

RESEARCH  
REPORT  
// 2013

# celebrating **PARTNERSHIPS**

UNIVERSITY OF THE  
FREE STATE  
UNIVERSITEIT VAN DIE  
VRYSTAAT  
YUNIVESITHI YA  
FREISTATA





# ACKNOWLEDGEMENTS

The UFS acknowledges the work of its researchers and various research teams at different levels. The 2013 Research Report is the product of the concerted effort of everyone involved. A special word of thanks is due to the deans of the seven UFS faculties, all the individual researchers, and the staff of DRD.

A detailed list of the UFS 2013 research publications is available on: <http://supportservices.ufs.ac.za/content.aspx?id=161>

The list of active collaborators and partners is available on: <http://supportservices.ufs.ac.za/content.aspx?id=161>

**ISSUED BY**

Directorate Research Development  
University of the Free State

**CREATIVE AND EDITORIAL DIRECTION**

Cheryl Lombard, Framework Systems (Pty) Ltd

**EDITORIAL TEAM**

Glen Taylor  
Cheryl Lombard

**DESIGN AND LAYOUT**

SUN MeDIA Bloemfontein  
(Maryke Venter)

**PRODUCTION**

SUN MeDIA Bloemfontein

**PHOTOGRAPHS**

Stephen Collett  
UFS Corporate Communications  
Individual contributions

NASA/GSFC/METI/Japan Space Systems, and  
U.S./Japan ASTER Science Team (Satellite  
image – page 7)

<http://images-of-elements.com/>  
(Platinum-group metals – page 7)

# Celebrating PARTNERSHIPS

# TABLE OF CONTENTS

1	message from the VICE-CHANCELLOR
3	message from the VICE-RECTOR: RESEARCH
4	message from the senior director RESEARCH DEVELOPMENT
5	celebrating PARTNERSHIPS
6	WORKING TOGETHER FOR TECHNOLOGY Challenging established theories on mineral formation 7 A glimpse into the past in strange places 8 Tapping into unique genetic material in extreme biomes 10 The endless possibilities of polymer nanocomposites 12 The green shack project 14 Dealing with the invisible world 16
17	WORKING TOGETHER FOR SOCIETY AND THE ECONOMY Improving the quality of education – one step at a time 18 Radical sustainable housing 20 Ageing and dying – challenging preferences and values 22 Engaging the community 23 Language activism for language justice 24 Observing small and medium-sized enterprises 25 What's behind service delivery protest tactics? 26 Making sense of employment equity 27 What society can learn from wild mammals 28 Even the little people count 30
31	WORKING TOGETHER FOR HEALTH Getting the better of vector borne and zoonotic viruses 32 Familial breast cancer in the rainbow nation 34 Striving for drug safety using traditional medicines 36 The fight against an AIDS-defining illness 37 Fighting tuberculosis and HIV 38 Phytomedicines from African traditional medicines 40 New horizons for children with DCD 42
43	WORKING TOGETHER FOR FOOD SECURITY African agricultural systems 44 Improving the quality of meat 46 Manipulating crops with plant strengthening agents 48 Keeping our livestock healthy 49
50	WORKING TOGETHER TO BUILD THE NEXT GENERATION OF RESEARCHERS Meet some of our prestige scholars 50
56	research performance AT A GLANCE
59	2013: the year in REVIEW
66	researchers featured IN THIS REPORT
67	CONTACT US



*Top academics and the best graduate students look to work with the stars in their field. Excellence is the ability to draw in other top academics from across the world, to create pools of critical mass, to generate enthusiasm in colleagues and research students.*

University of the Free State Strategic Plan  
2012–2016

## message from the VICE-CHANCELLOR

Prof Jonathan Jansen

The familiar and persistent media image of the old man in a white coat labouring in solitude inside his laboratory to produce esoteric findings after many years does not, of course, capture the actual nature of the modern research enterprise. Research across the world is no longer the preserve of old men; millions of young scientists and scholars occupy research centres and institutes as next-generation researchers. Research is not something that happens only in laboratories; some of the most exciting research today happens to be in the social sciences and humanities, and in fields straddling the human and the natural sciences. And there is not a single instance, past or present, in which research is produced in isolation of partnerships with others.

Doing research in partnership entails a conversation among people with the same intellectual interests. In this respect I am deeply impressed with the mushrooming of 'research conversations' across the University of the Free State – from the high-powered history seminars under Prof Ian Phimister's group to the race, reconciliation and research dialogues under the umbrella of the Institute for Reconciliation and Social Justice, headed by Prof André Keet. It is in conversation that research ideas are presented, tested, refined and even discarded. It is through conversation that new ideas are generated, a hunch confirmed

or a hypothesis strengthened. And it is the process of conversation that rallies people with similar ideas behind the identification of new research directions and partnerships.

Research is also the active collaboration between scholars and scientists across the world. The Faculty of Theology, for example, has established a world-class Jonathan Edwards Centre that links Yale University and the University of the Free State in a partnership that not only trains doctoral students from across the continent and beyond in the theology of Edwards, but generates new research directions arising from that line of inquiry. Another model partnership came about through financial assistance from the International Labour Organization (ILO) and the SA National Treasury to establish the SME Observatory of South Africa. The Observatory is located in the Centre for Development Support (CDS) of the Faculty of Economic and Management Sciences and serves to boost SME development and research, a first of its kind in South Africa. Then there is the Simulation Unit in the Faculty of Health Sciences, made possible through a partnership with the College of Medicine at Penn State University Medical Centre, Herschey, which over the past 15 years has become a leader in medical simulation.

But to 'do' partnerships requires funding, and in this respect we have been fortunate

to have major international funders create possibilities for research training and exchange, such as through the Erasmus Mundus programme which links our young and more experienced scholars to top European universities through long-term academic commitments. The Fulbright Program funds some of our colleagues for advanced degrees, who then come back to campus to, in fact, lead research with capacities gained elsewhere. The Mellon Foundation and the Oppenheimer Trust, for example, provide critical funding that creates new partnerships with universities and scholars in southern Africa for purposes of advanced research in the humanities. The Kresge Foundation provides funds that build in-house capacity in prospects research without which the UFS would not be able to efficiently source international funding opportunities. In South Africa the partnership with the South African National Roads Agency (SANRAL) has produced a Chair in Science, Mathematics and Technology Education funded through an endowment of R30 million to promote school-level research and action in the rural Free State. That the Free State province enjoyed the highest marks in physical science and the top position in Grade 12 school results is in large part a result of the partnership model driven by the MEC for Education, Tate Makgoe, in collaboration with the UFS.



*"But to make the most of partnerships it is important for the UFS to constantly look for new research alliances in other parts of the world."*

Prof Jonathan Jansen

We also offer international leadership through various partnerships, and one of the most distinguished efforts in this regard is led by Prof André Roodt from the Department of Chemistry. Prof Roodt was appointed Dean for the SA-YSSP2 (South African Young Scientists Summer Programme II), a systems research initiative funded and supported by South Africa's National Research Foundation (NRF) and the Department of Science and Technology, together with the distinguished International Institute for Applied Systems Analysis in Vienna, Austria. In the same vein, Prof Marian Tredoux from the Department of Geology formed part of an international research team which published an article in the top journal *Nature* on the fairly common occurrence of platinum deposits in sulphite melts.

Not all partnerships are productive, and the UFS has increasingly narrowed its list of research partners to ensure that such collaborative activities lead to concrete products of research, the most common being the scholarly book or published articles in high-impact journals.

There are indeed some wonderful examples of such productive international partnerships, such as the work of Prof Melanie Walker with Alejandra Boni which has produced exciting books such as *Human Development and Capabilities: Re-imagining the university of the twenty-first century* (2013) or with Monica McLean leading to the publication of *Professional Education, Capabilities and the Public Good: The role of universities in promoting human development* (2013).

Or consider the successful international partnership between Prof Dennis Francis (Education) and Dr Renée DePalma from Universidade da Coruña (Spain) Facultade de Ciencias da Educación built around two large NRF-funded research grants. Dr DePalma is a leading scholar on sexual and gender diversity and is also the author of the 'No Outsiders' project in the UK. Their collaborative research on the teaching of sexual and gender diversity in South African schools appears in prestigious journals such as *Gender and Education*, *Health Education Research*, *Sex Education*, the *Journal of Homosexuality*, and *Culture, Health & Sexuality*.

And then there are the productive research activities undertaken between Bremen University, Germany, and the Faculty of Economic and Management Sciences on the timely subject of behavioural economics, a field that, after the global financial meltdown, suddenly attracted much attention in scholarship and development. The Faculty of Law also has many productive and mutually beneficial collaborative agreements, which have played a significant role in postgraduate research and training – with universities such as Tilburg, Antwerp and Leuven amongst others.

But to make the most of partnerships it is important for the UFS to constantly look for new research alliances in other parts of the world. Here the new science-driven partnership with Okinawa Institute of Science and Technology in Japan is a really powerful ally in advancing the biological sciences at the UFS. This brand

new Institute, headed by a South African scientist, enables us to place our top young scholars in Okinawa and to consider joint ventures in areas of mutual concern.

So what do we know and celebrate about research partnerships? One, it takes hard work to establish and sustain productive relationships. Two, it cannot happen without dedicated individuals on each side to want to make the partnership work; reciprocity is key. Three, it often requires third-party funding through government agencies, foundations or the private sector to enable faculty exchange or the acquisition of laboratory facilities. Four, it works best with productive outcomes planned in advance and delivered on time; such productivity in turn attracts further funding. Five, it builds enduring relationships across cultures and geographies which, in the end, is why science and scholarship is so important in the quest for decency, humanity and civilisation.




Prof Corli Witthuhn

## message from the VICE-RECTOR RESEARCH

**The University of the Free State is situated in a rural environment, in a province driven economically by its agricultural activities. In one of the poorer provinces in South Africa, the UFS is one of the beacons of hope and possibility for a brighter future through higher education.**

As a university we are fully aware of the challenges that face many of the people of our province with regard to access to higher education in order to better their lives and the lives of their children. In spite of these regional challenges we are driving a research agenda aimed at not only regional and national impact, but at the same time research that is globally groundbreaking and cutting edge. In a world in which the sustainability of our natural resources is increasingly under pressure, we must research what is relevant and make a contribution to the improvement of our world, our country and our province. In order to achieve this it is of the utmost importance that we build partnerships, as no institution of higher learning can do research in isolation. We have worked hard to maintain and expand our national and international collaboration to further our research endeavours. These partnerships and collaborations are the focus of the 2013 Research Report, highlighting what we have achieved and serving to motivate us to expand global collaboration even further.

It has been a year since the instatement of a Vice-Rector with the responsibility for the research portfolio at the UFS. During the past year we have attempted to build on the research successes of the previous research leaders and managers at this University. In 2013 we were successful in reaching many of our research targets.

- There has been an increase in the number of high impact research publications in accredited international journals.
- We have enhanced our national competitiveness in the number of peer-reviewed scholarly books.
- We have significantly more NRF rated researchers.
- A record number of highly productive postdoctoral fellows are involved in our research endeavours.
- We recorded the most successful return on applications for scholarships and funding in the history of the UFS.
- Through all this we have increased our international footprint.

We are also in the process of addressing the challenge of increasing the research capacity of staff at the UFS. We are proud of the progress that the Vice-Chancellor's Prestige Scholars' Programme (PSP) has made in the development of our bright

young research stars. On another level, in order to provide research support to a broader number of academic staff members, we have initiated a mid-career research development programme with the aim of supporting less experienced researchers to make a meaningful contribution to our research outputs. All these programmes are supported by the research skills development programmes offered by the Postgraduate School.

I take this opportunity to thank the researchers at the UFS for their dedication and passion, for the hard work and long hours they spend doing research that matters. I wish also to thank them for their excellent guidance and mentorship of the researchers of the future – those people who will become the leaders who will be entrusted with ensuring a better future for us all. Lastly, I want to thank all the donors and sponsors of the research activities at the UFS, as it is their investments that have made this possible.







Dr Glen Taylor

message from the senior director

## RESEARCH DEVELOPMENT

As universities have evolved over the last decade, they have realised that, in order to be a world class or elite university, it is not business as usual. To be a leading university requires strategic partnerships and collaboration. Universities that are able to forge the right collaborations and partnerships are the ones that are able to push the frontiers of knowledge and scholarship. With the right partners they can also be strong drivers of innovation and economic growth for the communities they serve.

Although it is generally acknowledged that collaboration and partnerships are important, it is not always a simple process or one that occurs naturally. It takes effort by researchers and scholars to engage with industry and other partners. There are often large inherent differences that need to be overcome in order to engage in strategic partnerships. Overcoming these differences requires a shared research vision. In doing so, these researchers are able to develop long-term professional ties. There has to be a significant amount of trust between the parties, and the benefits from these collaborative partnerships create a win-win outcome. It is my opinion that the scholars who become the drivers behind successful partnerships are those who are able to

bridge these cultural divides, and work with researchers and colleagues from a range of different types of institutions – be they other academic or research institutions, industry, business, government, NGOs, NPOs, or the community, nationally and internationally. Partnerships require that the partners have an understanding of both worlds – the academic world and the partner's world. Partnerships come in all shapes and sizes, and flexibility, shared vision, understanding and 'going the extra mile' are essential ingredients to making them work.

Collaborations and partnerships can have a positive influence over a broad range of activities in a university. This extends beyond just research, as the impact of the collaboration often also influences the teaching and learning environment by modernising the way in which we do things. There is an exchange of ideas and the development of new skills and competencies. As our staff and students are linked into a range of active collaborations and partnerships, there is a mutual exchange of experiences, knowledge and ideas – crossing the cultural divide of not only people and nations, but also between academia and the real world of industry, business and the community.

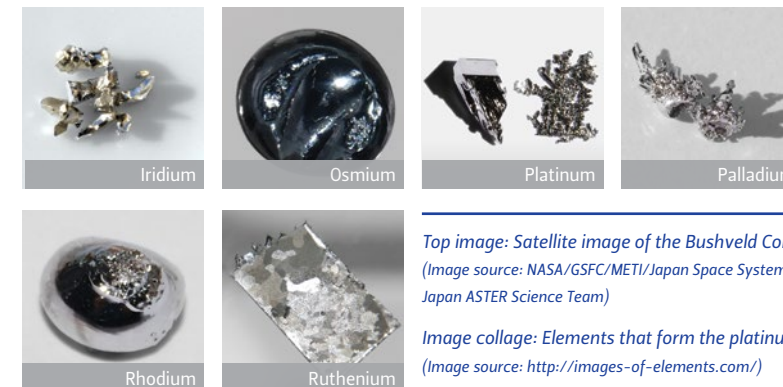
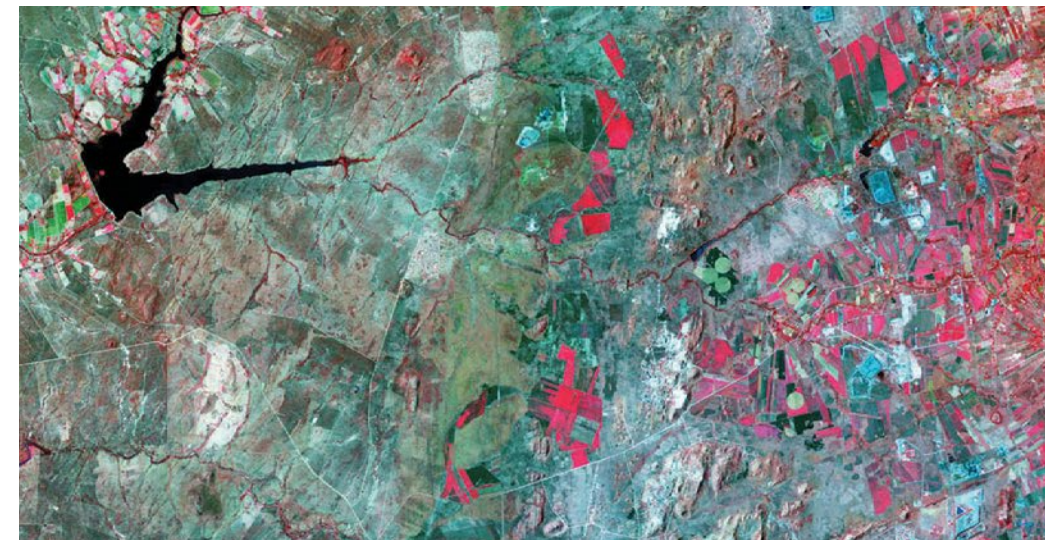
A key foundation of our research strategy is the development of strong collaborative partnerships – locally, nationally and internationally. We believe that this is key to developing a culture of innovation. This edition of the UFS Research Report celebrates these partnerships – which range from communities across the city to fellow academics across the globe. The diversity of partnerships and collaborations that our researchers are actively engaged in, reflects our forward thinking and vision, and show how working together can lead to valuable, sometimes life-changing, results. In a document of less than 100 pages it is impossible to include everything, and the 2013 Research Report is therefore only able to present a limited snapshot of some collaborations and partnerships undertaken at the University of the Free State. We trust that this will whet your appetite sufficiently to make contact with us in order to discover more.

# celebrating PARTNERSHIPS





# working together for TECHNOLOGY



Top image: Satellite image of the Bushveld Complex.  
(Image source: NASA/GSFC/METI/Japan Space Systems, and U.S./  
Japan ASTER Science Team)

Image collage: Elements that form the platinum-group.  
(Image source: <http://images-of-elements.com/>)

"In the past, it was taken for granted that transition metals are dissolved in silicate melts principally as oxide species. In a seminal paper in 1995, Prof Tredoux and co-workers proposed on theoretical grounds that many noble metals are self-organized in melts in the form of poly-atomic clusters, long before concentrations are reached that discrete noble metal phases could nucleate. Until recently, direct evidence for self-organization of transition metals was missing. In this collaborative experimental-nanoanalytical project, platinum-rich nanophases and nanoparticles were made visible for the first time, confirming after 20 years' speculation that Tredoux's prediction was correct."

Prof Chris Ballhaus  
Steinmann Institute

## Challenging established theories on mineral formation

The latest research conducted by Prof Marian Tredoux of the Department of Geology, in collaboration with her research student Bianca Kennedy and their colleagues from Germany and Egypt, placed established theories regarding how minerals of the platinum-group of elements are formed, under close scrutiny.

In low temperature aqueous solutions, it has long been recognised by *in situ* experiments that many minerals are preceded by crystalline nanometre-sized particles and non-crystalline nanophases, but it was thought that these would not appear in magmas due to the high temperatures (>1 000°C), although the suggestion that such nanometre-sized precursors did exist has been around for some time.

The study, which was conducted at the Steinmann Institute of the University of Bonn and at the UFS, demonstrated by high temperature quench experiments that atoms of platinum and arsenic self-organise into nanoclusters long before the mineral sperrylite can crystallize. Thus the platinum does not occur as a primary sulphur compound. Studies are now being conducted on other metals in the precious

metal group, specifically palladium, rhodium and ruthenium.

The discovery of the nanoclusters and the combination with arsenic could have far-reaching consequences for the platinum industry, if it can be utilised to recover a greater amount of platinum ore and therefore result in less wastage ending up in mine dumps. This will signify optimal mining of one of South Africa's most important export products.

For Prof Tredoux the research results also prove her long-held theories around the forming of platinum minerals, which she postulated some 20 years ago; however, the evidence had to wait for the development of technology to prove it.

The research, which was published in the online version of the highly respected

scientific journal *Nature*, forms part of a long collaboration between Prof Tredoux and Prof Chris Ballhaus of the Steinmann Institute, which has resulted in their students working on aligned problems in the field. The research was supported by Inkabaye Africa, a German-South African multidisciplinary and intercultural Earth Science collaborative programme of the NRF. Bianca Kennedy was privileged to be part of this exchange programme: "Through the programme I got to conduct research in state-of-the-art laboratories, learned new skills, travelled locally and abroad to present my research and interacted with scientists from all over the world. The great thing about collaboration is that not only do you grow as a scientist, but you grow as a person."

Prof Marian Tredoux  
Department of Geology  
[mtredoux@ufs.ac.za](mailto:mtredoux@ufs.ac.za)

### PARTNERS

Prof Marian Tredoux collaborates with scholars from (amongst others)

Department of Physics, UFS, South Africa // GeoForschungsZentrum Postdam, Germany // Minia University, Egypt // Nelson Mandela Metropolitan University, South Africa // Rhodes University, South Africa // Steinmann Institut, Universität Bonn, Germany // University of Stellenbosch, South Africa //



“Our collaboration has ranged from hauling dassie dung middens out of isolated rock shelters, to sleeping on hay bales in abandoned farm houses during Karoo mountain winters, to pulling sediment cores out of ancient pond deposits. Recently I was trying to find a good photograph of Louis doing fieldwork, and couldn’t. All my photos show the back of his head while he was meters deep in some trench collecting pollen samples! That epitomizes Louis’ career – he spends more time working and less time posturing.”

**Dr C Britt Bousman**  
Anthropology Department,  
Texas State University



Prof Louis Scott sampling for aerial pollen.

## A glimpse into the past in strange places

**Prof Louis Scott is a leading scholar in the fields of Quaternary palaeobotany and palaeoecology. By employing pollen analysis of swamp and cave deposits and fossil hyrax and hyena dung from rock shelters, his work contributes to reconstructing past environments in dry areas in Africa. This has contributed significantly to insights into the origin of our current environment by identifying long-term patterns of climate and vegetation change, and the effects of past global warming.**

Like many of the world’s subtropical regions, southern Africa is highly sensitive to changes in the earth’s climate system, but a dearth of natural archives with reliable palaeoenvironmental records means that relatively little is known about how regional environments have been affected over centennial to multimillennial timescales associated with our evolutionary history. To a large extent this sensitivity is a function of the position of these regions at the interface between temperate and tropical circulation systems. Thus, while African environments are rich in archaeological finds, they are generally unsuitable for fossil pollen preservation due to the absence of lake and wetland deposits, strong seasonal moisture variations and oxidation. Animal faeces, which can be preserved under dry conditions preventing microbial activity, present alternative archives; coprolites are therefore

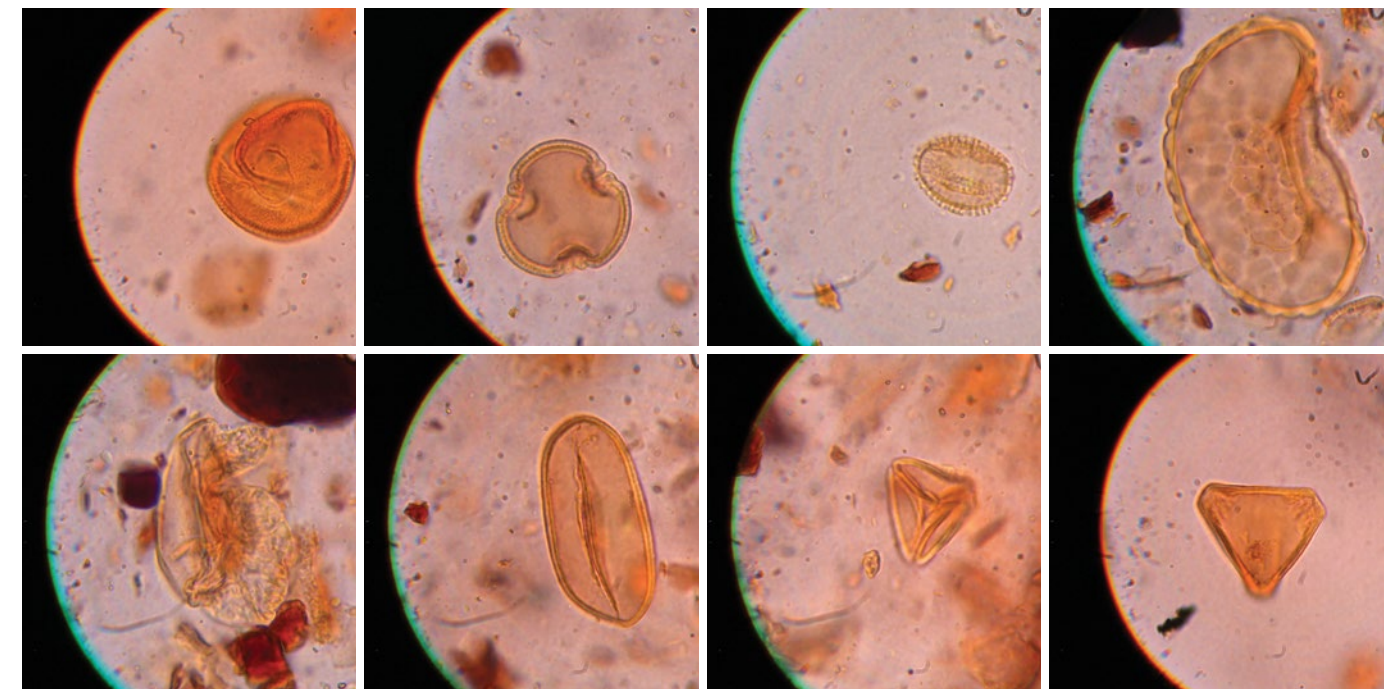
used to extract proxies like pollen, which are trapped and preserved inside them.

Due to its multidisciplinary nature, Prof Scott’s research demands collaboration. His long-standing collaboration with many colleagues from a range of fields in numerous countries is evidence of the wide recognition that he enjoys and it is no surprise that he is much sought after as a collaborator.

Together with colleagues from South Africa, Egypt and Germany, Prof Scott investigated the Holocene palynology and palaeoenvironments in the savanna biome at the Tswaing Crater in central South Africa. A radiocarbon dated pollen and microscopic charred particle record from the site provided new evidence for environmental changes during the period c. 9400–1800 cal years BP. Pollen grains are scarce or absent in layers dating from before 9400 cal years BP but deposits rich in pollen occur in overlying layers. The section dated between 9400 cal years BP and c. 7200 cal years BP contains grass, Asteraceae and dry savanna pollen types that suggest fluctuating but generally dry moisture conditions. Later (between c. 7200 and 1800 cal years BP) broad leaved savanna woodland elements and local swamp pollen indicate relatively stable vegetation and wetter, mildly fluctuating climatic conditions, consistent with previously published biomarker analysis. Between c. 6200 and 5500 cal

years BP, the numbers of charred particles increased slightly, indicating burning activity, which can probably be attributed to dry season ignition of denser fuel under relatively moist conditions. A decrease of local swamp pollen between c. 3600 and 3500 cal years BP suggests that conditions became briefly drier again as pollen of woody elements declined in favour of open grassland pollen. A comparison between the Tswaing pollen profile and various other sequences within the central interior of South Africa suggests generally similar conditions over the sub-continent during the Holocene, deviating from sequences further afield along the coastal areas of southern Africa. Between 9400 cal years BP and ca. 7200 cal years BP, the western and southern coasts were probably controlled in part by orbital forcing responsible for different atmospheric and oceanic circulation regimes under the influence of a strong westerly winter-rain system, while the north-eastern area experienced less summer rain from the Intertropical Convergence Zone (ITCZ).

In recent research undertaken together with his collaborators from Spain and Germany, pollen taphonomy was investigated to aid interpretations of local and regional vegetation changes in fossil hyena dung by assessing dietary and other pollen sources of fresh hyena scats from the Tswalu Kalahari Reserve in comparison with



Over 40 million-year-old fossil pollen types from Namaqualand.

coprolites from Equus Cave in the Northern Cape. The researchers mechanically separated inner and outer sections of each scat and coprolite and extracted pollen from both fractions for analyses. The results were associated with vegetation maps of the Reserve and compared with pollen in modern soils, and quantitatively analysed in order to test potential differences in quality and richness of pollen between dietary sources in the inner and wind transported pollen in the outer parts of the samples.

In a related study with colleagues from Germany and the Council for Geoscience in Pietermaritzburg, a palynological and sedimentological record from the Mahwaqa Mountain in KwaZulu-Natal, provides evidence of the vegetation dynamics in this part of the grassland biome during the last c. 18000 years. The vegetation responded to humidity and temperature changes during the late Pleistocene and Holocene, and the period c. 18000 and 13500 cal BP is characterised by fynbos pollen including high Ericaceae and Restionaceae percentages and few charred particles, indicating cool conditions and little burning. Around 13500 and 8500 cal BP, fynbos was gradually replaced by grasses, signalling climate warming: growing environmental wetness during the same time period is inferred from *Phragmites*-type pollen (reeds) and *Cliffortia* pollen. Since c. 8500 cal BP, *Cliffortia*, Restionaceae, and *Phragmites*-type percentages maintained low levels, and Ericaceae were almost completely replaced by grasses and Asteraceae by c. 7500 cal BP. All indications are that warm and fluctuating moisture conditions followed until 4600 cal BP, but they became driest between c. 4600 and 3500 cal BP, when high Asteraceae, including *Pentzia*-type,

and *Scabiosa* percentages were prominent. From c. 3500 to 800 cal BP the increase of sedges, *Aponogeton* and grass pollen (including *Phragmites*-type) at the expense of Asteraceae pollen suggests the return of slightly more humid conditions. Since c. 1000 cal BP an increase of water demanding *Podocarpus* and *Cliffortia* occurred.

Prof Scott describes this research as a “big jigsaw puzzle with each person contributing different interpretations”, and piece-by-piece, together with his colleagues, he is giving us a glimpse of the bigger picture. His commitment to his research has had a profound effect on his students, many of whom have become his collaborators. Dr Graciela Gil-Romera started working with Prof Scott as a PhD candidate and says: “He was to me both a dedicated mentor and a

permanent reference to develop my work. Collaboration with Prof Scott enabled me to develop my own research career on a relatively unknown but promising scientific field. Thanks to him I was introduced to a wider research community in African palaeoecology where I am still developing my investigations, leading new research lines in my home institution in Spain and collaborating in a well-developed network of African Quaternarists.”

**Prof Louis Scott**  
Department of Plant Sciences  
scottl@ufs.ac.za

### PARTNERS

*Prof Louis Scott collaborates with scholars from (amongst others)*

Assiut University, Egypt // Council for Geoscience, Pietermaritzburg, South Africa // Evolutionary Studies Institute, University of the Witwatersrand, South Africa // Forschungsstelle Paläobotanik, University of Münster, Germany // Institut des Sciences de l’Evolution de Montpellier, CNRS, France // National Museum, Bloemfontein, South Africa // Natural Sciences National Museum, Madrid, Spain // Oklahoma State University, USA // Pyrenean Institute of Ecology, CSIC, Zaragoza, Spain // Queen’s University, Ireland // Research Laboratory for Archaeology and the History of Art, University of Oxford, UK // Texas State University–San Marcos, USA // University of Cape Town, South Africa // University of Georgia, USA // University of Leicester, UK //



“Through our work on the microbiology of the deep gold mines, Prof Van Heerden expanded my technical focus by involving me in her research on microbes that can help to solve some of the metals-related groundwater issues in South Africa. In recent years our collaboration has involved taking some of the capabilities that we have developed in the laboratory to the field, and Prof Van Heerden has done an excellent job of developing clients from some of the most important companies in South Africa.”

**Dr Mary deFlaun**  
Principal Environmental  
Scientist, Geosyntec



## Tapping into unique genetic material in extreme biomes

The TIA/UFS Metagenomics Platform was established in 2007 to create an Intellectual Property Portfolio of novel genetics, materials, bioactive molecules and microbes and their activities through research and training. However, with developments at the Technology Innovation Agency (TIA), the Platform evolved to become a more applied and industrially aligned research centre. Although the research has always concentrated on the unique biodiversity and environments in South Africa, in 2010 there was a shift from bioprospecting to biocycling and application. Now the Platform focuses on the discovery and exploitation of unique and novel micro-organisms from South Africa's extreme environments, such as deep mines or contaminated sites, for industrial applications and processes. This includes their potential to be used as biomarkers or to serve as biocatalysts in bioremediation processes.

This shift in vision allowed for more industrial interaction. As a result, the UFS partnered with the world-renowned Geosyntec Consultants, based in the USA, a specialised firm that addresses new ventures and complex problem-solving in the environment, natural resources and civil infrastructure. With TIA's endorsement, this partnership allows for quicker technology development with known benchmarks.

Currently the Platform also has several interactions with the South African industrial sector.

Eskom, the leading power provider in South Africa, generating approximately 95% of the country's electricity, has made sustainable development a priority, integrating this into decision-making processes in accordance with national as well as international environmental management standards. The reduction in water consumption as well as minimising water and air pollution are crucial to Eskom, and the company

is therefore striving to find new and innovative technologies to address these issues. Furthermore, treating potential acid or alkaline drainage is very important to the South African water balance. With this in mind, the UFS Platform developed, from a proof of concept laboratory-scale reactor data set, an on-site pilot-scale water treatment system with chemical and biological reactors in an effort to remediate contaminated water. This is now being deployed at two different Eskom sites. The composition of the water on the sites is different and therefore two different technologies were implemented. At one site, the water is chemically treated for the removal of iron and sulphates, while at the other site the water is biologically treated to remove chromium (VI), other metals, as well as sulphates from the contaminated water.

The advantage of these water treatment processes is that the treatment steps are custom designed, based on the type of contamination in the water and the laboratory benchmarking and proof of concept data sets. Although biological treatment is more complex, and usually slower, it also lowers the waste generated and operating costs, thereby making this technology not only affordable, but also environmentally friendly. According to Kelley Reynolds-Clausen, a Senior Consultant at Eskom, these projects have offered Eskom an uncomplicated, inexpensive means to deal with a possible serious environmental issue. She states that “Prof Van Heerden and her group have been extremely helpful and knowledgeable in getting all involved Eskom personnel

to comprehend the process. They are professional, open and extremely passionate and dedicated to providing the optimal means of dealing with the problem.”

The TIA/UFS Platform also collaborates with Exxaro, one of the largest South African-based diversified resources groups, with interests in the coal, titanium dioxide, ferrous and energy markets, and with current business interests in South Africa, Botswana, Republic of the Congo, Inner Mongolia, and Australia. The company is the second largest coal producer in South Africa, with current production of almost 40 million tonnes per annum (MTPA), and is listed on the Johannesburg Stock Exchange (JSE), where it is a constituent of both the Top 40 and Socially Responsible Investment (SRI) indices.

In order to have sustainable growth, Exxaro believes they must invest in technologies that can reduce their capital expenditure while ensuring their high standard of social responsibility. And that is what the University of the Free State is giving them – innovative water purification technology that is both more economical and environmentally friendly, especially for passive treatment systems. The technology that the UFS is developing focuses on semi-passive acid mine drainage treatment for the South African mining industry. The partnership will not only produce financial benefits, publications and innovative technology, but will also remediate South African polluted water, our most valued resource.

**Prof Esta van Heerden**  
TIA/UFS Metagenomics Platform  
[vheerde@ufs.ac.za](mailto:vheerde@ufs.ac.za)

### PARTNERS

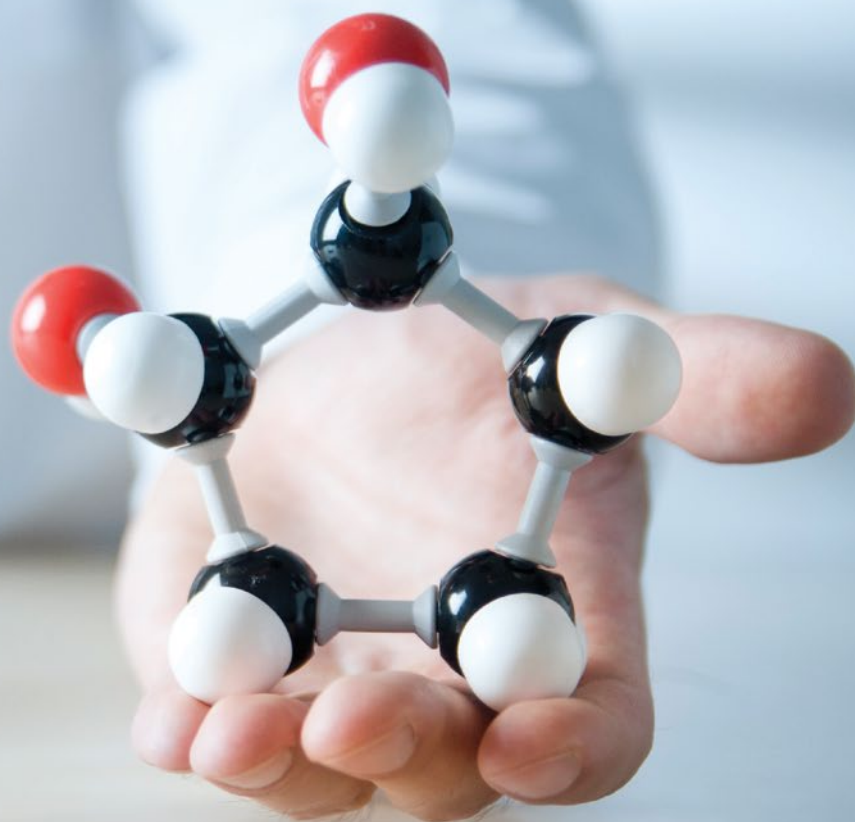
*Prof Esta van Heerden collaborates with (amongst others)*

Eskom, South Africa // Exxaro, South Africa // Geosyntec Consultants, USA // Technology Innovation Agency, South Africa //



“We have had a strong and fruitful collaboration for many years. In the framework of the programmes of scientific and technological co-operation between the Italian Republic and the Republic of South Africa, several Master’s and PhD students spent research periods in our laboratories.”

Prof Massimo Messori  
University of Modena and Reggio Emilia



## The endless possibilities of polymer nanocomposites

In his highly active career as a polymer scientist, Prof Riaan Luyt of the Department of Chemistry at the Qwaqwa Campus has built up an enviable network of collaborators. Many of these have grown out of close professional relationships he has developed with postdoctoral researchers who have worked in his laboratory.

Igor Krupa, formerly from the Polymer Institute of the Slovak Academy of Sciences in Bratislava, was a postdoctoral fellow with Prof Luyt during 1999/2000. This partnership has led to very fruitful and rewarding ongoing collaboration, continuing as Prof Krupa heads the Qapco Polymer Chair at the Qatar University’s Center for Advanced Materials.

Their respective research teams have been involved in collaborative research on thermal energy storage, which bridges the time gap between energy requirements and energy use; thermal energy storage

systems thus contribute to the effective use of energy. Phase change materials have received much interest in many applications such as energy storage and thermal protection systems, as well as in active and passive cooling of electronic devices. It is very challenging to find an ideal phase change material that satisfies all the desirable properties, and different inorganic as well as organic substances have been employed for the creation of phase change materials. Paraffin waxes are used as phase change materials for thermal storage applications because of their desirable characteristics, such as high latent heat of fusion, negligible super-cooling, low vapour pressure in the melt, chemical inertness and stability, self nucleation, no phase segregation and commercial availability at low cost. However, waxes exhibit some inherent limitations, such as low thermal conductivity and large volume change during phase transitions. When paraffin

waxes are used in energy storing systems, their lower thermal conductivities reduce the heat exchange rate during melting and solidification cycles, and therefore the overall power of the phase change regenerator decreases. Paraffin waxes seem to be the best candidate for the preparation of smart polymeric phase change materials for different applications such as thermal storage of solar energy, thermal protection of electronic devices, thermal protection of food and medical goods, passive storage in bioclimatic buildings, use off-peak rates and reduction of installed power, thermal comfort in vehicles, etc.

Dr Vladimir Djokovic, from the University of Belgrade, has been a collaborator with Prof Luyt since he was a postdoctoral fellow on the Qwaqwa Campus in 2001/2002.

Their collaborative research is mostly based on the effect of a variety of nanoparticles on a range of properties of polymer nanocomposites. More recent work focuses on bio- and biocompatible polymer nanocomposites. Research on nanocomposites is also the basis for the collaboration between Prof Luyt and Prof Massimo Messori, of the University of Modena and Reggio Emilia.

The development of advanced materials through a sustainable approach has become



a scientific and technological priority and much effort has been dedicated to the bulk modification of polymers, in particular thermoplastic or thermoset commodities having the widest diffusion, the lowest price and applicability in numerous different fields, to obtain innovative materials presenting advanced properties without need of unsustainable implementation costs. While the development of advanced materials often entails initial costs that are incompatible with most of the emerging countries’ economical possibilities, the modification of existing economical polymers with innovative reinforcing nanoparticles results in a faster and more provident route to new plastics suitable for advanced applications.

In research being undertaken by Prof Luyt and his partners, the preparation procedure of such nanoparticles is aimed at obtaining high-value reinforcing materials starting from low-cost and commonly available raw materials by means of different chemical approaches (sol-gel and hydrothermal syntheses), properly exploited to gain reinforcing agents suitable for the modification of the most widely used transparent plastic materials. Silica, titania and zirconia nanoparticles will be synthesised, surface modified with organophilic compounds in order to improve their compatibility with polymer

matrices and fully characterised before composites manufacturing. The prepared composites will be characterised in terms of morphology, thermal properties and mechanical properties, in order to have feedback on the suitability of the prepared nanocomposites for advanced applications. Experiments on the recyclability of such nanocomposites will also be performed.

In order to investigate different methods of introducing nanoparticles into a polymer so that good dispersion and interaction are obtained, an additional study is looking at the *in situ* preparation and dispersion of nanoparticles in a polymer through a sol-gel method, and the characterisation of such polymer nanocomposites. The characterisation will involve the determination of the morphology, as well as a number of thermal and mechanical properties that will determine whether the successful introduction of the nanoparticles

in the polymer has actually led to an improvement in the polymer’s properties and performance.

The collaborative networks that Prof Luyt has forged over the years have also benefitted his students. One of these is Julia Mofokeng, who has been under his supervision since 2008 when she started her honours degree and is now busy with her PhD studies. “He has made a deep impression on me, with the patience he has in terms of guiding and supervising his students. I was one of the students that he sent abroad for one month on one of his Italian collaborations, and later to Budapest University. He has given me the exposure to go and see how other countries carry out their research.”

Prof Riaan Luyt  
Department of Chemistry (Qwaqwa Campus)  
luytas@qwa.ufs.ac.za

### PARTNERS

Prof Riaan Luyt collaborates with colleagues from (amongst others)

Budapest University of Technology and Economics, Hungary // Center for Advanced Materials, Qatar University, Qatar // Leibniz Institute for Polymer Research, Dresden, Germany // Mahatma Gandhi University, Kottayam, India // Polymer Institute, Slovak Academy of Sciences, Slovakia // University of Belgrade, Serbia // University of Modena and Reggio Emilia, Italy // University of Palermo, Italy //





## The green shack project

Adequate housing for the marginalised poor has been a priority since South Africa became independent. Added to this is the need to provide housing using simple, low-tech designs, which are environmentally friendly. In a unique project undertaken by the Department of Quantity Surveying and Construction Management, together with Verster Berry Quantity Surveyors, who financed the entire project, a comfortable house was constructed for a family of six members. The project thus combined two goals – construction for research purposes together with community upliftment.

The project involved constructing a low costing housing structure in the Bloemfontein Grasslands area, consisting of gumpoles and SAP pine bearers, with a timber roof structure and internal cement block flooring. The 'green shack' received additional 'green' elements – internal nutec cladding, glasswool insulation, internal gypsum ceiling boards with 'think pink' insulation, internal dividing wall and door, polystyrene in the floors, internal paint, and tint on the windows.

The main purpose was to investigate the cost and energy efficiency of sustainable shacks, comparing the 'green shack's' energy and heat efficiency with that of a typical, existing shack. As such, a structure was created that is environmentally friendly, maintains a comfortable interior climate in winter and summer, is cost-effective and economical to erect, as well as socially acceptable to the family and the community.

Data loggers have been installed in both the existing and the new shacks in order to measure the differences in comfort level inside the two different types of structure.

In the words of the new owner of the first 'green shack', Johannes Mamfene: "Ek bly baie lekker in die nuwe huis. My vrou en kinders hou ook baie daarvan. Dit is lekker warm binne in die huis en ons gebruik die verwarmers min. Die bure hou ook baie van my huis en hulle will net die heertyd kom kuier". ("I enjoy living in the new house. My wife and children also like it a lot. It is nice and warm inside the house and we use the heater very little. The neighbours also like my house a lot and they just want to come and visit all the time.")

Related to this project, collaboration with the Appalachian State University has enabled the monitoring of temperature and relative humidity in various smaller houses in Bloemfontein and Botshabelo. The data is captured and plotted by researchers in the Department of Quantity Surveying and Construction Management. Through the simulation of different environments, building materials and alternate forms of energy, software models are used to determine more energy-friendly building

### PARTNERS

Prof Kahilu Kajimo-Shakantu and her team collaborate with scholars and representatives from (amongst others)

Appalachian State University, USA // Grasslands community, Mangaung Metro Municipality, South Africa // Verster Berry Quantity Surveyors, Bloemfontein, South Africa //

"My graduate students here at Appalachian State University, Robin Delarm-Neri and Helen Burkett, and I cherish our collaboration with colleagues at the University of the Free State. It is these types of relationships that make possible international collaborations and the improved perspectives they induce. My colleagues there at UFS are wonderful to work with and have greatly increased my capacity to research the comfort and energy consumption of low-income housing around the world."

Prof Jeff Ramsdell  
Appalachian State University



materials and methods. These findings will be used to improve comfort levels within smaller, low cost housing units.

Structures such as the 'green shack' may serve as an intermediate step to future housing possibilities as they are cost-effective, quick to erect, comfortable, socially acceptable and can be constructed by the people of the community, since only basic skills and training are required.

Prof Kahilu Kajimo-Shakantu and Ms Esti Jacobs  
Department of Quantity Surveying and Construction Management  
kajimoshakantuk@ufs.ac.za  
jacobse1@ufs.ac.za





## Dealing with the invisible world

Dr Karel von Eschwege's research interests are related to the systematic research and development of photo-induced molecular switching devices. Fast developing micro-electronic technologies are imminently faced with reaching the so-called quantum-tunnelling limit, preventing further miniaturisation. This challenge may logically be overcome by a transition from traditional solid-state materials to intelligent molecular assemblies, as exemplified by biological systems around us.

The chemical compounds of his research have the added potential of application in the field of solar liquid fuels. The photo-catalytic charge transfer capability of these molecules holds promise as a synthetic process related to photosynthesis. Although the supply of electricity by both conventional and sustainable means is expected to meet the general need for the time being, based on evidence from various disciplines the prospect for substitute liquid fuels is not promising. Sustainable energy alternatives will, of necessity, have to remedy this predicament, but a great deal of research and development still needs to be done.

In light of these challenges, Dr Von Eschwege has focused his research on the extremely versatile dithizone molecule and its photo- and electrochromic metal complexes. Some dithizonatometal complexes switch colour on illumination with visible light, followed by a spontaneous radiationless back-reaction, i.e. they are photochromic. With a few exceptions, published information on the photo-active properties of these compounds is limited; however, modern instrumentation and techniques now present the opportunity for greatly enhanced understanding and the possibility to chemically engineer these compounds. At the heart of his research lies the chemical, optical and electronic control of these photo-reactants, i.e. molecular engineering to control reactions

to the point where its spectral (colour) and redox (electronic) switching properties may become of practical use.

This project, which has involved collaboration with Prof Jannie Swarts and especially Prof Jeanet Conradie of the Department of Chemistry, was started by searching 'trap' molecules that may selectively and reversibly interact with metal dithizonates. The time and expenses required for lengthy and often complicated syntheses of chemically modified species led to the investigation of possibilities to theoretically predict geometry, optical and redox properties via computational means. Surprisingly excellent correlations were found between computed and experimental parameters from which reasonably accurate predictions of anticipated spectral and redox potentials may be made. The power of *ab initio* quantum computational chemistry lies in explaining physicochemical properties that would otherwise have gone unnoticed, and preventing the 'trial and error' approach, which has often been tremendously demanding on both time and physical resources in the lives of chemical scientists. Apart from the former means, the chemical scientist has to rely greatly on a variety of spectrometers and thorough subject knowledge, to make sense of what is happening in the invisible nano-world of molecules and atoms.

Dithizonatometal complexes conveniently have the potential for substitution with anchoring functional groups at several positions. Apart from simply embedding the photochromic compound into transparent

polymers and investigating its properties, it was also chemically anchored onto both hydrophobic and hydrophilic polymers – cosynthesized from its basic components. During more extensive experimental work the colour of the ligand was discovered to be solvent (solvatochromic) as well as concentration dependent (concentratochromic – one of only three compounds globally).

Structural studies form an integral part of this work, including extensive X-ray crystallography as well as UV-visible, Infrared, nuclear magnetic resonance, and mass and laser spectroscopies. A critical component in this project is measurement of the ultra-fast properties of photochemical reactions under investigation. Interdisciplinary collaboration with colleagues at the Laser Research Institute at the Physics Department of Stellenbosch University enables the required experimental work on state-of-the-art NRF-placed laser equipment. Their tuneable pulsed laser system measures full UV-visible transient absorption spectra at 50 femtosecond intervals, i.e. after every 0.000 000 000 000 05 seconds. Hereby ultra short-lived properties of photo-induced electronic excitations and transfers, intermediate and excited states, and fast isomerisations are explored.

For this research to be successful, close collaboration is required. During the last couple of years Dr Von Eschwege has forged active and rewarding cooperation with several local, national and international researchers in the fields of X-ray crystallography, electrochemistry, computational chemistry, laser spectroscopy and ethics in chemistry.

**Dr Karel von Eschwege**  
Department of Chemistry  
veschwkg@ufs.ac.za

### PARTNERS

*Dr Karel von Eschwege collaborates with colleagues from (amongst others)*

CSIR, South Africa // Laser Research Institute, Stellenbosch University, South Africa // University of Bayreuth, Germany // University of Pretoria, South Africa // University of Tromsø, Norway //

working together for

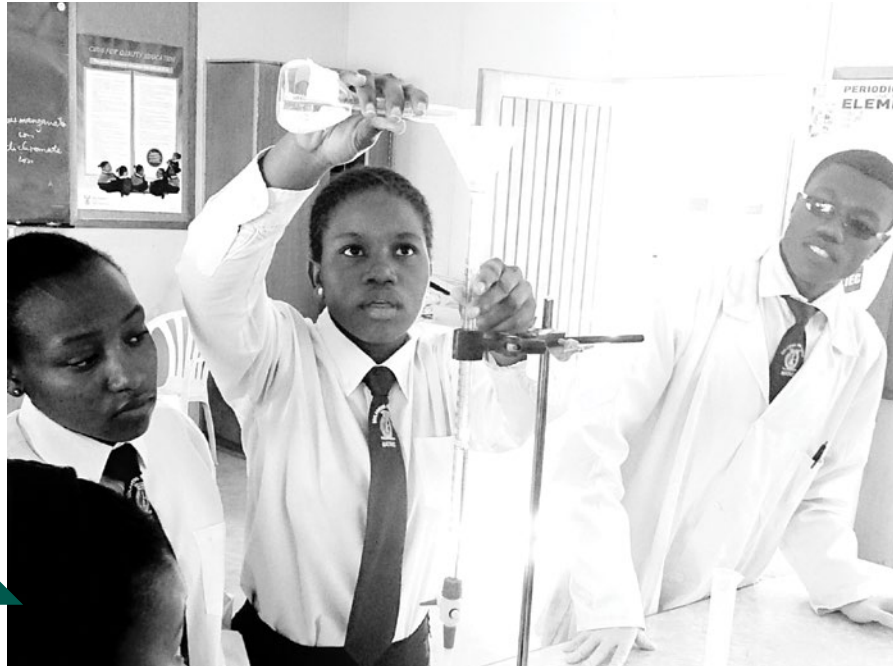
# SOCIETY AND THE ECONOMY





*“We have jointly developed a research programme, and based on this programme Prof Mahlomaholo has graduated a number of Master’s and PhD students all of whom are today contributing to educating young students who will be well-equipped to work for the sustainable development of South Africa. I have benefitted immensely from discussions with Prof Mahlomaholo and I hold his knowledge and his humanity in very high regard.”*

**Prof Mona Dahms**  
Aalborg University



Some of the students from the Ladybrand part of the project led by Dr Tlali, the first to graduate from the Sustainable Learning Environments Programme.

## Improving the quality of education – one step at a time

**Prof Mahlomaholo has a zeal for improving the quality of education, at schools and universities. He believes that good policies are in place, but that the problem lies with the implementation. His research has therefore focused on governance, teaching, learning and the curricula. By anyone’s standards, that is an ambitious agenda and he has therefore not only built up a strong cohort of committed postgraduate students, but also an extensive network of collaborators who include representatives from government, teachers, and researchers from South African universities as well as universities abroad.**

The theme of Prof Mahlomaholo’s research is ‘sustainable learning environments’, which occupies a research team of 15 academics, 18 PhD and 12 Master’s students involved at 30 schools. His current primary project is aimed at formulating a framework for sustainable postgraduate learning environments. Research shows that the rates of attrition at PhD level are very high. Even many of those who graduate do so from a perspective that emphasises abstract knowledge. The proposed framework, which relies on teamwork and democratic critical participation, aims at enabling students to acquire research knowledge by solving real life problems.

The notion of sustainable postgraduate learning environments takes its lead from the theory of a learning environment, popularised by Eric De Corte’s and Barry Fraser’s mathematics and science education teams in Leuven and Curtin Universities respectively. They argued that for good academic performance in learning (and/or otherwise) to occur, it is not only about one’s genetic makeup and inborn potentialities, but that the context provides further cues for the re-creation of identity that includes differentials in terms of performance. The theory of a learning environment thus integrates both the nature and the nurture theoretical positions into one coherent and meaningful theory, which recognises that as humans we are born with certain potentialities, which require a material context for realisation, without undermining our emergent volition or agency which defines who we are.

Added to the concept of postgraduate learning environments is the notion of sustainability, which the researchers have appropriated from the sustainable education and sustainable development theorisations that found expression in the United Nations’ Sustainable Development Goals (SDG). The concept links the study with these broad international theories

and movements, which are also inspiring economic development, environmental sustainability and social inclusiveness. These three pillars of Sustainable Development Goals have influenced their understanding of what the postgraduate learning environment is and/or should be about. Among others, sustainable postgraduate learning environments are those contexts where the students can learn effectively in a way that they can meaningfully contribute towards the economic development of the nation and beyond.

The concept of sustainable postgraduate learning environments reaches its climax when it addresses the issue of social inclusivity, the third pillar of the SDG. This implies that such a learning environment should enable the PhD graduate to contribute towards the advancement of the agenda for equity, social justice, freedom, peace and hope.

In order to create such sustainable postgraduate learning environments the research team found using Participatory Action Research (PAR) to be the most useful theoretical framework. PAR advances the agenda for equity, social justice, freedom, peace and hope, affirms the fact that research is always collaborative and is



defined by negotiation and communicative spaces among researchers and participants. Most importantly, PAR insists that even the learners, the teachers, the parents and other instances of civil society in those school communities where the individual PhD students will be conducting research, have to be constituted into teams facilitated by the students. These layered levels of teams are critical when PhD students have to learn about problem identification and formulation, as these are not imposed but democratically formulated in a collaboration of researchers and participants. Once the problem has been identified, formulated and accepted by the teams, PAR prescribes that the teams have to work out a clear common vision which will guide all team members in terms of the literature review, the appropriate theoretical framework, the methods and methodologies to adopt for data generation and analysis. PAR prescribes that all participants and researchers have to be accorded the same status of equality throughout the research process. It is a humanising approach to research, which is built on the principles of critical participatory democracy and transformation.

The research team collectively conducts situation analyses at the schools where the

students are employed. Each student brings together another team at the local school community level made up of teachers, learners, parents, and civil society, who can assist with the resolution of each problem constituting the focus of research. Each local school team then conducts a SWOT analysis in order to identify five priorities that can be achieved in three years. For each priority each school team designs at least five activities, identifying responsible persons, resources and time frames. In this way, even the local school communities have the opportunity to learn, to take an interest and play a practical role in the resolution of problems that affect their children and schools directly.

The research being undertaken by Prof Mahlomaholo and his team is clearly not only relevant within the South African context. In the words of Prof Susan Tilley of Brock University: “My collaboration with Prof Mahlomaholo has provided opportunities for the cross-pollination of ideas related to education for social justice in South African and Canadian contexts. Prof Mahlomaholo’s research program holds great value for faculty and students situated in these very different cultural and educational contexts.”

**Prof Mahlomaholo**  
School of Maths, Science and Technology Education  
mahlomaholomg@ufs.ac.za

### PARTNERS

*Prof Mahlomaholo Mahlomaholo collaborates with scholars from (amongst others)*

Aalborg University, Denmark // Brock University, Canada // Central University of Technology, South Africa // Department of Education, North West Province, South Africa // Provincial Government, South Africa // Manchester Metropolitan University, UK // Nelson Mandela Metropolitan University, South Africa // North-West University, South Africa // Tshwane University of Technology, South Africa // UNISA, South Africa // University of Fort Hare, South Africa // University of Johannesburg, South Africa // University of KwaZulu-Natal, South Africa // University of Plymouth, UK // University of Pretoria, South Africa // University of Venda, South Africa // University of the West Indies, Trinidad and Tobago // University of Zululand, South Africa //





## Radical sustainable housing

**Meeting Anita Venter is an inspiring and thought-provoking experience. She has continually challenged herself to move away from the rhetoric and ensure that her research makes a difference – and one cannot help but be impressed by her enthusiasm.**

Given the reality of poverty in South Africa with the accompanying housing and food shortages amongst the marginalised poor, there is an urgent need to find sustainable and implementable strategies to address these shortages on a large scale. A combination of social and green entrepreneurial approaches could solve some of these problems. Such approaches may require stepping outside of existing comfort zones and testing unconventional possibilities for the development of skills, while also making a difference at the grassroots level. These challenges have spurred researchers from the Centre for Development Support, led by Anita Venter, to actively engage with projects aimed at the implementation of sustainable development through a social

entrepreneurial initiative called *Qala Phelang Tala* – meaning “Start Living Green”.

The initiative provides a platform for testing products and applications focused on environmental sustainability, including solar and wind energy products, irrigation, cultivation and recycling products and methods. In preparation for this Venter spent three weeks in Guatemala, where she joined volunteers from all over the world to learn how to build a low-cost sustainable house from recycled material. This inspired her to establish something similar closer to home, and her collaboration with those she met with, such as Mateo Paneitz, the Executive Director of Los Técnicos, which is doing groundbreaking pro-poor development work in Latin America, has been invaluable.

In line with the green building research and enabling principles advocated by the United Nations and applied by Los Técnicos, *Qala Phelang Tala* continuously experiments with, develops and implements appropriate

building technologies. These technologies include methods to construct housing by combining indigenous building methods and sustainable material (stone, earth, flora) and recycling, re-using and re-purposing of waste material (tyres, building rubble, etc), water harvesting, and urban food gardening with ‘greywater’.

Two informal research and development pilot sites have been established in the Mangaung Municipal Metro, in the suburbs of Bayswater and Wilgehof. All building and food security methods are first tested on these premises before they are piloted in community projects. At the Bayswater property a demonstration house has been constructed, complete with rainwater harvesting and greywater re-use for an urban food garden. On the Wilgehof pilot site, a ‘survival unit’ and greenhouse, together with a water harvesting reservoir, have been constructed using waste materials.

The next stage of the project was to roll it out to the Freedom Square informal settlement. This project commenced in November 2013, and researches the development of a sustainable, self-reliant, off-grid, secure tenure, eco house on a property of 299 m<sup>2</sup>. It will enable a single, female-headed low-income household to

manage the construction of a self-sufficient, energy-efficient and water-saving sustainable house which, when completed, will be much more resistant to temperature changes than the shack in which she and her family have been living for the past 15 years. In the first phase of the project private sector sponsors and volunteers are constructing a two-room house while the informal house remains in use by the owner. Locally available recycled materials, such as old tyres filled with excess garden soil, glass and plastic bottles, basic steel products for the roof, lime and straw, are repurposed to serve as building materials in the construction of the house. The garden, sustained by rainwater harvesting, will supply the household with food. In the second phase of the project, the homeowner will incrementally upgrade her house herself, by adding on additional rooms, including a bathroom and solar toilet. The cost of building the sustainable house is in the region of R20 000 – less than a quarter of the price of current government subsidised housing.

The outcomes of this case study indicate that self-help sustainable informal building practices offer a viable, replicable option to house the poor. Secondly, community cohesion can be achieved through the

transfer of appropriate technology skills to community members inspired to build their own self-help houses; and thirdly the formalised tenure system and building regulations are very unaccommodating to the poor, and hamper the creation of sustainable communities.

Despite two decades of post-apartheid scholarly reflection on informal settlement upgrading, recommendations are rarely realised at the grassroots level. This spurs Venter on to challenge herself “to see how much an academic can influence policy and practice by using my knowledge to generate change in society.” In her view, intervention and housing policy programmes still seem to serve the institutionalised and standardised ‘master planning’ approach. Although intervention programmes proclaim to have very progressive principles and aims, in practice the over-regulated approach appears to be resistant to accepting informal and self-sufficient building practices, and building regulations and town planning policies currently discourage residents from upgrading their own homes.

**Ms Anita Venter**  
Centre for Development Support  
[ventera@ufs.ac.za](mailto:ventera@ufs.ac.za)

### PARTNERS

*Anita Venter collaborates with (amongst others)*

Natural Building Collective, South Africa // Earthship Biotechture, New Mexico, USA // Freedom Square community, Mangaung Metro Municipality, South Africa // Lebone Village, Mangaung Metro Municipality, South Africa // Los Técnicos, Guatemala // Thabo Olivier, Municipal Councillor, Mangaung Metro Municipality, South Africa // Tierra Projects, South Africa // Toekomsrus community, Randfontein, South Africa //





## Ageing and dying – challenging preferences and values

**Riaan Botes, together with Prof Eric Buskens, his supervisor at the University of Groningen in the Netherlands, has been studying a range of issues related to the quality of life of the elderly (people over 65 years of age) with chronic diseases. His study on clinical epidemiology is part of a broader study involving health psychology, medical ethics, and demographics.**

Multi-disciplinary guidelines for cardiovascular risk factor management are available, which assume that prevention of cardiovascular disease (CVD) is warranted. Events may be avoided and thus life years gained. 'Patients' identified are urged to alter life styles and take medication, with presumed risk reduction in terms of Major Cardiovascular Events (MACE), and subsequent survival benefit. The reverse, however, is rarely considered, as newly identified patients incur a certain immediate disutility, and, in the long run, trade in a relatively mild and sudden CVD death for (vascular) dementia, cancer or other chronic degenerative disorders.

With this as background, Riaan Botes investigated two main issues: (i) How do life courses change in terms of MACE and other disorders, and (ii) how do the population at risk of being identified as 'patients' (those with CVD and with alternative chronic degenerative disorders), value a life course

with an altered outcome as opposed to a course largely determined by MACE?

The study group involved 120 elderly Dutch participants, and 120 elderly individuals from South Africa. The study aimed to describe what is important to elderly individuals with chronic diseases, comparing different types of chronic diseases, level of frailty, gender, and other variables.

Empirical data on preferences and quality of life was gathered using structured interviews, and combining two types of questionnaires, namely health related questions, and questions related to well-being. Botes' main findings indicate that for health related issues, the most important considerations for elderly people with chronic diseases, in their opinion, are (i) mobility, (ii) self-care, and (iii) activities of daily living. Related to this, in terms of well-being, the elderly with chronic diseases consider attachments (friends and family) the most important factor, followed by security (financial and feeling safe and protected), and remaining in control of their own lives.

Botes has developed a model that predicts life expectancy based on the type of disease, and the number of remaining years that are likely to be 'good years'. Expanding on this model, he will develop a Quality Adjusted Life Year, which will value specific health

states as they relate to the economic side of health care.

He found many similarities between the two different national groups studied, but the South African group tended to value health states higher than their European counterparts. However, regardless of the country, most issues are universal.

The results obtained through modelling and the empirical valuation study are combined with ethical theory and reasoning to provide patients, professionals and policy makers with information on the overall merits of prevention. The research raises many questions as to whether governments will be able to take care of the elderly in the way that they need to be.

**Riaan Botes**  
Department of Basic Medical Sciences  
botesr@ufs.ac.za

### PARTNERS

*Riaan Botes collaborates with scholars from (amongst others)*

University of Groningen, The Netherlands //



## Engaging the community

The UFS regards community engagement as an integral, indispensable and pervasive feature of higher education in South Africa. This is aimed at empowering and exposing students to the realities of the social and human dynamics within our communities. The inclusion of the community in the education of its children has not received the attention it deserves in the South African context; as in many other parts of the world, the teacher does his or her 'thing', and social capital from the community and learners is not utilised.

This is a problem that has engaged the minds of researchers in the Faculty of Education, such as Dr Dipane Hlalele and Dr Cias Tsotetsi from the Qwaqwa Campus, amongst others. They therefore embarked on a project to examine the lessons and prospects emanating from engaging the community for educational and social amelioration. This project was undertaken together with an NGO in the community, which assists learners using peer educators who are not formally trained teachers.

The University invited volunteers from its population of student-teachers to offer Grade 10 mathematics and physical sciences to learners in the community. Each Saturday students offered two-hour sessions on each subject. The study on the intervention followed a participatory action research approach, and data was collected using free attitude interviews.

Findings from the study showed that there were distinct advantages of networking and collaboration. While the assumption could be that the school community learned only from the University, the opposite was also true. Personal growth and learning were clearly demonstrated amongst all participants – peer educators, student-teachers, as well as learners. The project encouraged and boosted the confidence of the learners, peer educators and the leadership of the NGO to take responsibility for their own growth and success.

The researchers subsequently broadened their research to also try to understand the parents' role in the improvement of their children's literacy skills. Through an NGO-initiated community engagement programme, the project, which adopted an adaptive leadership framework, sought to create awareness amongst parents regarding the crucial role they can play in improving their children's literacy skills. Nineteen UFS students were involved in the project, offering workshops to parents. A focus group interview was held with the parents and the students who were involved in these workshops. Benefits generated from the interaction included students' ability to conduct workshops and facilitate the learning process, while parents were made aware of their daily activities which could be of assistance in the improvement of their children's literacy skills. The NGO also benefited from the involvement of the students.

The active involvement of Dr Hlalele and Dr Tsotetsi from the Qwaqwa Campus in issues related to community engagement and education led to a joint project with Prof Julia Preece and Dr Desiree Manicom from the University of KwaZulu-Natal (UKZN). The project, a community engagement and service learning action research partnership between the UFS Qwaqwa Campus and the UKZN Pietermaritzburg Campus, compares how two higher education institutions engaged with their neighbourhood learning spaces and environments as a pedagogical resource for student learning. The project, funded by the NRF with additional support from the UFS and UKZN, consisted of 12 case studies involving 65 students, 9 NGOs and 4 schools. In each case students worked in teams in response to community requests for assistance. Projects included running Saturday curriculum activities for schools, workshops for parents, assisting with film making or archiving, assisting with monitoring and evaluation of rural reading clubs, producing small organic gardens and assisting with a child care development project. Project evaluations involved interviews with students and community

*"The partnership benefited from cooperation and flexibility within the team and a strong willingness to deliver targets on time. Further benefits of this collaboration have included the subsequent opportunity to work together with a global organisation called PASCAL through a learning cities network, which is looking at urban-rural relationships. I have very much appreciated the opportunity to work with Dr Hlalele and Dr Tsotetsi. They have been efficient and creative in their efforts to address the research problem, and it has proved very useful to compare findings across two very different geographical environments. It is a partnership that started before the research project itself, and one which I hope will continue beyond the present commitments."*

**Prof Julia Preece**  
Centre for Adult Education,  
University of KwaZulu-Natal

contacts and some interim observations during the project implementation phase.

The case study findings compare the ways in which the students learned and applied their knowledge in community settings. It specifically compares and analyses the two higher education institutions' different organisational strategies for creating community learning spaces, the pedagogical methodologies, and the learning outcomes and experiences for the participating students, and how these are influenced by place (rural and urban) and the effect of social relationships (with NGOs and schools).

**Dr Dipane Hlalele and Dr Cias Tsotetsi**  
School of Education Studies (Qwaqwa Campus)  
hlaleledj@qwa.ufs.ac.za  
tsotetsict@qwa.ufs.ac.za

### PARTNERS

*Dr Dipane Hlalele and Dr Cias Tsotetsi collaborate with scholars from (amongst others)*

Centre for Adult Education, University of KwaZulu-Natal, South Africa // Phuthaditjhaba community, Free State, South Africa // School of Social Sciences, University of KwaZulu-Natal, South Africa //





## Language activism for language justice

Prof Theo du Plessis' goal is to document and analyse language intervention in South Africa in an endeavour to advance language justice. He has built his research agenda on his PhD, in which he introduced the notion of language intervention. Empirical data in this field is important not only to improve our understanding of the overall ecology of language within a specific polity, but also to enhance our understanding of the phenomenon of societal multilingualism. His research agenda has coincided with the establishment of a new language regime in South Africa since the 1990s – one that moved away from the overly prescriptive tradition established under apartheid, but which still essentially implies a hands-on approach to language intervention.

As part of this development, he has actively encouraged community projects. His rationale for this is linked to the concept of the engaged language-planning scholar. This strategy led to the establishment, in collaboration with the University of Antwerp, of a long-term community project with a strong research component, the Multilingual Information Development Programme (MIDP). This project contributes to the cultivation of a language dispensation in South Africa that is fair and that benefits all its inhabitants.

The Province of Antwerp in Flanders has funded the MIDP since 1999. Through this initiative, which operates in three-year cycles, Theo du Plessis succeeded in establishing an international colloquium

series (eventually a symposium series) on the management of multilingualism. To maximise the effect of these events, a peer-reviewed publication series, *Studies in Language Policy in South Africa*, was established in collaboration with Van Schaik Publishers.

The overall aim of the most recent MIDP project, MIDP V (2011–2013), was to help institutionalise the already-functioning multilingualism in the Xhariep area in order to make public life more accessible to ordinary citizens. All phases of the MIDP involve both research and community development components. Within the MIDP V, the community development component focused on training *ad hoc* language practitioners and the establishment of resources for these language practitioners. As part of MIDP V numerous research activities were undertaken in the Xhariep area, including postgraduate studies, publications and an international symposium.

This initiative has entailed wide and extensive collaboration – primarily with colleagues from the University of Antwerp

and University of Ghent, who were partners in developing the whole initiative. The Catholic University of Louvain Campus in Antwerp also joined the fray. Collaboration with the involved communities and relevant governmental authorities has, however, been a cornerstone to the MIDP.

Prof Du Plessis also established the *South African Language Rights Monitor*, a project that documents the language debate in South Africa as it unfolds in public texts (language policy decisions and case law) and public discourse (mainstream printed media and through instruments of language activism such as language complaints and litigation). This project involves collaboration with the International Academy of Linguistic Law in Canada. A related project, in collaboration with researchers from Bar Ilan University and Tel Aviv University in Israel, studies language visibility in the linguistic landscape of South Africa.

**Prof Theo du Plessis**  
Unit for Language Facilitation and Empowerment  
dplessit@ufs.ac.za

### PARTNERS

*Prof Theo du Plessis collaborates with scholars from (amongst others)*

Catholic University of Louvain Campus, Belgium // International Academy of Linguistic Law, Canada // Language Policy Research Centre, Bar Ilan University, Israel // Tel Aviv University, Israel // University of Antwerp, Belgium // University of Ghent, Belgium // University of Pretoria, South Africa //



## Observing small and medium-sized enterprises

**Over the past 20 years several Enterprise Observatories in Europe, Latin America and India have studied the performance of micro, small and medium enterprises in various policy contexts. The purpose of such studies has been to inform policy formulation in order to enhance enterprise growth and thereby job creation.**

The first of its kind in South Africa, the SME Observatory of South Africa, was launched on 3 December 2013. It is a joint project between the UFS, the International Labour Organization (ILO), and the Free State Department of Economic Development, Tourism and Environmental Affairs, institutionally operating in the Centre for Development Support (CDS) of the Faculty of Economic and Management Sciences. The SME Observatory is funded by the Flemish International Co-operation Agency through the ILO and National Treasury,

The objectives of the SME Observatory are, through state-of-the-art research and monitoring of enterprise development, to influence policy making and SME practice in South Africa, and in so doing to foster an enabled environment for private sector growth and job creation. Over and above trend analyses and enterprise architecture, the SME Observatory will, through case study research, focus on topical issues that are matters of concern in the Free State economy.

The prime purpose of the SME Observatory is to present valuable facts and insights about enterprises in the domains it is observing.

To be able to operate on an evidence-based foundation, the SME Observatory will, in the main, build on three 'research production lines', namely (i) enterprise architecture analyses which focus on analysing the correlation between enterprises of various sectors that are found in a locality; (ii) the SME Monitor, which will be based on a comprehensive survey instrument developed with input from the ILO and dti (Department of Trade and Industry); and (iii) topical case studies and an enterprise research agenda.

In the first phase (2013–2014) the Observatory is focusing on towns in the Free State Province. Dr Daan Toerien, research associate at the CDS, and Johannes Wessels, Project Manager of the SME Observatory, compiled the report *50 Towns in the Free State: What the Enterprise Architecture of these Towns is telling us about Entrepreneurial Space*.

The second phase of the project (2014–2016), will be linked to the ILO's project for Sustainable Enterprise Development Facility for Job Creation in South Africa. This phase

"Since 2012 the UFS and the ILO have been collaborating closely on the establishment of an SME Observatory for South Africa. Much like a traditional astronomical observatory observes the movements of planets and stars and their relation to each other over time, the SME Observatory seeks to observe private sector development and the relation between small and medium enterprise to determine their performance and contribution to economic growth and job creation."

**Jens-Dyring Christensen**  
ILO Chief Technical Advisor

will focus on three provinces (the Free State, KwaZulu-Natal and the Eastern Cape), in support of provincial government priorities for job creation through SME development.

**Dr Deidré van Rooyen**  
Centre for Development Support  
griesd@ufs.ac.za

### PARTNERS

*The partners of the SME Observatory are*

Department of Economic Development, Tourism and Environmental Affairs (DETEA), Free State Provincial Government, South Africa // Flemish International Co-operation Agency // International Labour Organization (ILO) // National Treasury, South Africa //



the  
**SME Observatory**  
of South Africa



## What's behind service delivery protest tactics?

Since the dramatic eruption of community protests – also known as service delivery protests – in Diepsloot and Harrismith in September 2004, South Africa has witnessed unrest of significant proportions at the local level. The causes of the protests are varied and complex. Service delivery protests throughout South Africa increased from about 10 in 2004, to more than 100 in 2009 and 2010, and 226 in 2012. The scale of and capacity for violence, devastation and death has escalated, generating concerns about morality and ethics.

In an attempt to understand the context in which service delivery protests emerge, the variety of participatory governance channels and instruments available to citizens to engage in the political and local processes, need to be analysed. While participatory governance is regarded as a tenet of governance thinking in the democratic South Africa, the upsurge in service delivery protest activity is reflective of the extent to which the formal institutional channels for citizen engagement have failed. A counter-argument could be that the protests actually underline the freedom of expression that we enjoy in the post-apartheid era.

Much of the research studies on protests, and service delivery protests in particular, have been single-case oriented, primarily focused on the frequency and nature of the protests, or rely heavily on media reports. Thus the research conducted by Dr Sethulego Matebesi, a member of the Vice-Chancellor's Prestige Scholars' Programme, aimed to gain a better understanding of the underlying forces and dynamics of service delivery protests, and to determine the relationship between individual choices of channels to affect political decisions and the effectiveness of participatory governance structures at local level.

A particular study undertaken by Dr Matebesi and his colleagues aimed to identify why, in spite of a myriad of participatory governance mechanisms, communities manage to mobilise successfully against their local municipalities. In particular the study attempts to answer the following two questions: How are service delivery protests socially constructed and rendered meaningful at a collective level, and what elements of the social fabric enable communities to sustain mobilisation against their local municipalities?

The study is based on qualitative case studies – one in a predominantly white community and the other in a predominantly black community. In the former the organisation was through the Ratepayers Association, and was thus highly structured with clearly

defined leadership. The protests started in 2005 against sewage spillage in the town for seven weeks, resulting in contaminated drinking water. A legal dispute was declared in November 2007 after numerous failed attempts to engage local government. The protest tactic utilised was to withhold municipal rates and taxes, which were instead paid into a trust account to employ workers to clean the town. The outcome of the protest was peaceful.



In the case study of the other community, schools were used as bargaining power. Protests started in May 2012, through the Community Forum and were led by former members of the African National Congress Youth League. The main demand was the resignation of the mayor of the local municipality. The protests were spontaneous and highly fragmented, and there was weak leadership. Initially one high school and two primary schools with a learner population of 2 500 were affected; however the protests later spread to neighbouring towns, ultimately affecting 35 schools and preschools. In this case the demand was to tar the 100 km of road linking the villages. For the first time in the history of South Africa, parents denied their own children access to education in order to gain the attention of the government. Protests became violent and destructive, with forced 'stay-aways'. The Residents' Forum indicated that they had never planned to use a violent strategy, but had exhausted all avenues and levels to engage the government.

In analysing what incentives motivate community groups with a fundamental set of similar grievances to embark on

either violent or peaceful protest, the study found that the structure of the community organisation plays a significant role in the protest tactic. Cohesive, highly structured organisations which are led by professionals, act as a restraint for violence. On the other hand, a poorly-resourced community, with fragmented, weak authority structures, tends to foment violence. The case studies show that social capital based on strong community ties, as well as high levels of intimidation, contributed to successful mobilisation. The protests not only led to reduced revenue for municipalities and undermined the accountability and consultative processes embedded in good governance at local

government level, but hold serious consequences for democracy in South Africa.

Local government is regarded as the sphere of government closest to the people, and unless the current widespread service delivery protests are curtailed, the continued paralysis in its functioning will have severe developmental and human consequences.

**Dr Sethulego Matebesi**  
Department of Sociology  
matebsz@ufs.ac.za

### PARTNERS

*Dr Sethulego Matebesi collaborates with scholars and representatives from (amongst others)*

Communities from affected towns // Rhodes University, South Africa // University of Uppsala, Sweden // University of Queensland, Australia //



## Making sense of employment equity

**The Employment Equity Act of 1998 applies to all employers and workers – it therefore touches all of our lives in one way or another. Soon after the promulgation of the Act, Prof Loot Pretorius and his colleagues Charles Ngwena, Talita Laubscher and Elsabé Klinck embarked on a collaborative project to produce a comprehensive legal commentary on the Act.**

This book, *Employment Equity Law*, was first published by LexisNexis in 2000, and was the first of its kind in the country. Since then 14 annual updates have been published in which all new legal developments and case law are discussed. *Employment Equity Law* is a comprehensive guide to the often controversial field of employment equity. Combining the expertise of constitutional and labour lawyers, it is eminently practical, integrating workplace law and the constitutional equality framework, and details how to apply general principles to

particular workplace practise or policies. It is thus ideal for legal and human resource practitioners and students of labour law.

The book has been quoted with approval in a number of Labour Court judgments, by the Equality Court in *Du Preez v Minister of Justice and Constitutional Development & Others* (012) 23 SALLR 2 (LAC); and most notably by the Constitutional Court in *MEC for Education and Others v Pillay and Others* 2008 (2) BCLR 99 (CC).

This initial collaboration has led to complementary research on affirmative action and disability discrimination.

**Prof Loot Pretorius**  
Department of Constitutional Law and Philosophy of Law  
pretorjl@ufs.ac.za

### PARTNERS

*Prof Loot Pretorius collaborates with colleagues from (amongst others)*

Centre for Human Rights, University of Pretoria, South Africa // Bowman Gilfillan Africa Group, Johannesburg, South Africa // Elsabé Klinck Consulting, Johannesburg, South Africa //



“Dr Le Roux and I are currently examining the endocrine correlates of paternal care in bat-eared foxes as part of her primary research focus on the ultimate and proximate causes of paternal care behaviour. As my research focuses on reproductive function and physiological responses to stressors in predominately mammals, I am very grateful for this ongoing and very fruitful collaboration as it allows us to link the endocrine status of bat-eared foxes to rare behaviour like paternal care or other life-history traits in order to better understand these behavioural patterns and its fitness consequences on either parents or their offspring.”

**Prof André Ganswindt**  
Faculty of Veterinary Science,  
University of Pretoria



## What society can learn from wild mammals

**Dr Aliza le Roux of the Department of Zoology and Entomology on the Qwaqwa Campus, who is also one of the 2013 cohort on the Vice-Chancellor's Prestige Scholars' Programme, has devoted the past decade to researching the cognitive and communicative skills of wild mammals in the arid regions of South Africa and Ethiopia. She is convinced that we have much to learn about ourselves from animals, including those outside the primate order.**

Most recently she has begun to focus on paternal care in an eccentric canid, the bat-eared fox (*Otocyon megalotis*). Whereas most birds are socially monogamous and males contribute extensively to raising offspring, the exact opposite is true for mammals – paternal care occurs in only 5% of extant species. Perhaps because of its rarity we know very little about the reasons why fathers would take care of their offspring instead of pursuing multiple mating opportunities, and even less about the influence that male care will have on the development of young. Unusual for mammals, bat-eared fox males groom, guard, play with, feed, and reportedly teach their offspring about rare prey items. Their influence on pups may thus be distinct from that of the mother, who actively avoids non-suckling interactions with her offspring. Little is known about the physiological stress that foxes face, or how paternal care affects the father, the mother, and the pups.

Even in humans, the true impact of paternal care is poorly understood.

In this project Dr Le Roux investigates the ultimate and proximate causes of paternal care of a wild population of bat-eared foxes. She hopes not only to describe the ecology and physiology of fatherhood, but also how a father's care can affect the cognitive development of his offspring. In addition, the research team is assessing endocrinological fluctuations that accompany paternal care. This interdisciplinary endeavour combines ecology, endocrinology and psychology to cast light on a rare form of behaviour that may be critical to mammalian pair bonds and the monogamous mating system. Collaboration with Prof André Ganswindt of the Endocrine Research Laboratory at the University of Pretoria has been essential to the success of the project.

Fear and stress can significantly impair animals' cognitive functioning. However, our current knowledge of the cognitive consequences of stress and fear is almost exclusively limited to humans and captive animals. In collaboration with Dr Russell Hill of Durham University, Dr Le Roux and Dr Kate Nowak, visiting postdoctoral researcher in the department, are studying the impact of fear on wild primate cognition, in particular the impact of fear on samango monkeys' (*Cercopithecus mitis erythrarcus*) foraging decisions and cognition.

While we know that humans and human infrastructure can alter predator-prey interactions (for example, shielding prey from predators), we rarely investigate the more subtle impacts of human observers on their study subjects. It is especially challenging to examine the 'human shield' effect's influence on foraging behaviour and risk-taking behaviour in habituated animals. The research team investigated this human shield effect in a predator-rich environment, and found that the mere presence of human observers can significantly affect samango monkeys' foraging decisions, particularly near ground level. This study has potentially far-reaching consequences for observational research on wild animals' risk-taking behaviour, and has caused quite a stir in the international media.

**Dr Aliza le Roux**  
Department of Zoology and Entomology  
(Qwaqwa Campus)  
leroux3@qwa.ufs.ac.za

### PARTNERS

*Dr Aliza le Roux collaborates with colleagues from (amongst others)*

Endocrine Research Laboratory, University of Pretoria, South Africa // Durham University, UK //



*"All of our correspondence over the years – hundreds and hundreds of emails – and many meetings have been very professional, but also very agreeable, as they are predicated now on a deep and abiding friendship. Francois is the consummate professional – truly expert in his field, exceptionally hard-working, and unfailingly collegial in his collaborative endeavors. I could not ask for a better colleague!"*

**Prof Steven A Hunt**  
Gordon College

## Even the little people count

***Character Studies in the Fourth Gospel: Narrative Approaches to Seventy Figures in John*** published in 2013 represents the most thorough study of characters and characterisation in the Gospel of John.

Building on several different narrative approaches, the contributors offer 62 essays related to the characters and group characters in John. Among these are detailed studies presenting fresh perspectives on characters who play a major role in the Gospel (Peter, Mary Magdalene, etc), as well as original studies of characters who have never been the focus of narrative analysis before. These are characters who are often glossed over in commentaries as insignificant (for example the boy with the loaves and fish, or the parents of the man born blind). Clearly, characters in John stand in the shadow of the protagonist – Jesus. In this volume, however, even the 'little people' step fully into the light, and it becomes clear how complex and nuanced many of them are.

The compilation of this volume of studies in John began somewhat by chance, when two of the editors met (via e-mail) because

they shared a love for Paul's rhetoric in Galatians; subsequently they also realised that they shared an enjoyment of literary studies related to the Fourth Gospel. So correspondence passed between Steven Hunt of Gordon College, near Boston, Massachusetts, and Francois Tolmie from the University of the Free State, and the idea was born. The team was complete when Ruben Zimmermann from the Johannes Gutenberg University of Mainz in Germany joined the project. They drew up the following purpose statement for the volume before issuing any invitations to contribute: "The purpose of this volume is to offer a comprehensive narrative-critical study of nearly every character Jesus (or, in some cases, only the reader) encounters in the narrative world of the Fourth Gospel. The emphasis is thus on a literary approach to the matter, in particular from the viewpoint of characterization as it is generally understood."

The aim of the project was thus something that has never been done before – to publish a scholarly work on *all* the characters that Jesus encounters in the Gospel of John. In

the end roughly 70 characters (or groups of characters), no matter how major or minor, and whatever their role, have been made the focus of an essay in the book. After drawing up the list of characters in John, the editors compiled a list of scholars to approach for possible contributions. In the end 44 authors from 11 different countries contributed to essays in this volume.

**Prof Francois Tolmie**  
Department of New Testament  
tolmief@ufs.ac.za

### PARTNERS

*Prof Francois Tolmie collaborates with scholars from (amongst others)*

Johannes Gutenberg University, Germany // Gordon College, USA //

working together for

# HEALTH







## Getting the better of vector borne and zoonotic viruses

Unlike the rest of us, Prof Felicity Burt has a passion for ticks and mosquitoes. This passion started during her research on Crimean-Congo haemorrhagic fever for her PhD, and has led to the establishment, under her leadership, of the Vector Borne and Zoonotic Virus Research Group in the Department of Medical Microbiology and Virology at the University of the Free State.

The Research Group focuses on investigating arboviruses and zoonotic viruses of medical significance; it is currently involved in developing serological and molecular assays for application in the detection of arboviruses and vector borne pathogens and investigating host immune responses against Crimean-Congo haemorrhagic fever virus (CCHFV), host virus interactions and evaluation of candidate vaccines for selected medically significant arboviruses

including CCHFV, yellow fever virus (YFV) and West Nile virus (WNV).

Novel and re-emerging viruses are continually being identified worldwide. These viruses are frequently vector borne or zoonotic agents associated with a specific reservoir host in nature and humans are merely accidental hosts. Vector borne viruses, or arboviruses, are transmitted by insect vectors such as mosquitoes, ticks, midges and sandflies. There are over 550 known arboviruses worldwide, including several that cause significant human diseases. Clinically, patients can present with inapparent or mild disease, a febrile illness frequently accompanied by a rash, with encephalitis or, in the most severe form, certain arboviruses are the aetiologic agent of haemorrhagic fever. The occurrence of the tick-borne

zoonosis, CCHFV, is well-established in southern Africa. Similarly, the mosquito-borne viruses Rift Valley fever (RVF), White Nile, Wesselsbron, and Sindbis are known to cause sporadic outbreaks annually with larger outbreaks frequently associated with heavy rainfall favouring vector breeding. However, in addition to the more commonly known arboviruses in this country, there is serological and/or virological evidence supporting the presence of lesser-known arboviruses. The medical significance of some of these viruses has not been established and the absence of awareness, specific diagnostic capacity as well as the potential for serological cross-reactivity among related viruses may lead to misdiagnosis.

The One Health concept acknowledges the interdependence and links between human health and animal health and encourages interaction between different disciplines to advance human health and animal health and determine the role of the environment. Several arboviruses causing disease in domestic animals are also zoonoses, such as RVF virus and WNV. In addition, livestock



and wild mammals have been implicated as the reservoir hosts for many emerging viruses with direct or indirect transmission to humans via an intermediate host or vector or via aerosolisation of excreta. For example, hantaviruses and arenaviruses are rodent-borne viruses transmitted to humans via aerosol transmission from excreta and some are known to be significant human pathogens in various parts of the world. Medically significant arenaviruses have been identified in Africa. To date, no medically significant hantavirus has been identified in Africa despite the presence of suitable rodent hosts. Molecular, virological and serological evidence of novel hantaviruses in West Africa, suggests the potential exists for other hantaviruses to be circulating on the continent.

In addition to developing assays for detection of existing and novel viruses, the Research Group investigates host-pathogen interactions and immune correlates of protection that will contribute to the development of novel anti-virals and candidate vaccines. Studies primarily focus on CCHFV. It is not clear how CCHFV causes severe disease in some patients leading to fatalities, while other patients survive infection, and it is not known what facilitates clearance of the virus in survivors. The Research Group investigates medically significant vector borne and zoonotic viruses to define associations between these viruses and diseases, to increase awareness of these pathogens and to further our understanding of host immune responses to facilitate development of novel treatments or vaccines.

The reasons for emergence are likely multi-factorial and include global warming with changes in weather patterns that influence vector populations, increased animal movement as a result of livestock

trade, as well as human activities such as changes in farming practices and land development. The seasonal patterns of vectors are influenced by temperature, and warmer climates are conducive to increased vector populations and activity with increased risk of transmission. Similarly warmer temperatures likely favour breeding of rodent populations and increased contact with people due to changes in agricultural practice and development. Viral recombination and mutation can contribute to spread with changes and adaptation to new vector species and changes in virulence. With the emergence and re-emergence of arboviral and zoonotic diseases worldwide there is an increased need to raise awareness in South Africa of these pathogens that have potential to cause serious illnesses.

Dr Nico Avenant of the National Museum is a long-standing collaborator of Burt's, and provides information and samples relating to the hosts as well as environmental factors that may or may not influence results. He considers her "one of those absolutely thorough people, completely dedicated to her work and endeavours to cultivate the same ethos in her students".

**Prof Felicity Burt**  
Department of Medical Microbiology and Virology  
burtfj@ufs.ac.za

### PARTNERS

*Prof Felicity Burt collaborates with colleagues from (amongst others)*

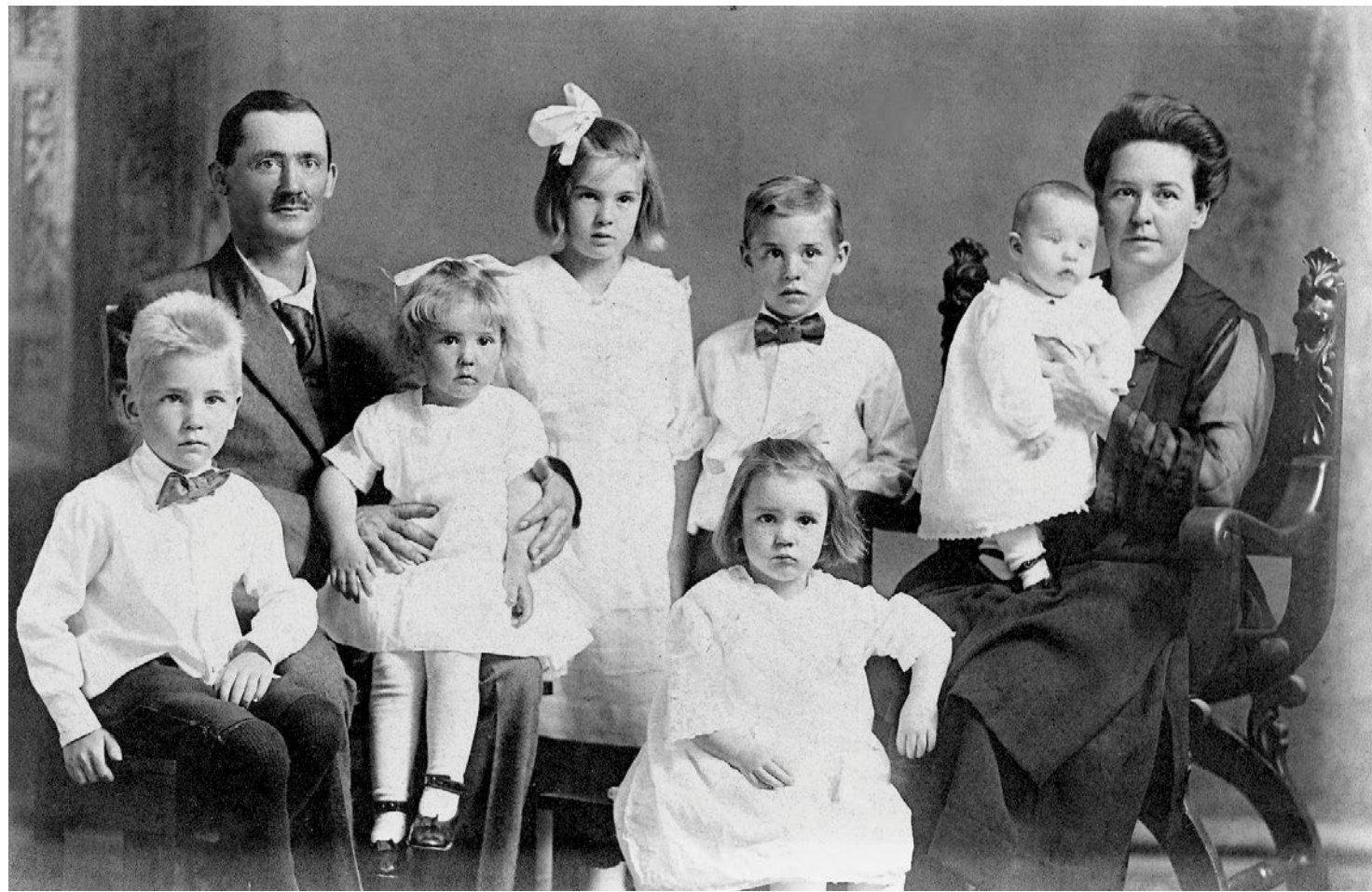
National Institute of Communicable Diseases, South Africa // National Museum, Bloemfontein, South Africa // University of North Carolina, USA //

"I have been fortunate to collaborate with Felicity Burt for the past several years. She has extensive experience working with and diagnosing emerging pathogens such as Rift Valley fever virus, Crimean Congo Hemorrhagic fever virus, and West Nile virus. This experience, combined with her outstanding virology skills, has allowed her to effectively translate basic science observations from our research teams toward the early stage development of new vaccines or diagnostics against a number of significant human and agricultural pathogens."

**Prof Mark Heise**  
School of Medicine,  
University of North Carolina







"It has been a pleasure to work with Dr Van der Merwe over the past several years. This collaboration has thus far resulted in a publication in *Clinical Genetics*, and we are currently working on a second manuscript. I am particularly interested in exploring founder mutations from around the world, and Dr Van der Merwe has provided me with a unique opportunity to explore my interests via her extensive collection of blood samples from different South African populations. I hope we can continue to work together."

Prof William Foulkes  
McGill University

## Familial breast cancer in the rainbow nation

**In this study we unfortunately have to use historical 'racialized' categories to articulate the scientific endeavour. South Africa's people have diverse origins, and include unique groups of people that have been racialized and categorised as African, Indian, White and Coloured.**

Breast cancer (BC) has become the leading type of cancer among South African women, with the lifetime risk varying for each population group – from 1 in 13 for white women to 1 in 59 for black women. Breast cancer rates and the median age of onset differ for each of these groups. Although BC is less common in 'Black' women compared to their 'White' counterparts, it strikes at an earlier age and has a higher mortality rate. It is also a known fact that the incidence of BC is increasing in sub-Saharan Africa, and that the incidence rate in urban areas is considered to be twice that of rural areas. For many years, genetic testing for familial BC within South Africa was limited to two 'White' groups: the Ashkenazi Jewish and the Afrikaner populations. This was due to the presence of recurrent founder mutations within these groups. The majority of South African citizens therefore did not have access to diagnostic testing for familial BC. There

was a lack of basic research information regarding the types of mutations present within the familial BC genes BRCA1 and BRCA2 for the majority of South Africa's population.

Dr Nerina van der Merwe, together with a colleague from the University of Pretoria, Prof L van Rensburg, initiated research on familial BC in South Africa some 15 years ago. Their work resulted in the identification of three major founder mutations present within the Afrikaner population. Genotype and genealogical analyses indicated common European ancestors for each of the three founder mutations. Collectively these founder mutations account for approximately 92% of all BRCA mutation in Afrikaner families. On comparing families carrying identical mutations, a difference in penetrance of the mutation was observed, and Dr van der Merwe started investigating known polymorphisms in other low penetrance genes as potential modifiers of cancer risk. This initial research project developed into a comprehensive diagnostic service for Afrikaner families.

Through most populations across the world, including South Africa, have mixed ancestry, a case is made scientifically for sensitively

dealing with population descriptors. When the study was expanded to 'Coloureds' in the Western Cape, it revealed the presence of some of the Afrikaner founder mutations, as well as the presence of the first non-Afrikaner founder mutation, together with two other recurrent mutations. These results contributed to the initiation of a diagnostic test for this group.

The National Health Laboratory Service at the UFS also became the testing centre for patients of Indian descent. These patients were screened in a tiered fashion, resulting in the identification of various unique mutations specific to this group. This phase of the research also resulted in the compilation of a population-specific diagnostic testing protocol that is currently utilised.

Data collected from Black patients resulted in the identification of novel disease-causing mutations. No recurrent mutations have been detected yet, which complicates diagnostic testing. This phase of the research is still underway.

The main focus of Dr van der Merwe's research on familial BC has involved screening for mutations within the genes BRCA1 and BRCA2. As only 10–30% of

the inherited component of BC can be explained by mutations within these two high-risk genes, other high-to-moderate penetrance gene variants have come to the fore as contributors to the hereditary BC risk. These genes have been shown to have rare, high-to-moderate risk BC associated variants, but have mainly been studied in European populations such as the Slavic, Canadians, Dutch, Finnish, etc. The next stage of the research to be undertaken by Dr van der Merwe and her colleagues (nationally and abroad) will focus on determining whether these additional hereditary genes might play a global role, by gathering data from diverse South African populations.

**Dr Nerina van der Merwe**  
Division of Human Genetics and National Health  
Laboratory Service  
vandermerwenc@ufs.ac.za

### PARTNERS

*Dr Nerina van der Merwe collaborates with colleagues from (amongst others)*

McGill University, Canada // NN Petrov  
Institute of Oncology, Russia // National Health  
Laboratory Services/University of Cape Town,  
South Africa // Nelson Mandela School of  
Medicine, University of KwaZulu-Natal, South  
Africa // PathCare Laboratories, Cape Town,  
South Africa // University of Stellenbosch/  
Tygerberg Hospital, South Africa //





## Striving for drug safety using traditional medicines

Cytochrome-P450 (CYP450) are enzymes mainly found in the liver, from where they are responsible for the metabolism of many drugs. As such, variations in the activity of these enzymes, for whatever cause, are major determinants of inter-individual differences in drug response and toxicity. Such variations may be due to drug-drug interactions or inherited abnormalities leading to poor and faster enzyme activity. Furthermore, CYP450 has also been implicated in paracetamol, isoniazid and nevirapine-induced hepatotoxicity, which has hampered the use of these essential drugs in many people who need them. Regarding the latter, the drug-transporters and the immune system have been implicated in CYP450 mediated drug toxicity. Therefore, a thorough knowledge of the factors that influence CYP450 activity, as well as the mechanism of CYP450 mediated drug toxicity, are required to ensure safer use of drugs as well as the development of new drugs.

The research programme headed by Prof Andrew Walubo focuses on a search for variations in Cytochrome-P450 enzymes and their role in inter-individual differences in drug response and toxicity. Within a range of themes, the programme has always maintained a strong emphasis on drugs that are useful to the majority of developing countries. The Medical Research Council (MRC) has been one of the primary collaborators in the research, particularly with regard to promoting the safety of traditional medicines.

Within the theme 'CYP450 and drug development', a project on screening

six traditional medicines in development for potential interactions with major CYP450 drug metabolising enzymes was undertaken, together with the MRC. This project aimed to predict potential CYP450 mediated drug interactions so that early warnings and appropriate prescribing guidelines for these herbal products are developed before they are marketed.

Other research is focusing on evaluating traditional medicines as 'immune boosters' – particularly for HIV patients. There are many natural products and synthetic drugs that are purported to be immune boosters or stimulants, and some of these have been used or tested for boosting the immune system in viral illness, cancer therapy, etc. Unfortunately, most of these products have not attracted wide clinical application owing to insufficient information on efficacy, specifically the lack of evidence of action against the purported indications.

Characteristically, most immune stimulants are tried on every illness without a scientific basis. Understanding the mechanism of the action of immune stimulants enables determination of the most appropriate indications for each product, appropriate time or stage of intervention, and setting specific parameters by which to monitor response. Unfortunately, there is no test or animal model by which to determine all these propositions. The current immunology tests do not predict a clinical response, while animal disease models are not available or easy to develop. Even then, for products that have been tested in the clinical studies, the difficulties in standardising (or defining)

the immune status (or stage of the disease) at which the product is effective, have made these clinical evaluations inconclusive.

Furthermore, because the most appropriate immune booster should not affect a normal immune system, immunology tests using normal physiological systems would not be appropriate. Tests using isolated systems or cells would also not be appropriate because the immune system is a complex one that exhibits activation and counter (or control) responses which do not happen in isolated systems/cells. In addition, because of their crude nature, testing of traditional medicines for immune modulation cannot be done on isolated systems. Therefore, a living system or animal model remains the best test-system for immune modulation testing. Research being undertaken by Makhotso Lekhooa will develop a rat animal model by which to screen products for immune modulation. The model will be tested by comparing 'phela', a traditional medicine with a known immune stimulant (levamisole) on animals whose immune system has been suppressed by different immunosuppressive drugs. This information will be correlated with results of a clinical study on HIV patients.

In a related study, Emily Binyane is studying the effect of 'phela' on some drug transporters in the gastrointestinal tract. The discovery of membrane drug transporters has led to renewed interest in, among others, the mechanisms of drug absorption, because several drugs that had poor bio-availability were found to be absorbed and/or secreted by membrane-bound drug transporters. It has been established that drug transporters

are an important factor in the bio-availability of some drugs, hence a source of drug interactions, whereby saturation or inhibition of influx transporters leads to decreased drug absorption, while inhibition of the efflux transporters leads to increased drug absorption and concentration due to reduced drug loss from the absorbing cell.

This research project will screen the traditional medicine 'phela' for potential interaction with four major drug transporters involved in drug absorption. It will establish the effect of 'phela' on the respective drug transporters and the implication to other drugs transported by these transporters, as well as develop a model for screening of traditional medicines for potential interaction with drug absorption transporters.

Under the theme 'CYP450 and drug toxicity', CYP450 mediated mechanisms of drug toxicity were studied in order to

develop safer treatment approaches, as well as diagnostic and preventive tests for drug toxicity. One such project was done on paracetamol, one of the most widely used analgesics in the world. Paracetamol overdose is common and is an emergency owing to the severe hepatotoxicity that can occur if therapy is not instituted in time.

The current mode of therapy has several drawbacks, and does not stop the toxic reactions; as a result many clinicians do not favour it. A treatment that stops metabolic activation of paracetamol is the most appropriate, and the research team used CYP450 enzyme inhibitors and successfully prevented paracetamol-induced hepatotoxicity after overdose in a rat model.

Rafuoe Baleni is screening plant extracts of grapefruit juice and watercress – plants known to contain enzyme inhibitors – for prevention of paracetamol induced

hepatotoxicity by enzyme inhibition. It is hoped that this will result in making paracetamol tablets laced with a small sub-therapeutic dose of enzyme inhibitor, so that when normal doses of paracetamol are used, the enzymes are not inhibited, but when many tablets are taken as in an overdose, the concentration of enzyme inhibitor is increased to effective levels.

**Prof Andrew Walubo**  
Department of Pharmacology  
waluboa@ufs.ac.za

### PARTNERS

*Prof Andrew Walubo collaborates with colleagues from (amongst others)*

Medical Research Council, South Africa //

## The fight against an AIDS-defining illness

**Fungi, which are a lower order of eukaryotic organisms, are essential for sustaining human life – in their application in the preparation of food and as sources of pharmacological agents. Paradoxically, this group of organisms can also act as agents that mediate infectious processes that may end life in susceptible hosts. Moreover, immunosuppressive conditions such as AIDS have led to a marked increase in host vulnerability to fungal diseases. As a result, the fungal species *Cryptococcus neoformans* has now emerged as an important disease-causing microorganism. To illustrate this point, the Center for Disease Control estimates that well over one million cases of cryptococcal infections are reported annually, with over a third of cases being recorded in sub-Saharan Africa. There is thus increased interest in understanding the patho-biology of this organism.**

Dr Olihile Sebolai's research is centred on this pathogen which causes a deadly AIDS-defining inflammatory condition of the brain. His research group is concerned with elucidating the role of lipids (3-hydroxy fatty acids) in the patho-biology of this organism, primarily focusing on showing if these lipid-based molecules influence host-to-pathogen interactions in favour of the pathogen, leading to a diseased-state in susceptible hosts. Such intimate knowledge may reveal strategies for identifying potential drug targets.

The high burden of HIV in South Africa, where just over five million people are estimated to be living with HIV and AIDS, has made this pathogen a serious public health concern, and highlights the significance of the work being done by Dr Sebolai. With no prospect of cryptococcal treatment in HIV-infected individuals, life expectancy is probably less than a month. To compound this, the use of conventional drugs in the management of

cryptococcal infections is often characterised by clinical failure, particularly in persons who are immunocompromised. Therefore, there is a constant need to find alternative effective and low cost drugs.

Dr Sebolai was selected to the Vice-Chancellor's Prestige Scholars' Programme (PSP) in 2011. As part of the programme, in 2013 he spent six months as a research fellow at the University of Birmingham, working with Professor Robin May, Lister Reader and Chair of Infectious Diseases. He was also able to pursue his research interest working with Prof Alex Idnurm at the University of Missouri-Kansas City, as a Fulbright Scholar from August to December 2013. During this time,

Dr Sebolai worked on developing new lines of research and learned new techniques pertinent to these lines.

For Olihile this exposure was extremely valuable in terms of seeing and experiencing other perspectives and research cultures. "If we stay isolated, we only know how things are done at home. This gives us tunnel vision which can only be challenged by working with people from other laboratories." He sees added value in being able to build partnerships, tap into networks and develop potential collaborations.

**Dr Olihile Sebolai**  
Department of Microbial, Biochemical and Food Biotechnology  
sebolaiom@ufs.ac.za



*Dr Olihile Sebolai, Ms Adempem Ogundeji, and Mr Bonang Mochochoko from the UFS and Prof Bongani Ndimba of the University of the Western Cape with the MALDI ToF-MS (UltrafleXtreme™) used in the research.*

### PARTNERS

*Dr Olihile Sebolai collaborates with colleagues from (amongst others)*

University of Birmingham, UK // University of Missouri-Kansas City, USA // University of the Western Cape, South Africa //





## Fighting tuberculosis and HIV

Established at the UFS in 1993, the Centre for Health Systems Research & Development (CHSR&D) was founded specifically to address the need for social scientific and operational research and related skills in the field of health and health care. Their research focuses on application, implementation and intervention, and is therefore always conducted in close collaboration with partners in the real and practical worlds. Their research and development initiatives rest heavily on collaboration with numerous partners inside and outside the UFS. This is especially true of a number of research projects that address tuberculosis (TB) prevention and control, and TB and human immunodeficiency virus (HIV) programme integration.

South Africa is second only to Swaziland with the highest per capita TB incidence in the world. With a peak of only 79% in 2011 against a target of 85%, treatment success in this country has been suboptimal for more than two decades and in the opinion of Prof Christo Heunis, Director of the CHSR&D, “TB patients are at the bottom of the food chain when it comes to health care in South Africa.”

In 2013, the CHSR&D completed the Operational Research Assistance Project in collaboration with the Desmond Tutu TB Centre (DTTC) at Stellenbosch University and the Free State Department of Health

(FSDoH). This was the fourth year of a series of university-government partnerships established as the basis for a programme of TB operational research development and implementation. The goal was to build the operational research skills of South African healthcare professionals at local, provincial, and national levels while carrying out TB-related operations research in each province.

In the Free State the CHSR&D partnered with the provincial TB Management and the Health Information, Research and Training Directorates of the FSDoH to examine the factors that contribute to a high two-month smear non-conversion rate among treated new smear-positive TB patients. The study firstly sought to determine these factors in the population of new sputum smear-positive TB patients in the Free State, and secondly examined gender-specific trends in two-month sputum smear non-conversion.

A retrospective record review was conducted on routine administrative data to compare sputum smear converting and non-converting patients in respect of a number of independent variables. This entailed an analysis of the data for the entire population of new smear-positive patients in the provincial TB database from January 2003 to December 2009. It was established that during this seven-year period the

overall two-month sputum smear non-conversion rate was 12.5% in males and 9.3% in females. However, by 2009, males had 60.0% higher risk of non-conversion than females. Given the importance of two-month sputum conversion as an indicator of TB programme performance, this male-female differential is of concern. These findings suggest that the TB DOTS programme in the Free State needs to pay closer attention and provide better support to male TB patients to adhere to treatment.

Funding for the research was received from TREAT TB and the International Union Against Tuberculosis and Lung Disease (IUTLD), and the United States Agency for International Development (USAID) through the DTTC.

In a project funded by the Canadian Institutes of Health Research (CIHR) through the University of British Columbia (UBC), a multi-partner team of 23 researchers is implementing and evaluating a workplace TB and HIV prevention and treatment programme for healthcare workers. This initiative developed out of findings from a series of research projects on occupational health and safety conducted over several years by the CHSR&D in partnership with the Global Health Research Programme at UBC, and the FSDoH. It investigates the health of healthcare workers. More specifically, a randomised controlled trial aims to determine if a combined workforce and



workplace intervention can improve health outcomes of these workers and strengthen occupational health and infection control services in Free State hospitals.

This pragmatic, cluster-randomised controlled trial is being conducted at 27 public hospitals in the Free State. All hospitals will receive bi-annual workplace infection control assessments as well as workplace follow-ups when staff members are diagnosed with active TB. All hospitals also provide access to voluntary and confidential TB screening and testing as well as HIV counselling and testing, TB prophylaxis for HIV-positive staff and TB treatment. Staff at intervention sites also have access to HIV treatment at the occupational health unit. In intervention hospitals, staff will conduct workplace assessments quarterly. The research team will monitor these reports and assist staff in implementing recommended infection control improvements.

In preparation for the trial, 40 occupational health nurses were trained in the management of primary conditions including TB and HIV as well as in diagnosis, management, classification and registration of TB cases. As a result of this training, the nurses from the 27 occupational health units were authorised by their Chief Medical Officers to provide TB treatment to staff members. The 15 nurses from the intervention units were authorised

to provide HIV treatment including antiretroviral treatment for staff from their hospitals. Furthermore, the research team has been assisting the FSDoH in the process of updating provincial policies on TB infection control, which will include the workplace assessments.

A baseline facility assessment was undertaken at all 27 occupational health units investigating the available human, infrastructural and equipment resources, as well as the services provided. Identified problems at some of the units included insufficient human resources and a lack of basic equipment. Standard TB and HIV care was not always offered at all units, and in some cases there was a lack of confidentiality at the units, as well as the presence of HIV stigma in the workplace. Furthermore, a questionnaire was developed to measure HIV and TB stigma

“Addressing complex global health challenges requires a special set of research skills reflecting not only rigorous attention to methodological details, but appreciation for the need for iterative qualitative and quantitative data gathering to address new issues as they arise. And it requires commitment to contribute to world knowledge, build capacity, inform decision-making and raise awareness, all the while ensuring that contributions of all members of an international interdisciplinary multi-stakeholder team are valued. It has been a real pleasure working with Dr Michelle Engelbrecht, who exemplifies a global health researcher committed to improving health of health workers in South Africa and beyond.”

**Prof Annalee Yassi**  
University of British Columbia

among healthcare workers. It was piloted in one large Free State hospital, which is not part of the trial. Two hundred and twenty questionnaires were completed by a sample of healthcare workers broadly representative of all staff categories.

**Prof Christo Heunis**  
Centre for Health Systems Research & Development  
heunisj@ufs.ac.za

**Dr Michelle Engelbrecht**  
Centre for Health Systems Research & Development  
engelmc@ufs.ac.za

### PARTNERS

*Prof Christo Heunis collaborates with scholars and representatives from (amongst others)*

American International Health Alliance, USA // Desmond Tutu TB Centre, Stellenbosch University, South Africa // Free State Department of Health, South Africa // The Urban Institute, USA //

*Dr Michelle Engelbrecht collaborates with scholars and representatives from (amongst others)*

Free State Department of Health, South Africa // National Institute of Occupational Health, South Africa // University of British Columbia, Canada //





“In this scientific exchange project funded by the EC, the South African partners from the UFS have contributed essentially to this project. More than 150 South African plant species have been investigated systematically to assess the potential cardiotoxic risk of commonly consumed botanicals and supplements. The South African group actively participates in and contributes to this EU project, which is invaluable for the overall aim of the consortium.”

Prof Judith Rollinger  
University of Innsbruck

explanatory models during the subsequent help-seeking steps.

These collaborative research projects have also been of benefit to the postgraduate students involved in them. A number of students have been seconded to top European universities and research groups in Vienna, Basel, Innsbruck, and Athens. Two students who have benefited from this opportunity are Khanya Phungula, a Master's student who was seconded to the University of Vienna for four months, and Kun Du who spent six months at the University of Basel.

Prof Jan van der Westhuizen  
Department of Chemistry  
vdwestjh@ufs.ac.za

Dr Susan Bonnet  
Department of Chemistry  
bonnetsl@ufs.ac.za

Dr Anke Wilhelm  
Department of Chemistry  
wilhelma@ufs.ac.za

# Phytomedicines from African traditional medicines

Researchers from the UFS Department of Chemistry are involved in a number of international projects which investigate traditional medicines and herbal remedies.

One of these is the hERG related risk assessment of botanicals (hERGscreen), an international project funded under the European Union (EU) 7<sup>th</sup> Framework Programme. Prof Judith Maria Rollinger of the University of Innsbruck leads the project.

This innovative project aims at identifying hERG (human Ether-à-go-go Related Gene) channel blockers in commonly consumed botanicals and supplements. Blocking these ion channels may result in ventricular tachyarrhythmia and an increased incidence of sudden death. Thus the hERG channel is considered to be an important antitarget. Several drugs have been removed from the market for this reason, and compounds have been blocked from proceeding to the

clinical development phase. As botanicals (comprising dietary supplements, spices, and herbal medicinal products) continue to increase in popularity, there is an urgent need for studies aimed at critically assessing the potential cardiotoxic risks of these products.

State-of-the-art methodologies and techniques are incorporated for target-oriented identification and isolation of hERG channel blocking constituents. Pharmacokinetics and pharmacodynamics studies are performed and LC-MS based methods developed and applied for the measurement of bioactive components in biofluid samples. Comparison of biofluids derived from administration of single chemical entities and corresponding botanicals is achieved using MS- and NMR-based metabolomics.

The UFS team, under the leadership of Professor Jan van der Westhuizen,

is responsible for the plant selection component of the project. This entails a preliminary selection of botanicals with high consumer relevance (herbal remedies, foodstuffs, nutritional supplements, spices) with potentially harmful effects with respect to the hERG channel. Emphasis is placed on botanicals available in and originating from the participating countries (South Africa, South America, and the Mediterranean area). The researchers (Prof Jan van der Westhuizen, Dr Susan Bonnet and Dr Anke Wilhelm) also contribute to the research on extraction, isolation and identification, as well as bioanalysis.

In another EU 7<sup>th</sup> PF project, the UFS is one of the partners in the 'Multi-disciplinary University Traditional Health Initiative (MUTHI): Building Sustainable Research Capacity on Plants for Better Public Health in Africa'. The project is led by Professor Berit Smestad Paulsen from the University of Oslo.

The World Health Organization (WHO) has recognised the role of traditional medicine and its practitioners in primary health care as important for obtaining better health for the African population. In most African countries, so-called western medicines are scarce and expensive, and the population generally uses herbal remedies for treating ailments. Several of the remedies used have never undergone any quality control, neither on the chemical/biological side, nor on the possible toxicological problems some of these plant products may give rise to. The overall objective of this project, therefore, is to create sustainable research capacity and research networks in Africa (Mali, South Africa and Uganda). The partner research institutions from Africa are implementing research methodologies so that they are able to improve traditional medicines, identify bioactive compounds, and clinically evaluate and register medicinal products that are used for treatment of illnesses that frequently occur in African countries.

The UFS research is focused on the bioactivity and safety of phytomedicines. To this end the researchers will conduct an assessment of training needs of local researchers to identify their needs and required expertise in the domains of medical anthropology, local knowledge systems

and local perceptions of the healers and the local population. In addition, the research team will conduct an ethnopharmacological study among healers and the population in order to elicit local perceptions of the interaction between etiologic factors of diseases such as HIV and AIDS, malaria and TB, amongst others, and the relevant phyto-remedies that are used in the prevention and management of these illnesses. They will be able to identify one of the major diseases that are locally relevant (either an infectious disease, a non-communicable disease or a neglected disease) and conduct a retrospective treatment outcome study to identify treatment and help-seeking strategies and the modification of

## PARTNERS

The collaborators in these projects include scholars from hERGscreen project:

Biomedical Research Foundation of the Academy of Athens, Greece // National and Kapodistrian University of Athens, Greece // Universidade Federal de Santa Catarina, Brazil // Universidade Federal do Rio Grande do Sul, Brazil // University of Basel, Switzerland // University of Florida, USA // University of Innsbruck, Austria // University of Vienna, Austria //

## MUTHI project:

Makerere University, Uganda // University of Amsterdam, The Netherlands // University of Bamako, Mali // University of Bergen, Norway // University of Oslo, Norway // University of Oxford, UK // University of the Western Cape, South Africa //





*"Your interest in researching some of the factors that we view as barriers to learning, early identification thereof and an intervention program is highly commendable and we are looking forward in engaging with your findings."*

**Mr RS Molope**  
Free State Department of Education

## New horizons for children with DCD

Development coordination disorder (DCD) can be defined as a marked impairment in the development of motor coordination that is not explicable in terms of general intellectual retardation or of any specific congenital or acquired neurological disorder. Children with DCD experience significant difficulties in motor learning and in the performance of functional motor tasks that are necessary in their daily activities at home (dressing and using various tools), normal play (riding a bike, running, swimming and ball games), and in school (writing and cutting activities). Secondary problems associated with DCD are related to physical health (such as obesity and lower aerobic levels due to lower activity levels), social, emotional and academic problems. Other co-recurring problems which can be linked to DCD are attention deficit hyperactivity disorder (ADHD), speech and language disorders, and visual-motor deficits.

DCD affects five to six percent of school-age children, and the literature indicates that boys experience more problems than girls. Although children diagnosed with DCD have certain difficulties of a motor-related nature, the children are a heterogenic group, with no two children being the same. Children diagnosed with DCD might have common symptoms, but the degree of motor difficulties varies, as well as from child to child.

Although children will not 'outgrow' the disorder as previously believed, they can be helped through correct assessment and intervention programmes. However,

although researchers have shown an increased interest in DCD, this disorder is not fully understood and many questions remain – such as the aetiology of the disorder, suitable screening tools for early identification, and appropriate intervention approaches. It is speculated that DCD is under-diagnosed, and early diagnosis is important for optimal outcomes for children. Interventions are not only important to improve current motor abilities and quality of life, but also to prevent the development of secondary impairments associated with DCD.

The research undertaken by Monique de Milander aimed to determine how many children in grade 1 in Bloemfontein suffer from DCD, and to investigate the impact of the disorder on children's school performance. In addition the role that parents and teachers could play in the early identification of possible coordination problems was addressed.

Data was collected through the participation of parents and teachers, by means of questionnaires, and kinderkineticists, who determined each child's motor abilities using a standardised measuring instrument. All children participating in the research project received an intervention programme

to improve potential developmental delays. Complete feedback was provided to parents regarding their child's motor skills and school readiness.

In an associated project, screening tools used to identify DCD were researched to determine the level of agreement between identifying motor difficulties with the Movement Assessment Battery for Children – Second Edition (MABC-2) performance test, when completed by parents on the one hand, and teachers on the other. The findings indicated conflicting results, and further research and development is thus required to determine what screening test is best and/or whether both parents and teachers need to participate.

In other associated projects which all aim to improve the quality of life of children with DCD, the influence of prenatal factors is being studied, as well as dominant preference and school readiness; sport stacking intervention for children with DCD and ADHD amongst grade 1 learners; visual motor control and learning related skills in boys and girls.

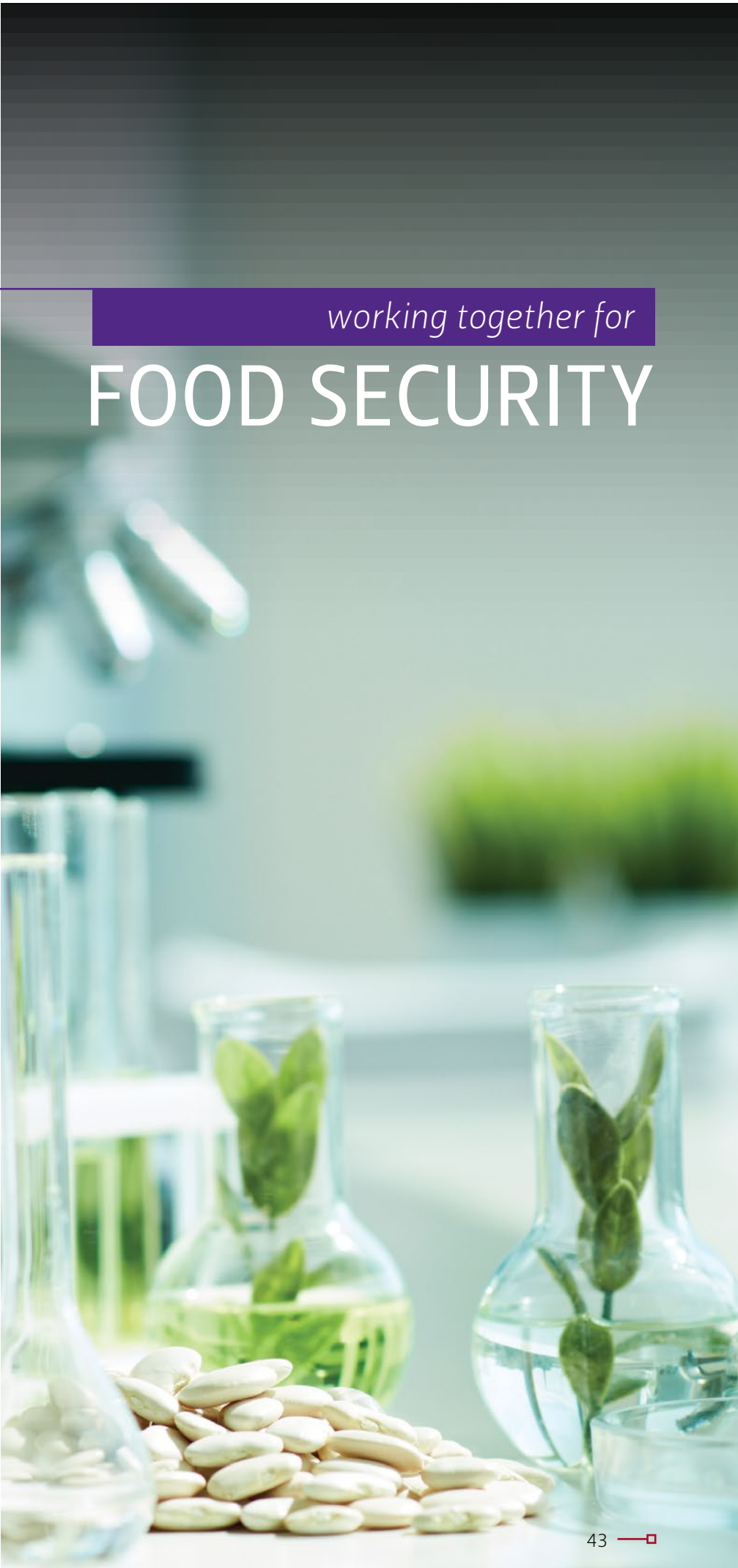
**Monique de Milander**  
Department of Exercise and Sport Sciences  
[demilander@ufs.ac.za](mailto:demilander@ufs.ac.za)

### PARTNERS

*Monique de Milander collaborates with (amongst others)*

Eunice Primary School, Bloemfontein, South Africa // Department of Education, Free State Provincial Government, South Africa // Jim Fouché Primary School, Bloemfontein, South Africa // Universitas Primêre Skool, Bloemfontein, South Africa //

## working together for FOOD SECURITY







## African agricultural systems

Sharing the vision to address the needs of African agricultural systems, biodiversity, ecosystem conservation, and improvement of African food security, the Norman Borlaug Institute for International Agriculture and Texas A&M AgriLife Research have set up a research programme in the Limpopo Province. Four specific focus groups focusing on horticulture, cowpea, sorghum, and agricultural engineering are currently conducting their research in the region. Four South African institutions are involved in this multi-national initiative – the University of the Free State, University of Limpopo, University of Pretoria, and Tshwane University of Technology.

Prof Neal McLaren and his team are involved in both the Cowpea and Sorghum Focus Groups. The Cowpea Focus Group has been extended to also include dry bean and soybean. In 2013 national cultivar trials for the respective crops, received from the ARC-Grain Crops Institute were planted in

Limpopo and severe wilting and plant death was recorded due to infection by *Sclerotium rolfsii*. Although disease incidence in cultivars differed significantly, all cultivars proved highly susceptible to the disease. Although *Sclerotium rolfsii* was recorded in soybeans, wilting was not as severe as in dry beans but reduced vigour was evident in most plots. Disease was significantly more severe in control plots compared to nematicide-treated plots.

Plants of the two crops were collected from the regional farming system and organisms associated with a range of leaf lesions were isolated with the aim of determining their pathogenic potential. These are being subjected to DNA sequencing and pathogenicity studies.

The Sorghum Focus Group has focused on sorghum production and end-use product development for increased food security. To date the primary research activities

were conducted through the postgraduate research of Danelle van Rooyen and Lisa Coetzee.

Danelle van Rooyen is researching the relationship between sorghum plant and grain characteristics, colonisation by mycotoxigenic *Fusarium* spp. and mycotoxin levels. Twenty-two sorghum lines representing the range of grain and plant characteristics were evaluated in multi-location trials. Grain samples were subjected to ergosterol analysis to determine general fungal colonisation while Real Time Quantitative PCR was used for the quantification of *Fusarium* spp., and in particular *Fusarium graminearum*. The relationship between fungal colonisation and grain PR-proteins and phenolic substances is being quantified. A significant negative relationship was recorded with grain phenolic substances and grain colonisation. The stability of the relationships is affected by environmental



“There are constraints inherent to international collaborations, such as time differences, export controls, and differing farm practices. Prof McLaren put in a tremendous amount of effort to ensure the success of the project. His most important contribution is his expertise in farming in South Africa and he is a world-class pathologist; he has had much to teach the project team members, and the graduate students and other personnel who are working with us on the project. Without the collaboration with Neal McLaren, the pulse cropping project would not have been as successful as it has been.”

Prof Jamie Foster  
Texas AgriLife Research

factors, which determine the expression of the anti-fungal effects, grain colonisation and mycotoxin levels.

Van Rooyen is also studying the effect of farming systems on colonisation of sorghum roots by *Fusarium* spp. and the potential of these toxigenic species to translocate mycotoxins to grain. Specific attention is being paid to *F. graminearum*, *F. verticillioides* and *F. thapsinum*. These systems include a range of on-going crop rotation permutations with cowpea, soybean and dry beans. Rotation effects on soil macro- and trace elements as well as pH and acid saturation have been monitored. Root mass increased significantly in cowpea systems, as did grain yield, but no effect on root rot severity was observed.

Lisa Coetzee's research involves the development of a weather based risk prediction model for the colonisation of sorghum grain by the *Fusarium graminearum* species complex and concomitant mycotoxin production. Field trials using nine commercial cultivars were planted at multiple locations and grain mold x weather relationships were evaluated using visual field disease ratings, ergosterol and real time quantitative PCR to determine species specific internal fungal biomass. Cultivars differed in their responses to grain molds and significant genotype x environment interactions were recorded that also affected the levels of mycotoxins recorded at the locations. The effect of grain decortication on the removal of mycotoxigenic fungi from grain and

subsequent mycotoxin levels was also investigated in collaboration with Prof John Taylor's laboratory at the University of Pretoria. Cultivars differed in the depth of fungal penetration. The mycotoxin prediction models are being used to identify 'risk areas'.

Soil samples were collected from a range of legume x sorghum/maize rotation systems by Michael Chung, a PhD student associated with this component of the project on a part-time basis, and were analysed using fluorescein diacetate (FDA) analysis as an indicator of total microbial biomass and microbial functional diversity differences between the treatments.

A significant difference in microbial biomass was recorded between sorghum/fallow rotation blocks and, in particular sorghum/soya rotated blocks which could have contributed to improved soil conditions and yield gains. It is anticipated that the greater diversity associated with rotation systems will add to root development and health and hence yield and grain quality.

Prof McLaren's research in this project functions at two levels: understanding the underlying stress mechanisms (disease and

grain quality/weathering), and evaluating current cultivars for the traits of interest. Postgraduate student programmes combine laboratory analysis with field research to help understand and reduce sorghum production and utilisation constraints, and train the next generation of scientists to tackle increasingly recalcitrant stress constraints. In the opinion of Prof Gary Peterson, one of the senior researchers leading the project, “this research is a cornerstone to achieve the project goal of increasing food security for small-holder farmers. Prof McLaren's contributions in research, graduate education, and team work are invaluable to the success of the project”.

Prof Neal McLaren  
Department of Plant Sciences  
mclarenn@ufs.ac.za

### PARTNERS

Prof Neal McLaren collaborates with colleagues from (amongst others)

AgriLife Research, Texas A&M University, USA // University of Limpopo, South Africa // University of Pretoria, South Africa // Zambian Agricultural Research Institute //





## Improving the quality of meat

Prof Arno Hugo's journey as a meat scientist specialising in the chemical stability of foods with a special interest in the lipid component of meat and meat products, has been an interesting one which has involved varied and interesting partnerships! Twenty years ago he starting working on lipids in meat; from there it was a natural progression to investigate lipids in other foodstuffs, which led him to collaborate with plant breeders. Recently he has worked with plant pathologists and soil scientists, investigating micro-organisms in soil. So what is next? Using the technology he has developed does not preclude investigating fertility of animals and humans.

Over the years he has established very good lipid analysis facilities for his research programmes; these have attracted collaboration with many scientists, both from within the University of the Free State as well as other research institutions.

One such collaborative research project was on the effects of dietary conjugated linoleic acid (CLA) feed supplementation on the

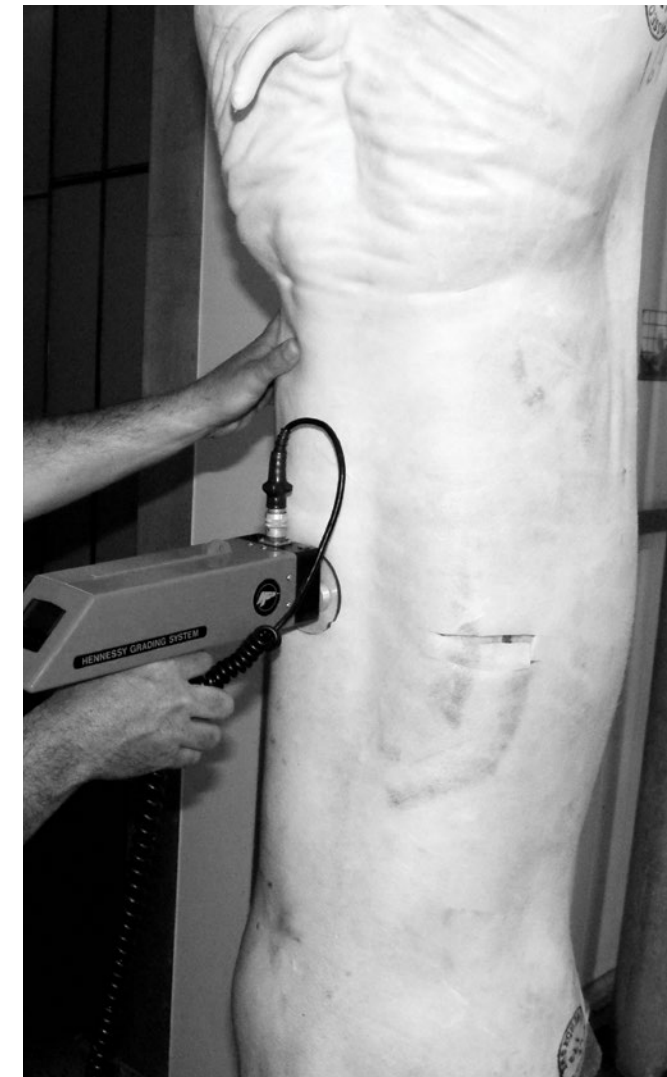
production and meat quality parameters of pigs under commercial production conditions; it also aimed to develop value-added pork products for the functional food market. The research was co-funded by the Red Meat Research and Development South Africa Trust (RMRD-SA) and THRIP.

International research has shown that increased CLA levels in the human diet are linked with improving immune function, preventing cancer, reducing heart disease, improving blood sugar levels and reducing body weight. The research undertaken by Prof Hugo's team has shown that animals receiving the CLA diet had improved feed conversion ratios, carcass classification and meat quality. The CLA levels in pork were elevated, which is a benefit to consumers. This counters the perception in recent times that pork contains excessive fat, saturated fatty acids and cholesterol. The feed containing CLA was also found to be less rancid after two months of storage than the control feed, due to the anti-oxidant properties of CLA. This presents a significant

finding as the use of synthetic anti-oxidants in human food and animal feed has come under increased scrutiny.

Sensory analysis indicated no effect of dietary CLA supplementation on the sensory properties of fresh and processed pork products. In the case of fresh pork chops and ground pork products, dietary CLA supplementation had a stabilising effect on the red colour of the products. Pork and pork products enriched with CLA can be considered functional foods and even 'nutraceuticals' with a positive effect on the health of humans. South African pig producers may therefore consider marketing CLA enriched pork products as a health food.

Prof Hugo stresses that CLA supplementation has important implications for meat production and quality, especially fat quality. These are important considerations if South Africa is to improve its competitiveness in the global meat industry, where competition is fierce and quality non-negotiable.



In another project to ensure healthier meat, Prof Hugo and his team are studying the effect of sodium reduction on the chemical, microbial and sensory quality of South African processed meat products. High salt intake is associated with hypertension and cardio-vascular diseases. The target of the South African Department of Health is to reduce the mean population intake of salt to 5 g per day. This implies a 40 to 50% reduction in salt intake from the current 10 g per day. Regulations aimed at reducing the sodium content of certain foodstuffs indicate that the sodium content of some meat products must be reduced to between 800 and 950 mg per 100 g product by 30 June 2016, and to 600 and 650 mg per 100 g product by 30 June 2019. Salt plays an important role in food production. Not only does it have important flavour enhancement and preservative functions, but it also facilitates water binding adhesion and fat emulsification during processed meat manufacture. An ill-considered reduction of salt content may have

serious meat processing, sensory and food safety consequences.

The current research project investigates the functions and requirements of salt in meat products as well as strategies to reduce salt in meat processing. The current salt and sodium content of processed meat products will be determined, as well as that of commonly used additives and ingredients. Various degrees of salt reduction are being tested in manufacturing salt-reduced processed meat products from each of the three main categories of processed products, namely whole muscle meat products (bacon), minced meat products (fresh pork sausage), and emulsion meat products (polony). The effect of various sodium reduction approaches on the technological, chemical, microbial and sensory properties will then be determined.

This project is co-funded by the South African Pork Producers Organisation (SAPPO), the RMRD-SA, and THRIP.

(Additional information obtained from Farmer's Weekly 23 March 2012)

**Prof Arno Hugo**  
Department of Microbial, Biochemical and Food Biotechnology  
[hugoa@ufs.ac.za](mailto:hugoa@ufs.ac.za)

### PARTNERS

Prof Arno Hugo collaborates with colleagues from (amongst others)

Agricultural Research Council (ARC), South Africa // Red Meat Research and Development, South Africa // South African Pork Producers Organisation, South Africa // University of Fort Hare, South Africa // University of Pretoria, South Africa //



"AgraForUm GmbH is an innovative company in Germany that specializes in the production of natural products for use in agriculture. Our main product ComCat has been intensively researched with the help of the UFS collaboration over the past 15 years and is now successfully used in numerous countries worldwide. AgraForUm together with the UFS develops natural solutions for the future, based on sound scientific research both under laboratory and field conditions."

**Dr Thomas Hüster**  
CEO, AgraForUm GmbH



## Manipulating crops with plant strengthening agents

In nature plants communicate and interact by means of allelochemicals and other phytochemicals as part of their resistance mechanisms towards biotic and abiotic stress conditions. Most wild plant varieties are usually well-adapted to resist these stress factors. However, to a large extent, monoculture crops have lost this ability. Active compounds contained in extracts from wild plants applied to monoculture crops can potentially supply the signal for the latter to activate their dormant resistance mechanisms.

The application potential of natural plant strengthening agents in the agricultural industry has, until recently, been largely ignored. This motivated the initiation of a research project 15 years ago that included the screening of natural plants (as original, untouched wild species, in which the genotypic and biochemical potential was unchanged by humans) for their bio-stimulatory activity in agricultural crops. As a result of this research a natural bio-stimulant (recently commercialised as ComCat®) was developed by the researchers at the UFS together with their partners AgraForUm GmbH (Germany). ComCat®, which contains three active brassinosteroids, is a unique and non-toxic plant strengthening agent derived from wild plants that enhances plant growth and yield as well as resistance against abiotic and biotic stress factors.

In order to understand the mechanism of action of the agent when applied as a foliar

spray in semi-arid conditions, agronomic parameters such as seed germination, root and coleoptile development in seedlings, as well as seedling establishment, vegetative growth, and the effect on final yield, were monitored under laboratory and field conditions. These experiments showed that the agent had a slight enhancing effect on seed germination, but a significant effect on especially root growth in young seedlings of several test crops, subsequently leading to the establishment of strong seedlings that were better adapted to utilise the available soil water as well as nutrients. However, the agent did not increase the growth of the seedling coleoptile and above ground vegetative plant parts.

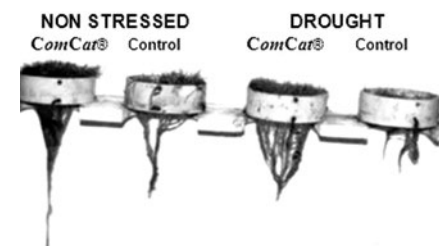
Substantial yield increases were observed in wheat and maize, as well as a number of vegetable crops. From this it seems that ComCat®, despite its enhancing effects on root development and yield, does not induce unwanted early vegetative growth that could jeopardise the final yield, as was found in the past with nitrogen application at an early growth stage.

Predicted future food shortages can only be overcome by increasing productivity on available land as opposed to acquiring more arable land. To achieve this, alternative techniques will have to be developed by which crop plants can be manipulated. Physiological data on the effect of this natural bio-stimulant product on photosynthesis, respiration and resistance

Visual effect of the natural bio-stimulant on sunflowers. Rows 1, 2, 6 and 7 were treated with the bio-stimulant.

**Dr Elmarie van der Watt**  
Department of Soil, Crop and Climate Sciences  
vdwatte@ufs.ac.za

**Prof Seef Pretorius**  
Department of Soil, Crop and Climate Sciences  
pretorjc@ufs.ac.za



Effect of natural bio-stimulant on growth of Creeping Bentgrass under drought conditions. Numbers 1 and 2 (from left) were not under stress conditions, with number 1 having been treated with the bio-stimulant. Numbers 3 and 4 were under drought conditions, with number 3 having been treated with the bio-stimulant.

### PARTNERS

Dr Elmarie van der Watt and Prof Seef Pretorius collaborate with (amongst others)

AgraForUm GmbH, Germany //



## Keeping our livestock healthy

The outbreak of infectious diseases recognises no boundaries. The emergence of zoonoses, such as Ebola haemorrhagic fever, multi-drug resistant mycobacterium, and Severe acute respiratory syndrome (SARS), to mention but a few, are a big threat to society. At the same time there is the realisation that trans-boundary animal infectious diseases, such as foot-and-mouth disease, can threaten food security and cause enormous economic loss. To protect against the threat of zoonoses on human and animal health it is necessary to advance knowledge about them and develop skills to manage these diseases.

Researchers at the Qwaqwa Campus of the UFS have responded to this challenge. Prof Oriel Thekisoe, a member of the Vice-Chancellor's Prestige Scholars' Programme, has been the principal investigator of the Parasitology Research Programme (PRP) since 2010. The research group focuses on studying the biology of parasitic protozoans, helminths and arthropods and other related parasitic infections in order to contribute to an understanding of the relationship between parasites and their hosts, and so prevent or control animal and human parasitic diseases.

Oriel Thekisoe primarily conducts research in the field of veterinary parasitology, with the emphasis on parasitic diseases of livestock. His main focus is on the development of molecular diagnostic assays, prevalence and epidemiological studies, as well as parasite-vector relationship studies. He has developed molecular diagnostic tests for detecting human and animal infection caused by the *Trypanosoma* and *Theileria* parasites.

Trypanosomosis is a disease caused by protozoan parasites transmitted by the tsetse fly in sub-Saharan Africa. The disease is commonly called 'sleeping sickness' in humans and 'Nagana' in animals. In South Africa we have only Nagana affecting livestock in the KwaZulu-Natal province. This research has resulted in a strong collaboration with Prof Noboru Inoue of Obihiro University in Japan, who is an expert on African Trypanosomosis.

Bovine theileriosis, caused by a protozoal parasite called *Theileria parva*, is fatal to cattle and also infects buffalo; it is transmitted by tick vectors. The collaboration of the PRP with Dr Ben Mans of Onderstepoort Veterinary Institute has resulted in the successful development of molecular diagnostic techniques for the detection of *T. parva* infections in buffalo in southern Africa.

**Prof Oriel Thekisoe**  
Department of Zoology and Entomology  
(Qwaqwa Campus)  
thekisoemma@qwa.ufs.ac.za

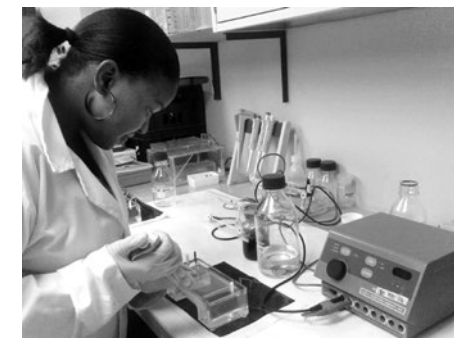
### PARTNERS

Prof Oriel Thekisoe collaborates with colleagues from (amongst others)

ARC-Onderstepoort Veterinary Institute, South Africa // Hokkaido University, Japan // Johns Hopkins Medical University, USA // National Zoological Gardens, South Africa // Obihiro University of Agriculture and Veterinary Medicine, Japan //

"Our cooperative research on vector-borne protozoan diseases focuses on clarification of the role of tabanids in trypanosome transmission and epidemiology of piroplasmiasis in domestic animals in South Africa. Oriel Thekisoe has made substantial contributions to develop a novel field-oriented molecular diagnostic method for human and animal trypanosomosis."

**Prof Noburu Inoue**  
National Research Center for Protozoan Diseases, Obihiro University of Agriculture and Veterinary Medicine





## Meet some of our prestige scholars

# working together to build the NEXT GENERATION OF RESEARCHERS

*"Within the South African academy, the PSP is a novel experiment in intellectual development and the development of professional scholars. It contributes towards positioning the University of the Free State as an innovator among research universities in the country."*

**Prof Robert Morrell**  
University of Cape Town

The Prestige Scholars' Programme (PSP) is a high profile initiative spearheaded by the Vice-Chancellor, which seeks to identify, support and promote the next cohort of the most promising and talented UFS scholars, irrespective of discipline. These are dedicated young scholars in various disciplines, five to eight years post-PhD, who are posed to become the next generation professors.

The PSP supports the accelerated scholarship of selected individuals, who participate in an intensive programme of support that includes international placement and mentorship. Since the first call in 2010, 40 scholars have been nominated to the programme. Our scholars work with the best in the world from Japan, Europe and the United States.

Over and above those already featured in this report (Aliza le Roux, Sethulego Matebesi, Olihile Sebolai, and Oriel Thekisoe), let us introduce you to some of our other Prestige Scholars.

**Gladys Kigozi**, a researcher in the Centre for Health Systems Research & Development, works on tuberculosis (TB), which kills more South Africans than any other disease. Kigozi's research explores TB/HIV service integration at the primary health care level, focusing on meeting the need to develop, facilitate and promote best practices in expanding and improving case findings, infection control, treatment and care of TB/HIV. She has collaborated and co-published with several leading scholars at international institutions, including the Centers for Disease Control and Prevention (CDC) South Africa, the State University of New York Downstate Medical Center, the University of Alabama at Birmingham, and the University of Antwerp. In South Africa she works closely with TB/HIV programme managers at the Free State Department of Health and researchers at the University Research Company-South Africa, Right To Care, Desmond Tutu TB Centre (Stellenbosch University), and the School of Public Health at the University of the Western Cape.

Kigozi, who was selected a Prestige Scholar in 2013, holds a doctorate in Psychology and Health Systems Research. She has collaborated on projects aimed at building research capacity in South Africa to promote the health and safety of healthcare workers in TB/HIV prevention and management.

**Dr Gladys Kigozi**



She is also contributing to the evaluation of professional and community health-worker training and mentoring models to improve TB patients' uptake of HIV counselling and testing, as well as the development and implementation of a multifaceted intervention to improve TB prevention in primary healthcare facilities. Her latest project-in-development seeks to investigate and test a model to enhance systematic TB contact investigation in households with most at-risk TB index cases. //

**Dirk Opperman**



**Dirk Opperman** is senior lecturer in Biochemistry at the UFS. Manfred T Reetz of the Max Planck Institut für Kohlenforschung in Germany lauded him as "one of the very best postdocs" with whom he has worked.

Returning from the Max Planck Institute, Opperman established a Structural and Evolutionary Biology research group at the UFS. His research focus is on structure-function relationships and natural and directed evolution of enzymes, specifically Baeyer-Villiger monooxygenases from fungi. These enzymes are not only remarkable biocatalysts, but also targets for inhibition against aflatoxin production through structure-guided drug design.

Opperman has an extended network of international collaborators, including the Biocatalysis and Organic Chemistry group at the Delft University of Technology in The Netherlands. He was selected a Prestige Scholar in 2011. //



## Prof Vernon Louw



**Vernon Louw** is Full Professor and Head of the Department of Internal Medicine. After completing his MBChB and MMed (Internal Medicine) degrees at Stellenbosch University (both with distinction), he completed a three-year Fellowship in Clinical Haematology at the Katholieke Universiteit Leuven in Belgium. During this time he also worked as a consultant haematologist at the University Hospital Gasthuisberg in Leuven. After his stint in Leuven, he became Head of the Division of Clinical Haematology at the UFS in 2004, a position he filled until 2013, before becoming Head of Internal Medicine. Louw also holds a PhD in Health Professions Education from the UFS, and is registered to practice medicine in the United Kingdom, Belgium and the European Union.

A prolific scholar, Louw has published more than 60 publications in peer-reviewed journals. He is also co-author of Kumar and

Clark's *Clinical Medicine*, a volume that won first prize in the Medicine Category at the 2006 British Medical Association Awards. He sits on the editorial board of *The Cancer Journal* (South African excerpts edition) and he is an international editorial advisor for the *African Journal of Haematology and Oncology*. He serves on numerous national and international expert committees and is, *inter alia*, the only African representative on the European Myeloma Network that published international guidelines for the management of multiple myeloma in 2011.

Louw's most recent scholarship focuses on the epidemiological aspects of the major transfusion medicine related haematological diseases such as myelodysplastic syndromes, multiple myeloma, thrombotic thrombocytopenic purpura (TTP) and the acute and chronic leukaemias. His research predicts that a better understanding of the prognostic and demographic background to these diseases, along with identifying risk factors, will allow significant improvement in planning by policy makers, funders and health managers.

His doctorate in Health Professions Education speaks to Louw's commitment to teaching. He and his team developed the only Anglophone postgraduate programme in transfusion medicine in Africa. He is now developing an online learning environment based on screencasting-type video clips of basic medical concepts with the aim of turning a series of these clips into massive open online courses (MOOCs).

In 2014 Louw will spend time at the University of British Columbia in Canada on a Fellowship from the Association of Commonwealth Universities. //

**Nthabeleng Rammile**, selected to the PSP in 2011, holds a doctorate in Marketing, for which she investigated the role of cultural diversity in successful brand management in the South African cellular industry. In response to a subsequent visiting lecture at the University of Bremen, her work was described as "insightful and relevant to the global audience."

Rammile continues to build a body of publications on this and related topics. Her most recent work aims to develop a comprehensive model to demonstrate how consumer attachment style influences brand attachment through the mediating role of implicit theories and brand communication.

She recently returned from the University of Washington, Tacoma, where she worked under the tutelage of Professor Greg Rose. This allowed her to embed her work in a cross-cultural study (United

## Dr Nthabeleng Rammile



States and South Africa) to identify and observe the characteristics of consumers' brand attachments. //

## Dr Brian van Soelen



**Brian van Soelen**, from the Department of Physics, joined the PSP in 2013. He works on high-energy astrophysics, contributing to an understanding of how gamma-ray binary systems and Be/X-ray binaries work and the

physical processes involved. His scholarship includes observations using telescopes such as the South African Large Telescope (SALT), and the Very Large Telescope (VLT) operated by the European Southern Observatory in the Atacama Desert of northern Chile.

The research team to which Van Soelen belongs is part of the South African contingent (with the University of the Witwatersrand and North-West University) of the international HESS (High Energy Stereoscopic System) Collaboration. This team is also a member of the working group 'Astrophysical transients, their hosts and their physics', established as part of the Dutch NWO/NRF Bilateral Agreement in Astronomy and Enabling Technologies for Astronomy. This group will focus on radio observations of transient and variable sources, with the South African MeerKAT radio telescope.

In 2014 Van Soelen will undertake a research visit to the University of Innsbruck, Austria. //

**Merridy Wilson-Strydom**, a Rhodes Scholar (Africa-at-large, 1999), completed her MPhil in Development Studies at Oxford University in 2001, and her PhD in Higher Education Studies at the UFS in 2013. She has also spent three months in Germany on a DAAD fellowship at the first International Women's University, which brought together women scholars across disciplines to work on collaborative research projects.

Wilson-Strydom's work considers the complex challenges of building a socially just higher education system in South Africa, and beyond. In theorising social justice in higher education she is breaking new ground with her application and operationalisation of the Capabilities Approach, developed by Amartya Sen and Martha Nussbaum. She has proposed and defended a Pragmatic Capabilities List for the transition towards a more 'socially just' university. The List consists of seven capabilities, which not only provide a framework for university transition, but also open new theoretical avenues for understanding readiness for university. With a three-year Thuthuka grant from the NRF, she is currently extending this work on readiness for university to consider issues of social justice in undergraduate education.

Wilson-Strydom has led a large-scale study on higher education in the Southern African Development Community (SADC).

## Dr Merridy Wilson-Strydom



The study focused on profiling public higher education across the fifteen countries in the region, and provides important information for decision-makers at regional, inter-governmental, national and institutional levels. She was selected as a Prestige Scholar in 2013, and is currently based in the Centre for Research on Higher Education and Development, where she is a Senior Research Fellow. Wilson-Strydom's first book, titled *University Access and Success: Capabilities, Diversity and Social Justice*, is currently in press and will be published by Routledge. //



## Prof Bradley Smith



At the age of 25, **Bradley Smith** co-authored his first peer-reviewed publication. The South African Supreme Court of Appeal would subsequently refer to this article in *Napier v Barkhuizen* 2006 (4) SA 1 (SCA). This reference served as catalyst for a career in legal scholarship. Now, with an LLM in Trust Law and an LLD in Family Law, Smith's primary area of legal expertise is in family law – in particular the impact of the validation of same-sex marriage and

the requirement of greater legal recognition for domestic partnerships (i.e. persons who live together without being married). His first article on the legal consequences of the potential legalisation of same-sex marriage in South Africa was published a year before the promulgation of the Civil Union Act in 2006. Subsequently Smith has focused on the consequences of the Act by analysing its provisions for the interrelationship between the legislation of same-sex marriage, existing matrimonial (property) law and the rights of domestic partners.

Smith's work is cutting edge and anticipates major legal and ethical developments in South Africa and abroad. He is regularly cited by scholars nationally and internationally, and his research has recently contributed to legal development by being cited by the Supreme Court of Appeal in a ground-breaking judgment delivered in 2012. During a visit to Oxford University, Smith presented his work which had earlier been described by a prominent Oxford scholar in the field as representing that of a "top-class forensic scientist". He was selected as a Prestige Scholar in 2011. In 2013 he was awarded a C2 rating by the National Research Foundation. //

**Freddie Roelofse**, a Prestige Scholar since 2013, joined the Department of Geology in 2011. His research aims to elucidate isotopic disequilibrium within large layered intrusions, using the Bushveld Complex, the world's largest resource of platinum-group elements, as his natural laboratory. A senior scholar in his field recently referred to Roelofse's work as both "impressive" and "innovative". He is currently collaborating with scientists from the GeoForschungsZentrum (Postdam) to investigate inter- and intracrystalline variations in isotopic compositions of the co-existing minerals of the Bushveld Complex. His research has also led to collaboration with scholars from the University of the Witwatersrand and Cardiff University, and in 2014 will be extended to the Carnegie Institution for Science (Washington).

Roelofse's work will potentially shed light on the fundamental processes operating within large magmatic systems, and the interaction of mantle-derived melts with

## Dr Frederick Roelofse



crustal material. A better understanding of these processes can potentially contribute to our knowledge on ore-forming processes, which may aid the search for new mineral deposits. //

## Dr Matildie Thom Wium



**Matildie Thom Wium**, lecturer in the Odeion School of Music, belongs to a new generation of South African musicologists who seek to participate in international debates on critical musicology, while maintaining a

close relationship with their uniquely South African heritage. In her doctoral thesis Thom Wium interpreted four works by the South African composer, Arnold van Wyk, drawing on structural analysis and sketch studies. She situated the readings contextually within international discourses ranging from English Sibelianism studies and musical intertextuality to post-Holocaust art criticism, thereby making incisive contributions to current South African debates on the post-colonial and post-apartheid criticism.

As part of her doctoral programme, Thom Wium spent a year at Royal Holloway, University of London, as the student of Nicholas Cook. She also received supervision from US Schenkerian analyst, Timothy Jackson. She has presented her research in Amsterdam and London, and has been invited to participate in a major research project on music in 19<sup>th</sup> century London, directed by Prof Roger Parker, the Thurston Dart Professor of Music at King's College London. She was selected to the PSP in 2013. //

**The fact that he** holds doctoral degrees in German, and Afrikaans and Dutch, suggests something about the scope of Cilliers van den Berg's scholarly interests and research. The nature of his work is inter-disciplinary, with a specific focus on the dynamics of collective memory – especially when coming to terms with 'difficult' pasts from the perspective of the perpetrator. With Bill Niven of Nottingham Trent University, Van den Berg was co-investigator of a project funded by the British Academy titled 'Contemporary German and Afrikaner cultural responses to issues of trauma, reconciliation and reparation'. This project brought together six scholars from the UK and South Africa to analyse the viability and meaning of comparison for the Afrikaner and German contexts.

The joint approach was the result of Van den Berg's international network on the representation of trauma, as well as collaboration with Stuart Taberner of Leeds University. Another result of this collaboration is his involvement with a planned exhibit at the Cape Town Holocaust Centre on Germany's coming to terms with its past and its subsequent and potential relevance for other similar discourses.

## Dr Cilliers van den Berg



Van den Berg, who was selected a Prestige Scholar in 2011, spent a year as a visiting scholar in the Comparative Literature Department at Cornell University. He has also undertaken research visits to the University of Augsburg (Germany) and Leiden University (The Netherlands). //

**Prof Jackie du Toit, Prof Neil Roos, and Prof Corli Witthuhn**

Co-Directors: Vice-Chancellor's Prestige Scholars' Programme

[dutoitjs@ufs.ac.za](mailto:dutoitjs@ufs.ac.za)  
[roosnd@ufs.ac.za](mailto:roosnd@ufs.ac.za)  
[witthuhnrc@ufs.ac.za](mailto:witthuhnrc@ufs.ac.za)

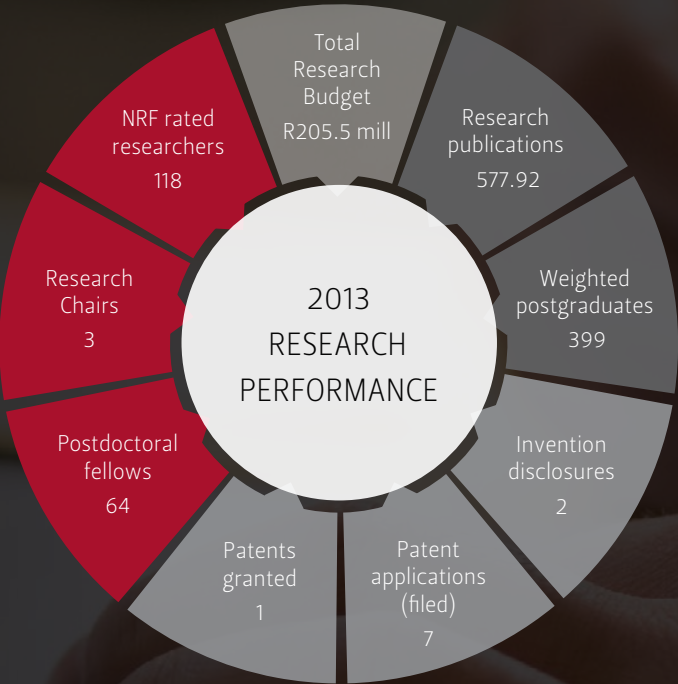


research performance

# AT A GLANCE

2013 has been a year of consolidation for research at the University of the Free State. New systems and processes were put in place to support the University's vision to become more research focused, and to enable better and more professional support to our researchers. As is inevitably the case when there is change, this has resulted in some areas where growth has been slow. However, in far more cases there has been very pleasing, and sometimes surprising, growth and improvement – as is evidenced by the following 'snapshots' of our performance against the most important metrics and indicators.

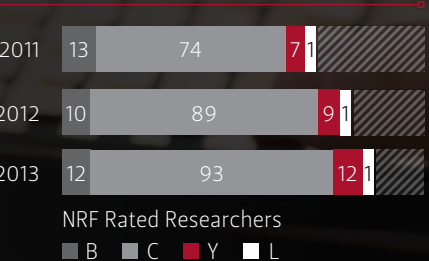
INPUTS AND OUTPUTS – AT A GLANCE



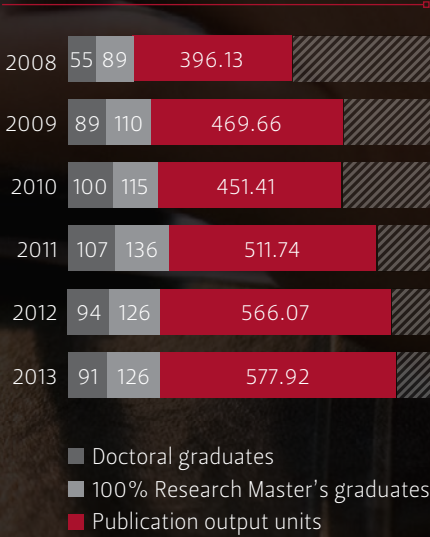
FUNDING



RESEARCHERS



RESEARCH OUTPUTS





IMPACT

The impact of the research undertaken by our researchers is taken very seriously, and in line with the drive by the Department of Higher Education and Training, researchers are encouraged to publish in journals with a high impact factor. This is but one of the measures by which the impact of our research can be assessed. In 2013, based on their journal outputs, the following researchers were considered to have had the highest impact:



Prof Jeanet Conradie  
*Department of Chemistry*



Prof Max Finkelstein  
*Department of Mathematical Statistics and Actuarial Science*



Dr Abdon Atangana  
*Institute for Groundwater Studies*



Prof Martin Ntwaeaborwa  
*Department of Physics*



Prof Hendrik Swart  
*Department of Physics and SARChI*

PRODUCTIVITY

Top 10 UFS Departments in terms of publication output units (POUs), 2013

Department	POUs
Chemistry	48.84
Physics	27.14
New Testament	24.00
Soil, Crop and Climate Sciences	21.53
School of Education Studies	18.26
History	17.26
Linguistics and Language Practice	16.66
Institute for Groundwater Studies	15.51
English	13.75
Mathematical Statistics and Actuarial Science	13.32

Top 10 UFS Researchers in terms of publication output units (POUs), 2013

Researcher	Department	POUs
Atangana, A	Institute for Groundwater Studies	12.34
Conradie, J	Chemistry	7.94
Conradie, MS	English	6.00
Finkelstein, M	Mathematical Statistics and Actuarial Science	5.83
Senekal, BA	Linguistics and Language Practice	5.50
Haddad, CR	Zoology and Entomology	5.46
Twala, C	History	5.33
Swart, HC	Physics	5.17
Roodt, A	Chemistry	5.11
De Wet, NC	School of Open Learning	5.08

COLLABORATORS AND PARTNERS



As we strive to solve real-world problems, we work closely with a range of partners at other universities and research institutions, as well as with governments, industry, business, the professions, and community groups.

A full list of our active collaborators and partners is available on:

<http://supportservices.ufs.ac.za/content.aspx?id=161>

2013: the year

IN REVIEW



Among the significant research events that occurred at the University of the Free State during 2013 were the following:

JAN	FEB	MAR	APR	MAY	JUN
JUL	AUG	SEP	OCT	NOV	DEC

UFS contributes to development of new drug

The Cardiology Research Unit at the UFS, together with countries such as the USA, Canada and Italy, contributed largely to the evaluation of the drug Juxtapid (lomitapide), which was developed by the Aegerion pharmaceutical company and approved by the FDA (Federal Drug Administration). The drug was evaluated in persons with so-called familial homozygous hypercholesterolemia (HoFH), a serious, rare genetic disease affecting the function of the receptor responsible for the removal of low-density lipoprotein cholesterol ('bad' cholesterol) from the body. Following FDA approval, Juxtapid is now a new treatment option for patients suffering from HoFH. //

Prof Francis reappointed chairperson for EDF



The Dean of Education, Prof Dennis Francis, was reappointed as the chairperson of the Education Deans Forum (EDF) for the second consecutive year. //

Symposium on Corruption

The UFS Faculty of Law hosted the *International Symposium on Corruption* from 24 to 25 January. The event featured a stellar cast of speakers, including Chief Justice Mogoeng Mogoeng, three current Supreme Court of Appeal judges, high-court judges, as well as local and international legal academics. //

JAN	FEB	MAR	APR	MAY	JUN
JUL	AUG	SEP	OCT	NOV	DEC

Dialogues on the ANC

The Centre for Africa Studies hosted a series of dialogues on the ruling African National Congress; these conversations preceded the party's 53<sup>rd</sup> National Conference held on the Bloemfontein Campus, and continued until February. A book with a collection of papers presented during the series is being finalised. The book features chapters by scholars such as Stephen Ellis, Shireen Hassim, Colin Bundy and Ben Turok, and covers topics on the role of women in the liberation struggle, the party's economic policy and the history of the party in exile. //

Constructions of illness and identity

A one-day colloquium titled *Constructions of illness and identity: Subjectivity and chronic illness in the South African Context* was held at the UFS on 5 February. Prof Arthur Kleinman, Professor of Medical Anthropology and Psychiatry at Harvard University was one of the main speakers at this colloquium. //

Prof Solomon appointed to RIMA



Prof Hussein Solomon, Senior Professor in the Department of Political Studies and Governance, was appointed Senior Research Associate of the Israeli think-tank 'Research on Islam and Muslims in Africa' (RIMA). Prof Solomon will provide an expert voice on the topic of Islam in Africa, and through RIMA he will work with other researchers and engage in collaborative research projects, allowing for the rapid cross-pollination of ideas. //

Capacity building of young researchers

The UFS hosted the Southern African Young Scientists Summer Programme (SA-YSSP). Nineteen young scientists from 16 countries

completed their three-month programme at the end of February. The Programme, which is hosted and managed by the UFS, was developed by the NRF in collaboration with the Department of Science and Technology (DST), and the Austrian Institute for Applied Systems Analysis (IIASA). Prof André Roodt of the Department of Chemistry is dean of the SA-YSSP, while Prof Martin Ntwaeaborwa of the Department of Physics serves as the deputy dean. //

Faculty of Health Sciences launches Simulation Unit



With the opening of the Simulation Unit in the Faculty of Health Sciences, the School of Medicine brought a stimulating new environment to research. The Unit is the first of its kind in Africa in that it focuses specifically on patient simulation and scenario imitation. //

JAN	FEB	MAR	APR	MAY	JUN
JUL	AUG	SEP	OCT	NOV	DEC

Inaugural lecture of Visiting Senior Professor



On 4 March Prof Charles Dumas, Visiting Senior Professor in the Department of Drama and Theatre Arts, presented his inaugural lecture at the UFS in a speech titled 'I, too, am an African'. Prof Dumas is a senior professor at Penn State University in the USA. //

Philosophy Colloquium



The Department of Philosophy hosted Breyten Breytnbach as part of its Colloquium series. Breytenbach shared his views relating to poetry and philosophy. //

New Vice-Rector for Research

The Council of the UFS approved the appointment of Prof Corli Witthuhn as Vice-Rector: Research during its meeting on 8 March. Prof Witthuhn obtained her PhD in Microbiology at the UFS in 1999. She then joined Stellenbosch University for 12 years, until she was appointed as Vice-Dean in the Faculty of Natural and Agricultural Sciences at the UFS in 2011. The portfolio of Vice-Rector: Research is new and was created as part of the University's academic project in which the institution aims to increase its research activities and outputs. //

International Advisory Council



The International Advisory Council (IAC) of the UFS held its biennial meeting with the University leadership in March. The IAC, consisting of seven leading academics, business leaders and policy makers, advises the leadership on how well the University is performing against international benchmarks in research, teaching, service and transformation. The members of the Council also act as advocates for the University in their own spheres of influence. //

Dialogue between Science and Society



Prof Pumla Gobodo-Madikizela, Senior Research Professor on Trauma, Forgiveness and Reconciliation, facilitated conversations in the Dialogue between Science and Society series on forgiveness and living reconciliation. The series was co-hosted by the Institute for Reconciliation and Social Justice. Participants in the discussion included Olga Macingwane, a survivor of the Worcester bombing of 1993, Dr Juliet Rogers, a Scholar on Remorse from the University of Melbourne, and Dr Deon Snyman, Chairperson of the Worcester Hope and Reconciliation Process. //

Prof Andrew Marston

The UFS was deeply saddened by the passing of one of its top researchers, Prof Andrew Marston. Prof Marston was a specialist in natural product chemistry and methods associated with the isolation and analysis of medically important chemicals from plants. He obtained a B-rating from the NRF in 2011 and was appointed as a senior professor at the UFS. His research group was part of a multilateral partnership with funding from the 7<sup>th</sup> Framework Programme of the EU. //

Chemistry gets a vote of confidence from SASOL

The research groups of Profs André Roodt, Jannie Swarts and Ben Bezuidenhout, received R2,97 million from SASOL for research in Organic Synthesis, Homogeneous and Heterogeneous Catalysis. SASOL has identified the UFS as one of the South African universities where chemistry is being expanded. The support forms part of SASOL's 'Hub-and-Spoke' initiative through which certain universities have been identified for strategic support for research and development. //

JAN	FEB	MAR	APR	MAY	JUN
JUL	AUG	SEP	OCT	NOV	DEC

Prof Dolf Britz appointed to Yale Divinity School



Prof Dolf Britz was awarded the honour of an appointment at Yale Divinity School. The appointment, which entails research initiatives and teaching of postgraduate seminars at Yale, is the natural progression of a collaboration agreement between the UFS and Yale University with the formation of the Jonathan Edwards Centre Africa at the UFS in 2009. //

Dr Hlalele receives Nordic Africa Institute Scholarship



The Nordic Africa Institute (NAI) has awarded the African Guest Scholarship to Dr Dipane Hlalele of the Faculty of Education on the Qwaqwa Campus. The scholarship was tenable at the NAI in Uppsala, Sweden from April to June 2013. //



Colloquium on sexuality and education

The Faculty of Education convened a colloquium on *Sexuality, Society and Pedagogy*. The colloquium was addressed by leading researchers in the fields of education and sociology and covered a range of topics such as how to teach sex education most effectively; how school children view sex, gender, disability, homosexuality and homophobia; the implications of teaching the subject incorrectly; and the role that educators could and should play in forming the gender-based world view of their young charges. //

Launch of book on the university of the 21<sup>st</sup> century



Prof Melanie Walker, Senior Research Professor and Director of the UFS Centre for Higher Education and Capabilities Research (CHECaR), and Prof Alejandra Boni, Associate Professor at the Universidad Politècnica de València in Spain, launched the book they edited, titled *Human Development and Capabilities: Re-imagining the university of the twenty-first century* (Routledge). The launch was hosted by the Institute of Education at the University of London. //

JAN	FEB	MAR	APR	MAY	JUN
JUL	AUG	SEP	OCT	NOV	DEC

New home for Postgraduate School



In order to further promote research excellence at the UFS, postgraduate students now have a dedicated physical, emotional and electronic space to provide for their specialised needs. The Postgraduate School, launched in 2011, moved into refurbished offices in the Johannes Brill Building. Coinciding with this, the postgraduate strategy, postgraduate prospectus, and new website were unveiled. Dr Henriëtte van den Berg, Director of the Postgraduate School, introduced the Supervisors' Wall of Fame, which will bestow much-deserved profile on a hand-picked group of 60 supervisors who have been responsible for more than 300 PhD and 500 Master's candidates over the past decade. //

Andrew W Mellon Foundation Award

The Andrew W Mellon Foundation made an award of US\$500 thousand over three years to support postgraduate and postdoctoral studies in the humanities at the University of the Free State. The award will underwrite 20 postgraduate studentships and postdoctoral fellowships, as well as annual postgraduate skills training workshops and a research seminar programme. The programme has attracted highly qualified young scholars for South Africa, Botswana, Zambia and Zimbabwe, as well as from the UK and USA. While their fields of study include history, politics, anthropology and development studies, most of the research has an African focus and a marked historical dimension. //

Multimillion rand NRF grant for nanotechnology

Prof Martin Ntwaeaborwa from the Department of Physics received a R10 million award from the National Nanotechnology Equipment Programme of the NRF for a high-resolution field emission scanning electron microscope (SEM) with integrated cathodoluminescence (CL) and energy dispersive X-ray spectrometers (EDS). This state-of-the-art equipment combines three different techniques in one and it is capable of analysing a variety of materials ranging from bulk to individual nanoparticles. This is the first of its kind in Africa. //

Funding from NRF Research Infrastructure Support Programme



Prof Bennie Viljoen from the Department of Microbial, Biochemical and Food Biotechnology was awarded R1,171 million from the Research Infrastructure Support Programme of the NRF for the purchase of a LECO CHN628 Series Elemental Analyser with a Sulphur add-on module. The analyser is used to determine nitrogen, carbon/nitrogen and carbon/hydrogen/nitrogen in organic matrices. It utilises a combustion technique and provides a result within 4.5 minutes for all the elements being determined. The instrument also offers a sulphur add-on module, which provides sulphur analysis for any element combination. The CHN 628 S module is specifically designed to determine the sulphur content in a wide variety of organic materials such as coal and fuel oils, as well as some inorganic materials such as cement and limestone. //

JAN	FEB	MAR	APR	MAY	JUN
JUL	AUG	SEP	OCT	NOV	DEC

TW Kambule Award for Marieka Gryzenhout



Dr Marieka Gryzenhout of the Department of Plant Sciences received the TW Kambule NRF-NSTF Award as emerging researcher. The award gives recognition to her outstanding contribution to science, engineering, technology and innovation in the country. Marieka, whose research is in the field of mycology, is also part of the Vice-Chancellor's Prestige Scholars' Programme. //

Eye-tracking device developed



The Department of Computer Science and Informatics has succeeded in developing a high-quality eye-tracker at a fraction of the cost of the imported devices. In an eye-tracking device, a tiny infra-red light shines on the eye and causes a reflection which is picked up by a high-resolution camera. Every eye movement causes a change in the reflection, which is then mapped. Based on the eye movements, a researcher can study cognitive patterns, driver behaviour, attention spans, even thinking patterns. Along with the hardware, the department has also developed specialised software for a number of applications. The UFS is the first manufacturer of eye-tracking devices in Africa. //

JAN	FEB	MAR	APR	MAY	JUN
JUL	AUG	SEP	OCT	NOV	DEC

Dr Chantel Swart invited as 'Expert on Stage'



An alumnus of the Vice-Chancellor's Prestige Scholars' Programme, Dr Chantel Swart from the Department of Microbial, Biochemical and Food Biotechnology, was an invited 'Expert on Stage' at the 4<sup>th</sup> International Nanomedicine Conference held in Sydney, Australia from 1 to 3 July. Her presentation 'A new nanotechnology for nanomedicine' reported on findings of the nanotechnology group of Prof Lodewyk Kock, which discovered gas bubbles inside cells when using Auger-architectomics, a nanotechnology they developed in 2010. This nanotechnology is used to track nanomedicine inside cancer cells in collaboration with the Mayo Clinic in the USA. //

Fulbright scholar, Mpho Jama



Dr Mpho Jama, lecturer in Health Sciences Education and a member of the Vice-Chancellor's Prestige Scholar's Programme, was awarded a Fulbright Scholarship. She was hosted by the Graduate School of Education at the University of California Los Angeles (UCLA). At UCLA she collaborated with the David Geffen School of Medicine on research focusing on stress among medical students. //

JAN	FEB	MAR	APR	MAY	JUN
JUL	AUG	SEP	OCT	NOV	DEC

DST Women in Science Awards



Three researchers affiliated to the UFS received awards at the Women in Science Awards 2013 function of the Department of Science and Technology. Prof Maryke Labuschagne, of the Department of Plant Sciences, was first runner up in the category Distinguished Women Researcher in Life Sciences, while Dr Marieka Gryzenhout received the award as Young Woman Scientist in the category Life Sciences.



Rose Lekhooa, who is studying towards a PhD in Pharmacology, received an award in the Doctoral Fellowship category. //



Prof Martin Prozesky's inaugural lecture



Prof Martin Prozesky, Extraordinary Professor in the Department of Religion Studies of the Faculty of Theology, presented his inaugural lecture on 'Tomorrow's ethics in a globalising world', on 28 August. //

JAN	FEB	MAR	APR	MAY	JUN
JUL	AUG	SEP	OCT	NOV	DEC

Prof Stephen Brown, Bloemfontein of the Year

Prof Stephen Brown, a cardiologist in the Department of Paediatrics and Child Health, was named Bloemfontein of the Year. He has dedicated his life to children's hearts ever since he qualified as a paediatrician, and he was honoured for the passion with which he works to save children's lives. Under Brown's leadership, Bloemfontein's Paediatric Cardiology Unit is the only certified and recognised unit for pulmonary-valve implants in Africa. The development of a local prenatal foetal heart screening and diagnostic programme, as well as adult congenital heart clinics, is due to his work and passion for his field of study. //

European bursaries for UFS staff and students

Eight staff members and postgraduate students who were recipients of the Eurosa and Erasmus Mundus EU-SATURN bursaries for 2013/2014 left to spend time at universities in Belgium, Austria, Germany and the Netherlands. The group, representing various faculties, used the opportunity to further their research and studies. They include Werner Pretorius, Jarlen Beukes, Jan Schlebusch, Trudie Schutte, Emmie Smit, Andre van Rensburg, Sanet Steyn, and Eben Coetzee. //

WRC Award for Prof Leon van Rensburg



Prof Leon van Rensburg from the Department of Soil, Crop and Climate Sciences received the award for Sustainable Development Solutions 2013 at the Water Research Commission Symposium. The symposium recognised his outstanding research guiding the management of salinity under irrigation at farm level in South Africa. Prof Van Rensburg's research is aimed at enhancing the efficiency of water usage of crop production systems in both the dryland and irrigation sectors. //

Colloquium on Mass Violence and Genocide in Africa

Africa's contested pasts have frequently been characterised by violence. The manner of the continent's subjugation to colonial rule, processes of indigenous resistance and accommodation, patterns of dispossession and accumulation, the construction and reconstruction of gendered identities, liberation movement dynamics, and the postcolonial politics of patronage, have all shaped African experiences of violence and antagonisms. To this list should be added past and present manifestations of xenophobia, the struggle for scarce resources in conditions of extreme inequality and climate change, and many more. In this light, the Institute for Reconciliation and Social Justice and Prof Ian Phimister hosted a colloquium on *Mass Violence and Genocide in Africa: Colonial and postcolonial perspectives*. The aim of the colloquium was to account for a range of issues encompassing individual trauma, mass violence and genocide, through a mixture of historical case studies and over-arching contemporary thematic and conceptual analyses. //

JAN	FEB	MAR	APR	MAY	JUN
JUL	AUG	SEP	OCT	NOV	DEC

Strengthening ties with Belgium



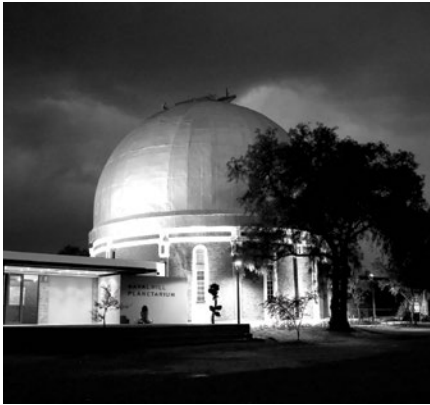
The UFS signed a formal agreement with the University of Antwerp, strengthening the collaboration between the two institutions. The agreement will ensure that the two institutions continue to work closely on research and other projects. It will augment pre-existing collaborations with the Unit for Language Facilitation and Empowerment, and the Centre for Health Systems Research & Development, and open the way for cooperation between other disciplines. //

International awards for Prof Jonathan Jansen

Prof Jonathan Jansen joined the ranks of laureates of Kappa Delta Pi (KDP), International Honor Society in Education. The award is one in a long list of awards made to Prof Jansen in 2013. These include the Alice and Clifford Spendlove Prize in Social Justice, Diplomacy and Tolerance from the University of California in the USA, the 2013 Academia Award at the Sixth Annual Ubuntu Lecture and Dialogue Awards Ceremony of the Turquoise Harmony Institute in Johannesburg, and the Education Africa Lifetime Achievement Award for Africa. //

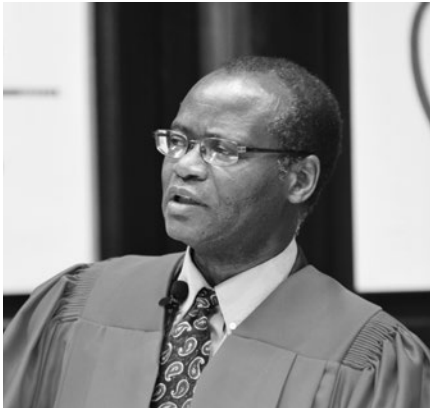
JAN	FEB	MAR	APR	MAY	JUN
JUL	AUG	SEP	OCT	NOV	DEC

UFS boasts modern digital planetarium



The new Naval Hill Digital Planetarium, situated inside the Lamont-Hussey Observatory, was officially opened on 1 November by Derek Hanekom, Minister of Science and Technology. The founding donors are the Department of Science and Technology, the Free State Department of Economic Development, Tourism and Environmental Affairs and the Mangaung Metro Municipality. It will be run and managed by the UFS. The new digital planetarium is the first of its kind in sub-Saharan Africa, and is unique in that it was erected within an existing observatory - which was opened in 1928. The digital dome that was fitted into the existing observatory structure, is a 12-metre wide, seamless aluminium screen complemented by a powerful surround-sound system. //

Prof Muna Ndulo, Extraordinary Professor



On 5 November Prof Muna Ndulo, Professor at the Cornell Law School, delivered his inaugural lecture as Extraordinary Professor in the Department of Mercantile Law at the UFS. The topic of his lecture was 'Facilitating regional and world trade through international trade.' //

DNA sequencer to fight HIV drug resistance



The Department of Medical Microbiology and Virology in the Medical School at the UFS partnered with the Free State Department of Health, the Medical Research Council and the Delegation of the European Union to South Africa, to fund a dedicated DNA sequencer that will be used to generate HIV and TB drug-resistance results. The new machine will enable cutting-edge research, and support patients with resistance strains to have access to advanced genotype testing techniques. The Free State province has been at the forefront of fighting HIV drug resistance in South Africa and has one of the most advanced treatment programmes for the management of resistance strains in the country. In addition UFS researchers are leading partners in the Southern African Treatment and Resistance Network (SATuRN), a research network that has trained over 2 000 medical officers in the treatment of drug resistance strains. //

New Professor in Physics



Prof Martin Ntwaeaborwa of the Department of Physics presented his inaugural lecture on 21 November on the topic 'Nanoscience and Nanotechnology: The pathway to rural electrification and low cost lighting'. //

JAN	FEB	MAR	APR	MAY	JUN
JUL	AUG	SEP	OCT	NOV	DEC

Farewell to Dean of Law



Prof Johan Henning, Dean of the Faculty of Law, delivered his farewell lecture titled 'From leonine to universal partnerships' on 2 December. This theme was the focus of his inaugural lecture and his later research. Prof Henning is an outstanding academic who has published widely and is the author of several textbooks. He is the editor of a number of journals and serves on the editorial board of several publications. He was director of the Centre for Comparative Partnership and Company Law at the Institute of Advanced Legal Studies of the University of London. He was appointed as African representative of CIDOEC, Jesus College, Cambridge and was the first South African to be awarded an honorary fellowship to the Society of Advanced Legal Studies in Britain, as well as the American Order of the Coif. //

Former Dean of Theology says goodbye



The former Dean of Theology and professor in New Testament studies, Prof Hermie van Zyl, bid farewell to the UFS on 3 December when he delivered his farewell lecture on 'Die historiese-literêre en teologiese aard van die Nuwe Testament' ('The historico-literary and theological nature of the New Testament'). //



RESEARCHERS FEATURED IN THIS REPORT

			Page
Bonnet	Dr Susan	bonnetsl@ufs.ac.za	40
Botes	Mr Riaan	botesr@ufs.ac.za	22
Burt	Prof Felicity	burtfj@ufs.ac.za	32
De Milander	Ms Monique	demilanderm@ufs.ac.za	42
Du Plessis	Prof Theo	dplesslt@ufs.ac.za	24
Engelbrecht	Dr Michelle	engelmc@ufs.ac.za	38
Heunis	Prof Christo	heunisj@ufs.ac.za	38
Hlalele	Dr Dipane	hlaleledj@qwa.ufs.ac.za	23
Hugo	Prof Arno	hugoa@ufs.ac.za	46
Jacobs	Ms Esti	jacobse1@ufs.ac.za	14
Kajimo-Shakantu	Prof Kahilu	kajimoshakantuk@ufs.ac.za	14
Kigozi	Dr Gladys	kigozign@ufs.ac.za	51
Le Roux	Dr Aliza	leroux3@qwa.ufs.ac.za	28
Louw	Prof Vernon	louwvj@ufs.ac.za	52
Luyt	Prof Riaan	luytas@qwa.ufs.ac.za	12
Mahlomaholo	Prof Mahlomaholo	mahlomaholomg@ufs.ac.za	18
Matebesi	Dr Sethulego	matebsz@ufs.ac.za	26
McLaren	Prof Neal	mclarenn@ufs.ac.za	44
Opperman	Dr Dirk	opperdj@ufs.ac.za	51
Pretorius	Prof Loot	pretorjl@ufs.ac.za	27
Pretorius	Prof Seef	pretorcj@ufs.ac.za	48
Rammile	Dr Nthabeleng	rammilen@ufs.ac.za	52
Roelofse	Dr Freddie	roelofsef@ufs.ac.za	54
Scott	Prof Louis	scottl@ufs.ac.za	8
Sebolai	Dr Olihile	sebolaiom@ufs.ac.za	37
Smith	Prof Bradley	smithbs@ufs.ac.za	54
Thekiso	Prof Oriel	thekisoemmo@qwa.ufs.ac.za	49
Thom Wium	Dr Matildie	thomwium@ufs.ac.za	55
Tolmie	Prof Francois	tolmief@ufs.ac.za	30
Tredoux	Prof Marian	mtredoux@ufs.ac.za	7
Tsotetsi	Dr Cias	tsotetsict@qwa.ufs.ac.za	23
Van den Berg	Dr Cilliers	vdbergjp@ufs.ac.za	55
Van der Merwe	Dr Nerina	vandermerwenc@ufs.ac.za	34
Van der Watt	Dr Elmarie	vdwatte@ufs.ac.za	48
Van der Westhuizen	Prof Jan	vdwestjh@ufs.ac.za	40
Van Heerden	Prof Esta	vheerde@ufs.ac.za	10
Van Rooyen	Dr Deidré	griesd@ufs.ac.za	25
Van Soelen	Dr Brian	vansoelenb@ufs.ac.za	53
Venter	Ms Anita	ventera@ufs.ac.za	20
Von Eschwege	Dr Karel	veschwkg@ufs.ac.za	16
Walubo	Prof Andrew	waluboa@ufs.ac.za	36
Wilhelm	Dr Anke	wilhelma@ufs.ac.za	40
Wilson-Strydom	Dr Merridy	wilsonstrydommg@ufs.ac.za	53

CONTACT US

MANAGEMENT

Vice-Rector (Research)

Prof Corli Witthuhn  
E-mail: witthuhnrc@ufs.ac.za

Vice-Principal: Academic and Research (Qwaqwa Campus)

Dr Elsa Crause  
E-mail: crauseej@qwa.ufs.ac.za

DIRECTORATE RESEARCH DEVELOPMENT

Website: <http://research.ufs.ac.za>

Senior Director

Dr Glen Taylor  
E-mail: taylorgj@ufs.ac.za

Deputy Director (Innovation and Business Development)

Mr Werner Nel  
E-mail: nelpw@ufs.ac.za

Assistant Director (Research Development)

Mrs Eleanor van der Westhuizen  
E-mail: vdwesthd@ufs.ac.za

FACULTIES

Faculty of Economic and Management Sciences

Website: <http://econ.ufs.ac.za>  
Dean: Prof Hendri Kroukamp  
E-mail: kroukhj@ufs.ac.za

Faculty of Education

Website: <http://edu.ufs.ac.za>  
Dean: Prof Dennis Francis  
E-mail: francisd@ufs.ac.za

Faculty of Health Sciences

Website: <http://health.ufs.ac.za>  
Dean: Prof Gert van Zyl  
E-mail: vanzylgj@ufs.ac.za

Faculty of the Humanities

Website: <http://humanities.ufs.ac.za>  
Dean: Prof Lucius Botes  
E-mail: boteslj@ufs.ac.za

Faculty of Law

Website: <http://law.ufs.ac.za>  
Dean: Prof Caroline Nicholson  
E-mail: nicholsonc@ufs.ac.za

Faculty of Natural and Agricultural Sciences

Website: <http://natagri.ufs.ac.za>  
Dean: Prof Neil Heideman  
E-mail: heidemannj@ufs.ac.za

Faculty of Theology

Website: <http://theology.ufs.ac.za>  
Dean: Prof Fanie Snyman  
E-mail: snymansd@ufs.ac.za

UFS Business School

Website: <http://bus.ufs.ac.za>  
Director: Prof Helena van Zyl  
E-mail: vanzylh@ufs.ac.za

POSTGRADUATE SCHOOL

Website: <http://postgraduate.ufs.ac.za>  
Director

Dr Henriëtte van den Berg  
E-mail: vdberghs@ufs.ac.za

PRESTIGE SCHOLARS' PROGRAMME

Website: <http://research.ufs.ac.za/content.aspx?uid=28>

Co-Directors

Prof Jackie du Toit  
E-mail: dutoitjs@ufs.ac.za  
Prof Neil Roos  
E-mail: roosnd@ufs.ac.za

Prof Corli Witthuhn  
E-mail: witthuhnrc@ufs.ac.za

INTERNATIONAL AFFAIRS

Website: <http://supportservices.ufs.ac.za/content.aspx?id=189>

Assistant Director

Mrs Dineo Gaothiwe-Ingram  
E-mail: gaothiwed@ufs.ac.za





**RESEARCH @**  
THE UNIVERSITY OF THE FREE STATE

**CELEBRATING  
PARTNERSHIPS  
// 2013**

[www.ufs.ac.za](http://www.ufs.ac.za)

UNIVERSITY OF THE  
FREE STATE  
UNIVERSITEIT VAN DIE  
VRYSTAAT  
YUNIVESITHI YA  
FREISTATA



**UFS  
UV**