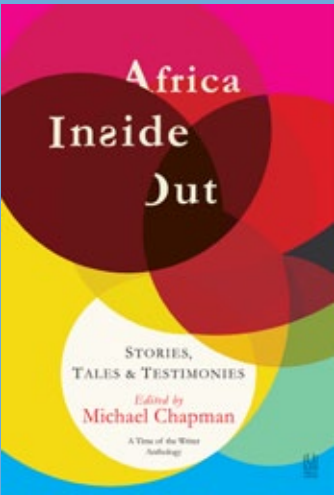
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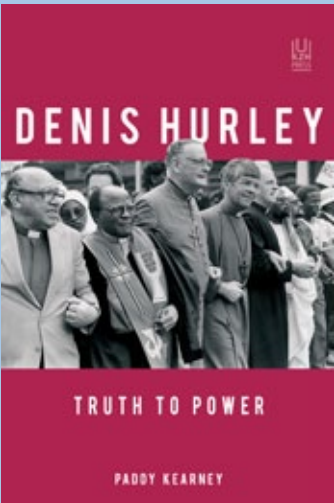
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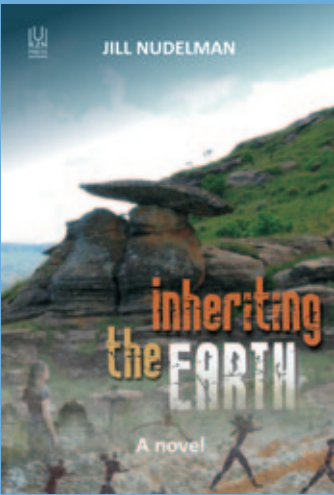
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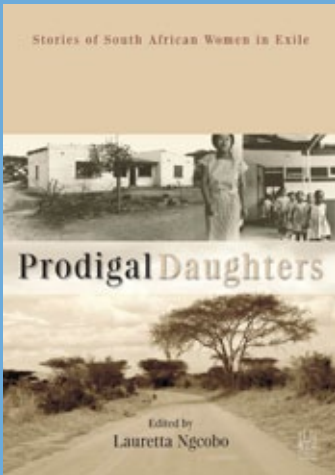
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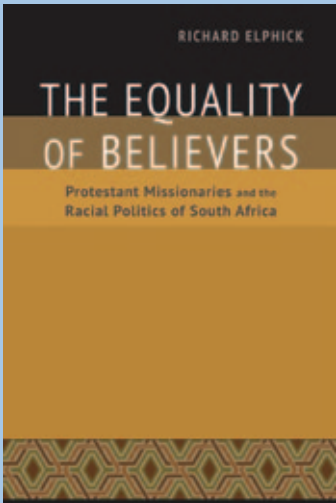
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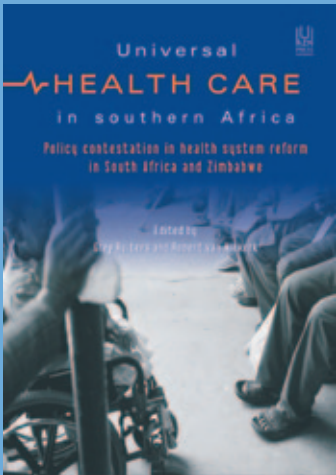
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Richard Elphick



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Greg Ruiters & Robert van Niekerk (eds)



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