



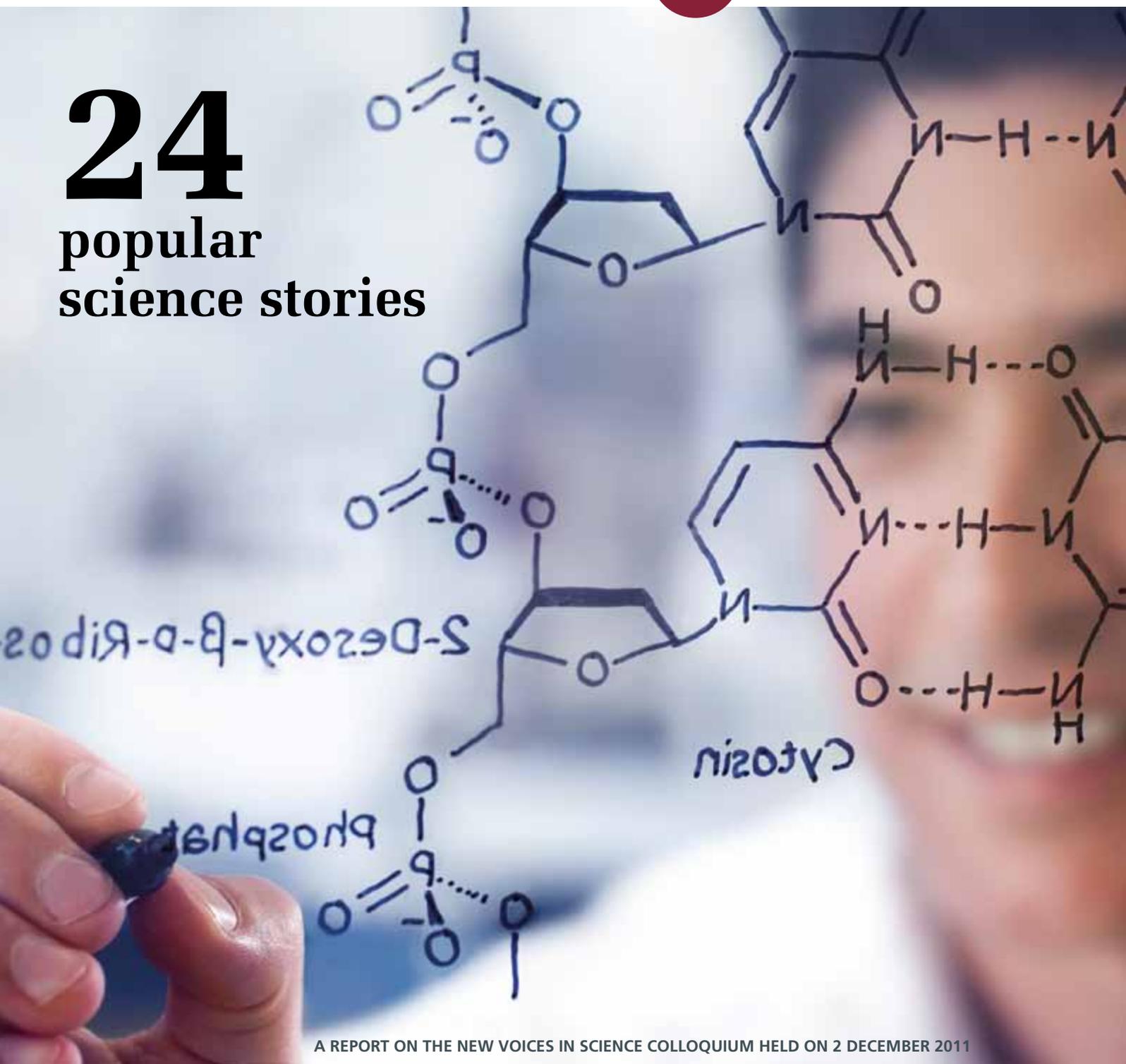
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Russel Botman
Rector and Vice-Chancellor

“ I am once again reminded that few things give humankind as much hope as science.

foreword



We believe that sharing science creates a strong democracy in which citizens empowered by scientific knowledge can meaningfully participate in decisions affecting their lives.

In 2011, we selected 24 of our graduating PhDs and trained them in science communication skills, encouraging them to make their findings easy to understand and to reflect on the relevance of their research for society. The process culminated in the New Voices in Science colloquium, as far as we know the first event of its kind in South Africa. Each scientist was challenged to reveal their research findings to a lay audience in just 10 minutes.

This publication is the printed version of their efforts, and contains a mixture of reports on the colloquium, interviews with the scientists as well as opinion pieces written about their work.

The event was such a success that we have decided to make it an annual occurrence. We are committing ourselves to ensuring that young researchers leave Stellenbosch University with more than a degree; armed with the ability to share their research with decision makers and the general public, to the benefit of society.

From the feedback I received from the students and the organisers of the event, I gather that this is not an easy task, as scientists are traditionally trained to communicate only with their direct peers, well versed in the technical jargon of their field. We believe that sharing science creates a

strong democracy in which citizens empowered by scientific knowledge can meaningfully participate in decisions affecting their lives.

Reading through this document, I am once again reminded that few things give humankind as much hope as science. This is in line with how we see the role of science and higher education at Stellenbosch. We think universities have a responsibility to be relevant to people’s needs. This conviction of ours is captured in our HOPE Project, which entails that we use our academic excellence and cutting-edge research to tackle societal challenges and promote human development.

In these pages you will find young scientists pushing the boundaries of the possible, harnessing their research efforts to solve the complex and multifaceted challenges faced by society today.

We hope that you will enjoy and be enriched by what you read here, and we hope to see you at the 2012 New Voices in Science event.

Prof. H. Russel Botman
Rector and Vice-Chancellor



MARULA

could mean money for peasant households

The people of Bushbuckridge have been conserving, cultivating and using marula for decades.



Peasant households own potentially valuable natural resources, indigenous knowledge and labour sources.

Peasant households near Bushbuckridge use their indigenous knowledge about the marula tree and its fruits to lift themselves out of poverty. They are showing government that they are not satisfied to merely receive hand-outs, but that they want to create sustainable and economically viable opportunities for their families.

The people of Bushbuckridge have been conserving, cultivating and using marula for decades.

Recent years have seen the commercial processing of the marula fruit into the well-known Amarula cream liqueur, pharmaceutical products and cosmetics that have reached international markets. However, the marula tree itself has never been commercially farmed. Local peasant households are at the heart of the lucrative and growing marula industry. They draw on indigenous knowledge and social networks, and are responsible for the propagation, harvesting and supply of the fruit and other useful parts of the marula tree.

But widely accepted economic theories and current government approaches to rural development are preventing these key players from reaping the benefits of commercialised marula production.

This is the opinion of Dr Vuyo Mahlati who received her doctorate in public development in December 2011 for research on the role of peasant household in the sustainable commercialisation of marula.

Dr Mahlati relates how the chairperson of a Marula Committee in Bushbuckridge, Mrs Mabuyi, explains their traditional production system, “We look after the trees, and we plant them, harvest them, clean and sort them. We use wheelbarrows to transport marula to our households and collection points, and then collectively hire cars to take them to the central point.”

The marula committees even ensure resource conservation by organising campaigns to stop people from chopping down trees.

“Despite production methods being pre-industrial, Mrs Mabuyi approaches her enterprise as an investor and entrepreneur, not as a survivalist,” believes Dr Mahlati. “Her supply strategy targets opportunities locally, and buyers for primary and secondary producers. She does long-term planning and has a long-term view, all in an effort to benefit from the poorly-managed ecosystem and imperfect markets.”

The result is deepening rural poverty despite escalating expenditure on rural development by government.

“These findings challenge the widely held view that peasant households are risk avoidant or that they are poor because they are backward and inefficient,” believes Dr Mahlati.

“These peasant households are value actors,” emphasises Dr Mahlati. “They are not just workers or employees, but employers themselves.”

The disregard of the productive and entrepreneurial potential of rural households has meant that government rural development programmes have focused on welfare and cash grants. Little or no attention has been paid to creating an enabling environment for them to join the mainstream economy, such as creating roads and other production infrastructure.

According to Dr Mahlati, these misguided government policies are based on current macroeconomic flow models, in which the firm or the factory is the productive centre, rather than households. The latter can only be providers of labour, the beneficiaries of wages and the consumers of products.

This approach has exposed peasant households to exploitative and paternalistic business relations. “The households absorb many production costs and associated risks that are not compensated for or rewarded by the buyers. They witness their buyers grow while they struggle to survive. The result is deepening rural poverty



despite escalating expenditure on rural development by government,” holds Dr Mahlati.

“We need a new approach for inclusive and sustainable rural economies,” she believes. “It should be an inclusive economic system that recognises and appreciates home production and the traditional sectors that serve local and particularly rural interests.”

“The household production centre must be connected with the industrial production centre to create an inclusive value chain model,” says Dr Mahlati, who is a senior advisor to government on economic and rural development and a member of the National Planning Commission. “There should be clear contracts between suppliers, producers and buyers.”

“Through the relationship between rural and urban, small and big, we can create new opportunities, new value and economic growth,” she believes.

Peasant households own potentially valuable natural resources, indigenous knowledge and labour sources. “They can strategically use commercialisation to secure sustainable livelihoods and prosper as industry players in the mainstream global market economy,” Dr Mahlati said.

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KNOWING CREATION: using faith in environmental education

From the coral reefs off the east coast of Africa to the graffitied streets of inner city neighbourhoods in England, young and old are drawing upon a fresh perspective to rethink the way in which they are living on this earth. They are using the environmental message of religion to encourage environmental awareness and action.

For many environmentalists, working within a religion framework was unheard of just 25 years ago. Religious leaders were seen as the least likely champions of climate justice, fair trade or environmental protection. However, today they are working hard to protect the planet and to educate people about the destructive impact which greed, rampant consumption and environmental mismanagement is having on

The neglect of religion in the environmental movement is a glaring omission and drowns out the voices, beliefs and knowledge systems of cultures and peoples, which could make an invaluable contribution to the environmental question.

the planet. Environmentalists are also discovering a language which millions the world over still value: the language of faith.

Ecological teachings, some suggest, have always been a part of many faith traditions and thus have great relevance today. The neglect of religion in the environmental movement is thus a glaring omission and drowns out the voices, beliefs and knowledge systems of cultures and peoples, which can make an invaluable contribution to the environmental question. Today, however, the green movement is beginning to acknowledge that religion

plays a vital role in shaping attitudes towards the environment. They are discovering religious resources which can be used to build a new ecological future. These include beliefs, religious practices, scripture, educational institutions, and a lived spirituality of simplicity, compassion and care.

Islam, the most under-researched of the faith traditions, has a lot to say about the environment, and Muslims across the world are beginning to act on this message. In Islam, the connection between belief and the struggle for social and ecological justice is expressed in an ecological ethic which seeks to

The religion and ecology movement, of which Islam is a part, is emerging as a vital partner in the green movement.

safeguard the welfare of all Creation.

Muslims have introduced the environmental teachings of Islam across the educational landscape, using traditional and new institutions to broadcast their green message. From the Friday sermon to the construction and upkeep of mosques, the mosque or masjid plays a central role as a centre of lifelong environmental education. In the maktab, young Muslims attending religious school audit the amount of water being used for ablution before prayers. This is done in an effort to ensure that water is not wasted. The technologically-savvy are accessing the growing number of blogs and websites devoted to the ecological message of Islam.

In South Africa, as these examples show, and across the world, Muslims are drawing on a range of institutions, old and new, to put the environmental message of Islam into action.

The religion and ecology movement, of which Islam is part, is emerging as a vital partner in green endeavours.

There are notable areas of commonality between the two movements: both look at the environmental question from a moral perspective, both acknowledge that the natural world has innate or intrinsic value; and both oppose the excessive consumption that is plaguing our planet.

Environmentalists and environmental educationists are finally listening to these messages. They are now using the language of faith, which maintains that it matters to care for the well-being of all Creation, human and non-human.

Dr Najma Mohamed received her doctorate in curriculum studies from the Faculty of Education in March 2012. She is a freelance environmental writer and researcher.

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The coincidence of WORMS and TUBERCULOSIS

Is it merely coincidence that in developing countries people infected with the bacteria that cause tuberculosis (TB) also often suffer from parasitic worm infections? This is the question that Dr Nelita du Plessis set out to answer as part of her doctoral research in medical biochemistry in the Faculty of Health Sciences. The interplay between these infections would make a lot of sense, given what scientists currently know about their influence on the immune system.

People who are infected with worms typically have what is known as a Type 2 immune response, whereas the bacteria that cause TB normally induce a so-called Type 1 immune response. "Each type of immune response sets in motion a different series of cellular activities in the body, which are aimed at ridding the body of the particular infection," Dr Du Plessis explains.

The two types of immune responses can counteract each other. "It would be reasonable to assume that a worm-infected body displaying a Type 2 response would be more vulnerable to the bacteria causing TB, which requires a Type 1 immune response," she says.

The results suggest that the immune cells of the lungs may play an important role in fighting off TB causing infections.

She tested the hypothesis on mice, and describes her findings as 'somewhat surprising'.

"We saw that mice that were co-infected with worms and the TB causing mycobacteria were better able to fight off the bacteria than those not infected with worms," she says of the findings, which showed an increase of an early immune cell-type known to engulf and kill mycobacteria in the lungs of the worm-infected mice.

"When these lung immune cells were transported to other mice that were not infected by worms, the rodents were better able to fight off mycobacteria," explains this postdoctoral fellow in the Department of Biomedical Sciences at Stellenbosch University. "This suggests that these lung immune cells could play a critical role in fighting off mycobacterial infections."

She is quick to add that this does not necessarily mean that worm infections could be good for you or can be used as an effective way to curb the TB causing bacteria.

"One cannot necessarily generalise the results of this mice study to a human population," Dr Du Plessis cautions. "Also, we only found improved lung protection found in the worm infected mice during the early stages of infection, and not at later stages."

This study shows that co-infection with two unrelated pathogens could positively or negative influence the ability of a host to fight these infections. The results suggest that the immune cells of the lungs may play an important role in fighting off TB causing infections, which opens up a new avenue for further research.

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BRAIN INVASION:

The impact of HIV and child abuse



Researchers have shown that a history of childhood abuse can cause abnormalities in the functioning and structure of the brain.

How was the study done?

The study was conducted among 130 women, who were divided into four groups: HIV-positive women with and without a history of childhood abuse, and HIV-negative women with and without a history of childhood abuse. They underwent three assessments on two separate occasions, and were interviewed about their health, feelings and situation at home. They also underwent a series of pencil and paper tests, very much like IQ tests, to assess a range of abilities.

Current research shows that HIV infection can have a negative impact on brain functioning, as can child abuse. Researchers have shown that a history of childhood abuse can cause abnormalities in the functioning and structure of the brain.

What does this mean for South Africa, a country burdened not only by the HIV epidemic, but also an equally devastating and underreported epidemic of abuse against women and children?

Most of the studies on the effects of either HIV or a history of child abuse on the brain have been conducted in countries other than South Africa. In addition, no studies to date have looked at the combined effect of HIV and child abuse on cognition in women.

My doctoral studies in health sciences set out to provide local knowledge on the subject, by investigating the effects of HIV and

childhood abuse on neurocognition, both separately and in combination, in South African women.

The findings showed that women infected with HIV/Aids performed weaker on immediate learning, memory recall, and executive functioning compared to uninfected women. Executive functioning includes brain processes such as attention and concentration, planning, problem solving, reasoning, inhibition, mental flexibility, multi-tasking, and monitoring of actions.

In women who reported a history of child abuse, poorer memory recall was also documented in comparison to their non-traumatised counterparts.

Although evidence was found for individual effects of HIV and child abuse on cognition, no proof was found that the combination of HIV and child abuse had a greater impact on cognition.

Contrary to expectation, women who were dually affected with HIV and childhood abuse did not perform worse compared to women who were influenced by only one of these conditions.

This could be attributable to the inclusion of relatively healthy, asymptomatic HIV-positive women and less severely traumatised women. Further investigation of the interaction between HIV and child abuse is therefore warranted.

Dr Georgina Spies received her doctorate in psychiatry (Faculty of Health Sciences) in December 2011. She is a postdoctoral fellow in the Department of Psychiatry at Stellenbosch University.

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2 languages in 1 MIND

Effects of the second language on the first in higher education

It is much easier said than done to study the effects of increased exposure to a second language on the first language of students at higher education institutions.

“This question is especially relevant in South Africa, because the majority of the students in our higher education system do not receive their training in their first language,” says Dr Marcelyn Oostendorp, who received her doctorate in general linguistics in March 2012.

She wanted to find out what the effects of increased exposure to English in a teaching and learning context was on Afrikaans first language speaking students’ academic literacy, and on their general academic achievement as a whole.

Dr Oostendorp looked at first year students who are bilingual and speak both Afrikaans and English, who had Afrikaans as dominant language, and who were educated in Afrikaans during their primary and secondary education. She divided this group into students taught in the medium of Afrikaans only and those who were taught the same course partially in English. The latter is an option available for some courses at Stellenbosch University. She found no significant differences between the two groups. “Increased exposure to English did not make a significant difference in the academic literacy in the first language or general academic achievement of these first year students”, she summarises her preliminary findings.

Dr Oostendorp argues that her research highlights the limitations of current research methodology on multilingualism. A standard approach

in investigating the effects of one language on another is to establish two groups: one group with exposure to the second language and the other without, she explains.

“However, I could not control how much input my research subjects got in English outside of the classroom, or through the use of English textbooks and learning material,” Dr Oostendorp sums up some of the curveballs she was thrown as part of the study. “Where does one find nowadays, for instance, South Africans who have not yet been exposed to English?”

“It is simply not true anymore that multilingualism is a rare phenomenon, that input in the second language is restricted to classroom settings, and that you can study multilinguals by comparing them to monolinguals,” Dr Oostendorp explains why she

Increased exposure to English did not make a significant difference in the academic literacy in the first language or general academic achievement of these first year students.

believes that standard approaches need to be updated.

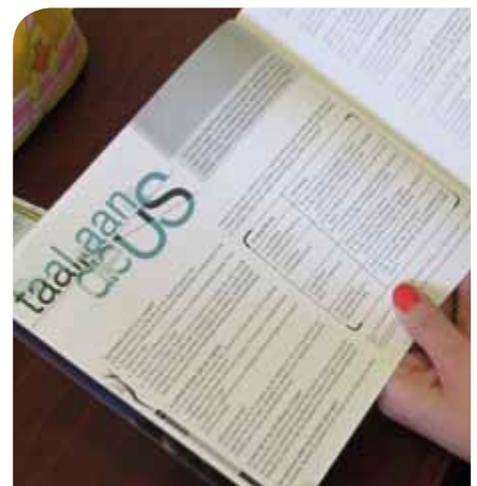
“We should not shy away from the problems and the ‘messiness’ of this topic,” believes this researcher from the Department of General Linguistics at Stellenbosch University. “We cannot transplant models and theory as is, but need to adjust them to the context we are working in.”

“Only then can we truly learn more about how two languages work in one mind,” concludes Dr Oostendorp.

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What does current research say about multilingualism?

- Multilingualism is not a rare phenomenon, with half of the world’s population being at least bilingual.
- Very few multilinguals know the two languages they have access to ‘perfectly’ or are able to use the two languages 100% in all contexts.
- Multilinguals code-switch for a variety of reasons. Students in Dr Oostendorp’s study said they used it as a learning strategy.
- Children raised as multilinguals tend to mix their languages more when communicating with other multilinguals. However, when they communicate with someone who is not multilingual they tend to mix their languages much less.
- Children seem to be better language learners than adults and the age at which somebody learns a second language seems to play an important role in the level of proficiency they will achieve in the language.
- Languages that are not used can attrite, but can also be re-learned again.



The Good, the Bad and the Ugly

Arts Journalism at *Die Burger* (1990–1999)



The famous 1960s spaghetti-western movie featuring the legendary Clint Eastwood, *The Good, the Bad and the Ugly*, is part of the popular culture framework of millions of people world-wide. This is in no small part due to the role played by the media in general, and arts and entertainment journalism in particular.

Arts journalists play a role in not only what we get to see and talk about in terms of arts, culture and entertainment, but also to an extent on what we think and feel about those offerings – and eventually about our own culture.

Arts journalists are very much like

the self-appointed sheriffs of taste who tell you what you should regard as ‘good, bad or ugly’. As the Taste Police of the media they stand with their mighty pens at the ready to draw the line between the so-called ‘culture culture’ and ‘vulgar culture’.

Why, for instance, do the current arts and entertainment pages of our main regional newspapers cover each and every Hollywood movie, but only very occasionally make mention of movies made in other parts of the world? South African movies often only get wide local exposure after they have received international acclaim – such was the

case with *Tsotsi* after it won an American Oscar in 2006.

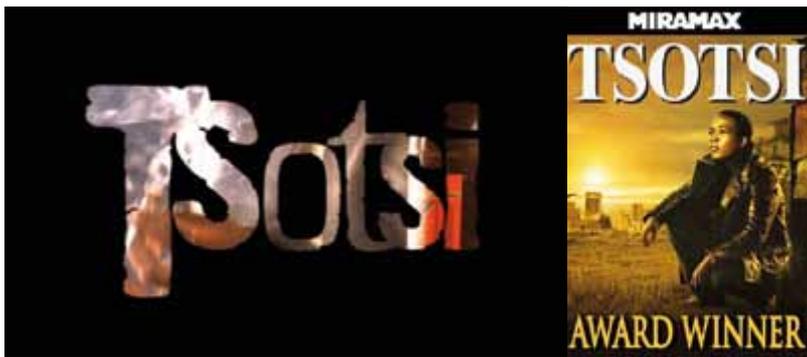
As a former arts editor of the Western Cape Afrikaans newspaper *Die Burger* until 2006, I speak from personal experience. After 15 years at the publication, I was well versed in the joys, responsibilities, limitations, and frustrations of arts journalism. Back then, I agreed whole-heartedly with commentators who said that arts journalism was in a ‘state of crisis’ for reasons such as that too much attention was given to the bottom line and to the so-called celebrity culture.

It was only when I joined academia

and became familiar with media studies literature that I started to consider the greater consequences of what I had heard, seen and experienced.

What really happened to arts journalists and their readers in the turmoil of a South African society in transition from apartheid to democracy in the 1990s, a decade that included the release of Nelson Mandela, the first inclusive elections and the controversial Truth and Reconciliation Commission? I was

art and culture could not be too popular or commercial, or it would run the ironic risk of losing its claim to quality and authenticity. In Afrikaans popular music circles, the so-called alternative artists were often preferred to mainstream commercial ones – regardless of production and technical quality – because of their more politically engaged nature. This was done in an effort to preach to conservative Afrikaners to move to the political and cultural left.



Whatever their exact influence, arts journalists had power and they did make a difference. To suggest otherwise is to ignore the important role of arts and culture communication in defining who and what we are – and most importantly – what we dream of.

there when history was made, but so involved in the day-to-day production cycle that the passing years had become a blur (with a by-line!).

Arts journalists (a very male dominated group back then) often displayed clear liberal sentiments (especially when compared to the more conservative political desk), which was apparent from their efforts to cover previously excluded and marginalised black artists and art works and in their support for a general discourse of reconciliation.

However, they were also taste cowboys. Although arts journalists deny that they had a gung-ho approach to their work, they now in hindsight admit that they did not have criteria or judgements of taste. They often simply shot from the hip.

Consider for instance how arts journalists in general decided on the quality of arts, culture and entertainment offerings. Popular

Arts journalists walked the badlands of the 1990s in search of order and structure amidst the changing of the guard. They at times sided with the lingering Western empire, but on other occasions they tried to suggest a fresh new African dawn to their managers, editors and readers.

Whatever their exact influence, arts journalists had power and they did make a difference. To suggest otherwise is to ignore the important role of arts and culture communication in defining who and what we are – and most importantly – what we dream of.

Dr Gabriël Botma received his doctorate in journalism in December 2012. He is Chair of the Department of Journalism at Stellenbosch University.

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Picking and placing without fingers

Researchers who are developing micro-sized grippers to handle micromaterials have taken a page out of nature's book to overcome many of the giant obstacles they face.

Precision engineering with objects hardly visible to the human eye is one such challenge.

"Manipulating the naturally occurring Van der Waals forces between microobjects can make them much easier to handle," is the solution offered by Mr Stephen Matope, who is busy with his PhD research in industrial engineering.

Van der Waals forces are the sum of the attractive or repulsive forces between molecules or parts of the same molecule.

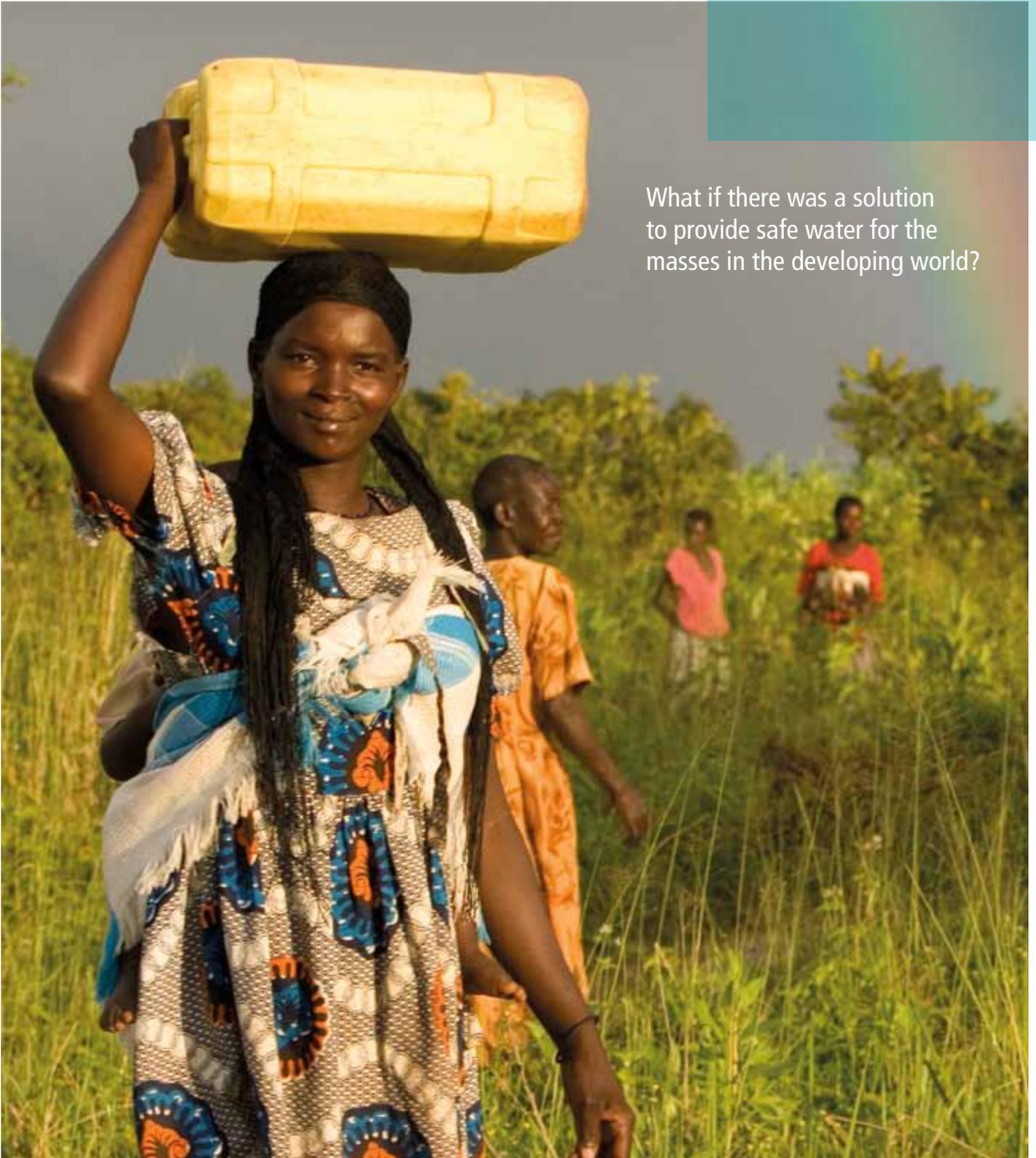
It is the same principle that is in action when geckos effortlessly scale sheer surfaces.

Attraction is clearly advantageous when trying to pick up a tiny object, but becomes a problem when it is time to release the piece. "When picking up a work piece the Van der Waals forces should be high, but when releasing the forces should be low," Mr Matope explains.

Van der Waals forces are affected by the shape, surface roughness and material type of the interacting objects. "By simply paying attention to the texture and shape of work surfaces and the microgripper you are using, you can greatly improve the effectiveness with which you handle micromaterials," believes Mr Matope.

The advantages of using Van der Waals forces are that they are applicable to all materials, can work in a vacuum, can work in aqueous conditions, do not require an external energy source, and are suitable for the micromaterial handling of sensitive electronic microchips. They also do not leave residual charges, stresses, strains or oxide layers on the interacting materials.

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What if there was a solution to provide safe water for the masses in the developing world?

Filtering water, bringing HOPE

Imagine an HIV positive woman in the Eastern Cape, whose life depends on her having access to clean water. This woman travels for kilometres every day, in most cases with a toddler on her back while carrying 30 litres of water on her head.

What if there was hope for such people? What if there was a solution to provide safe water for the masses in the developing world?

Making water accessible to such people was the main motivation for my study.

Clean safe drinking water is a basic human need and yet to date more than a billion people around the world spend an entire day searching for it. Shockingly, one child in the developing world dies every 17 seconds because of a waterborne ailment.

With the added challenges of HIV/Aids, climate change and the increasing population, this problem is only going to get worse in especially sub-Saharan Africa.

The United Nations has committed to provide safe drinking water to the developing regions of the world by 2015. However, at the current rate of delivery, it will take until 2040 to fulfil this goal.

A lack of skills and infrastructure simply makes it impossible to implement conventional water treatment techniques. Furthermore, dwellings of rural communities in the developing world are scattered over wide areas, which makes it almost impossible to pipe water from centralised purification systems.

The challenge is to create viable point-of-use systems that can provide safe drinking water, readily available at any time and place within these areas.

At Stellenbosch University nano-sized fibres were used to produce water purification filters. These have the potential to not only destroy bacteria that come into contact with the fibres, but also to repel attachment by these bugs. These filters were prepared from environmentally friendly and easily accessible materials and were investigated for possible application in water purification.

This was done on a small scale but showed potential for industrial scalability. Results from this study show that, with a few further improvements, these filters can be applied in

point-of-use systems. It has the potential to bring hope to the billion people around the world who lack access to safe water.

Dr Nonjabulo Gule received her PhD in polymer science in March 2012. This postdoctoral fellow in the Department of Chemistry and Polymer Science at Stellenbosch University was part of the research team that worked on the development of the so-called "tea bag water filter".

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“ I’ve been on your land for so long: now it’s mine ”

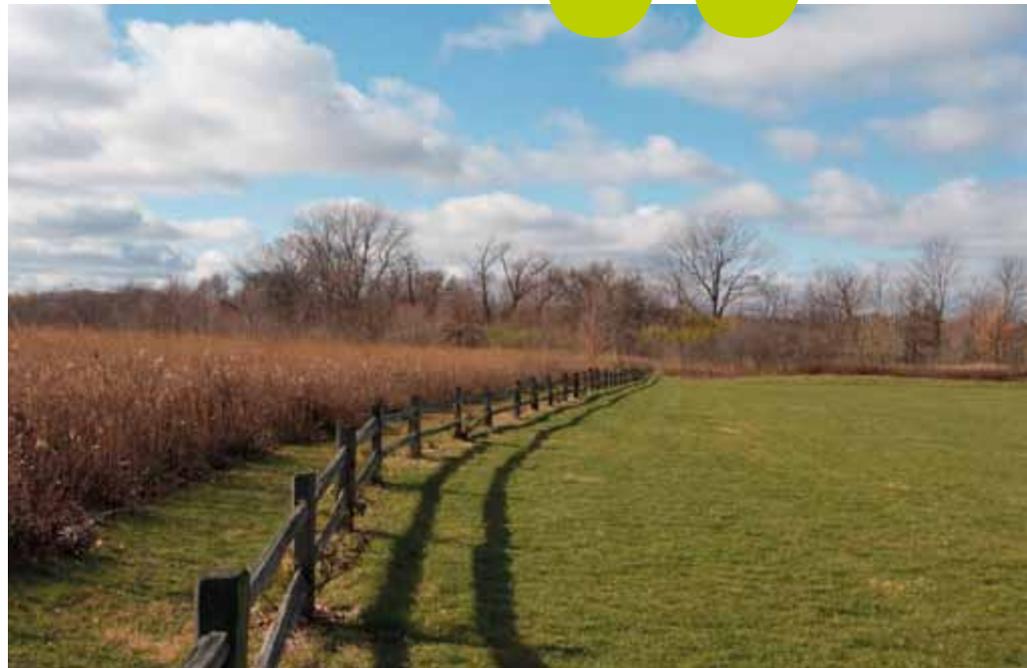
CASE STUDY **Acquisitive prescription**

Pye, a British private company, owned 25 hectares of land. It rented the land to Graham, the owner of a farm right next to the property.

The lease came to an end after some years. Graham attempted to conclude a new contract, but Pye did not respond. Pye wanted to apply for permission to develop the land at a later stage and therefore did not want a lessee on the land. Graham continued to farm the land for 12 years as part of his property, hoping that Pye would ultimately agree to a new lease contract. He effectively used the land without the company’s permission. Pye knew this, but never gave permission nor attempted to stop the farmer from doing so.

Graham went to court at the expiration of this period and claimed that he had become owner of the disputed land. The British courts found in his favour based on the rule of acquisitive prescription (‘prescription’).

Most people regard ownership of land as absolute and think that they can only lose property by parting with it voluntarily. However, this is but a half truth in terms of the legal term ‘acquisitive prescription’, which has its roots in ancient times and promotes legal certainty and punishes neglectful owners.



South African law is clear on the requirements for prescription: Someone must possess your land with or without your knowledge but without your consent (in the form of a lease or mere grant) for an uninterrupted period of 30 years. It is therefore much more difficult to lose one’s land in South Africa than in Britain.

Is it still possible to adequately justify prescription in line with South Africa’s Constitution?

Our Constitution stipulates that ownership may only be limited by law if such limitation is not arbitrary. In other words, there must be sufficient reasons for the limitation in question.

Say you ‘allow’ someone to occupy your farm in northern Limpopo for at least 30 years without ever entering into a contract with the occupier, evicting him or preventing the use of your land. For three decades – a whole

generation in essence – you induce the occupier (as well as third parties like banks and prospective purchasers) to believe that he rather than you is the true land owner. ‘Allow’ in this context means not interfering or granting permission. Someone staying on your land with your permission does not satisfy the requirements of prescription.

Prescription promotes economic efficiency and legal certainty, as it ensures that long-term possession and ownership coincide.

It also ensures the marketability of land. It allows potential buyers or other interested parties to disregard incorrect information in the register that predate the period of prescription, since a person can acquire land through prescription without registration in the register. Indeed, acquisitive prescription helps to “quiet titles” in situations where the formalities were not adhered to in the

Prescription promotes economic efficiency and legal certainty, as it ensures that long-term possession and ownership coincide.

transfer of land (such as registration), as it confirms ownership of the long-term possessor.

Prescription also ensures that the scarce commodity of land is used effectively. It confirms the ownership of occupiers who use land productively in the absence of a neglecting owner. This gives assurance to hardworking occupiers who can become owners of land after using it productively for 30 years. The acquisition of the land by the occupier is likely to be of much greater value to him than would be the feeling of loss to the owner, who has not looked after the property for three decades.

However, one cannot lose ownership through simple neglect, but only by ‘allowing’ someone to possess and use the land uninterrupted for 30 years.

These might seem like harsh measures. However, it is extremely difficult to satisfy the legal requirements of prescription. Owners can prevent time from accumulating in favour of the occupier through simple acts such as merely granting permission or evicting someone at any stage.

These difficult requirements create a balance between the limiting effect of prescription, namely the loss of ownership, and the purpose it aims to achieve, namely to promote certainty of ownership and to enhance economic efficiency. Therefore, prescription is clearly in line with the South African Constitution.

Dr Ernst Marais received his doctoral degree in public law in December 2011. He is a postdoctoral fellow in the Department of Public Law at Stellenbosch University.

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Eliminating pedestrian pushing and shoving

For South Africa’s half a million rail commuters, negotiating their way around train stations are nothing less than an extreme sport of pushing and shoving – all in an effort to find a seat on a train.

“Our station facilities are far from ideal,” believes Dr Laurent Hermant, who studied the behaviour of pedestrians as part of his recent doctoral research in civil engineering.

“I’m surprised that there are not more cases of rail commuter rage. Railway stations must accommodate ‘pulse-like’ passenger volumes. A single train can typically offload approximately 2 200 passengers. Existing guidelines for station design use outdated approaches, which lead to station facilities that are either too big, at unnecessary cost, or are too small, inconveniencing people that make use of public transport,” he says.

In his study, Dr Hermant observed the movements of pedestrian crowds on the platforms and stairs of various railway stations. He developed a simple to use Spatial Parameters (SP) model to test station designs and to help avoid pedestrian traffic jams within its confines.

The model was developed in MS-Excel and calculates pedestrian flows and densities in parts of the station as trains arrive and depart. It takes into account aspects such as the train schedule, boarding and alighting passenger volumes and the dimensions of a particular station.

“It will help authorities to quickly check and adjust new designs, or to identify bottlenecks in existing railway stations, while it can also provide ‘first-order’ design spatial parameters to engineers to further assess by microscopic modelling means,” believes Dr Hermant, who works as a professional engineer at Goba Consulting Engineers and Project Managers. The model can also perform an evacuation assessment of the station as a final but necessary check.

The study also took levels of service into account. It recommended that local rail authorities do not simply adopt Western pedestrian design standards, but that they should rather design stations around local conditions and cultures.

“Depending on the region, pedestrians seem to have different levels of tolerance for pushing or physical proximity.” Dr Hermant says of the site and regional differences in pedestrian flow he observed.

South African rail commuters are generally similar to their Western counterparts as opposed to Asian nationals in their preference for more personal space. However they seem to tolerate pushing more readily than Western or Asian pedestrians do.

“Given their preference for personal space, this could be attributable to them being accustomed to crowding and physical contact on a daily basis, rather than this being the preferred situation,” Dr Hermant believes.

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Sugar fibres can fuel industry



Some varieties of sugarcane are better than others – especially if you want to use their fibres to fuel the growing ethanol industry.

That is part of the findings of the doctoral degree research in chemical engineering being conducted by Mr Yuda Benjamin, in association with Dr Hongbin Cheng and Prof Johann Görgens from the Department of Process Engineering at Stellenbosch University. It helped him to identify the most cost-effective varieties of sugarcane to use in the production of ethanol from sugarcane fibres.

Mr Benjamin evaluated 115 varieties of sugarcane in terms of the amount of sugar that is released from the fibres. He also tested them at various levels of pretreatment and enzymatic hydrolysis.

Based on his findings, Mr Benjamin produced practical screening criteria that the agricultural and biofuels sector can consider.

“Ethanol is widely regarded as one of the alternative fuels that could one day replace fossil fuels such as

petrol,” Mr Benjamin says. “Fuel made from plants is our future, and will help us create sustainable employment and improve agriculture.”

Ethanol is traditionally produced from high-cost sugars, such as the sucrose found in sugarcane, or from starch found in grains such as maize and wheat. Sugarcane is a preferred crop for ethanol production because of its high productivity per unit land and its high sugar contents.

“We must make more use of the low cost carbohydrates available in agricultural residue such as corn cobs and sugarcane fibres to boost our ethanol industry and to see it grow into the next decade,” says Mr Benjamin. “By using residue, you do not impact on food production.”

Mr Benjamin studied how additional ethanol can be produced by using the fibre residue that is left once the sweet juice is extracted from sugarcane.

Sugarcane fibre, like other agricultural residues, is mainly composed of carbohydrates. However, it is quite difficult to access the carbohydrates

because it is protected by a gluey material called lignin. To convert the carbohydrates into simple sugars, the sugarcane fibres must first be put through an expensive pretreatment process to disrupt the structure. Once this is done, it has to go through another costly process called enzymatic hydrolysis which uses enzymes as a biological catalyst.

“By using fibres from sugarcane varieties that do not need so much pretreatment, we will be able to cut down on the cost involved in ethanol production,” he believes.

Mr Benjamin and his colleagues identified preferred sugarcane varieties which yield high productivity and high fermentable sugar, high fibre carbohydrate levels and low lignin levels.

He found that different varieties had different carbohydrate and lignin contents, and that their fibre composition was influenced by the breeding technology that was used.

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Using yeast to make crystal clear wine

Next time when you are lazily sipping on a clear glass of white wine, spare a thought for the efforts of researchers such as Ms Thulile Ndlovu to ensure that your favourite drink isn't only pleasing on the palate, but also on the eye.

"White wine clarity is crucial to the winemaker, because a bottle showing haziness is likely to be rejected by the consumer, even though this unattractive haze does not affect the taste and other wine quality characteristics," she says. "People will in all likelihood not drink murky-looking wine, even if you tell them that it is one of the finest wines ever produced."

A patent is already pending to protect the intellectual property generated by her doctoral degree research on wine haziness, which she is doing under supervision of Dr Benoit Divol and Prof Florian Bauer of the Institute for Wine Biotechnology at Stellenbosch University.

This student in the Faculty of AgriSciences says it is standard practice in the wine industry to address wine haze by using fining agents. These are added before bottling to adsorb insoluble particles such as proteins and to stabilise compounds that may form wine haze. Among the fining agents used are bentonite, egg whites, casein derived from milk, gelatine and isinglass obtained from fish bladders.

"Fining agents have their disadvantages, though, because their use is labour intensive and costly," says Ms Ndlovu. Bentonite, a type of clay, is by far the most commonly used agent, but results in loss of wine volume and may cause a loss of flavour and aroma compounds. It is also non-recyclable and cannot be reused.

"Other products are animal-derived, and have raised health concerns since they may cause allergies," she says. "Developing a viable alternative treatment to remove the grape proteins from wine prior to bottling would therefore be highly beneficial to the wine industry."

According to Ms Ndlovu, there are naturally occurring components in wine that reduce haziness. These protein-sugar compounds, called mannoproteins,

are found in the cell walls of yeast. They are released during yeast growth, for example during the fermentation of grapes and also on wines aged on lees. However, commercially available yeast strains tend to deliver too low levels of mannoproteins to effectively prevent haze formation.

In her research, Ms Ndlovu assessed various yeast strains, including some novel strains, for their potential to protect against haze. The research team's work on the use of a novel yeast strain, FB20, as starter cultures for fermentation or in yeast breeding processes, is currently being patented. Meanwhile, more studies will be needed to determine the impact of this strain in large scale fermentations simulating wine industry conditions.

"We now know that some new yeast strains are much better at protecting against haze than those currently used in the industry," she summarises her findings. "Our results show that wine haze formation not only depends on wine grape proteins, but varies according to the yeast strain used for fermenting the wines."

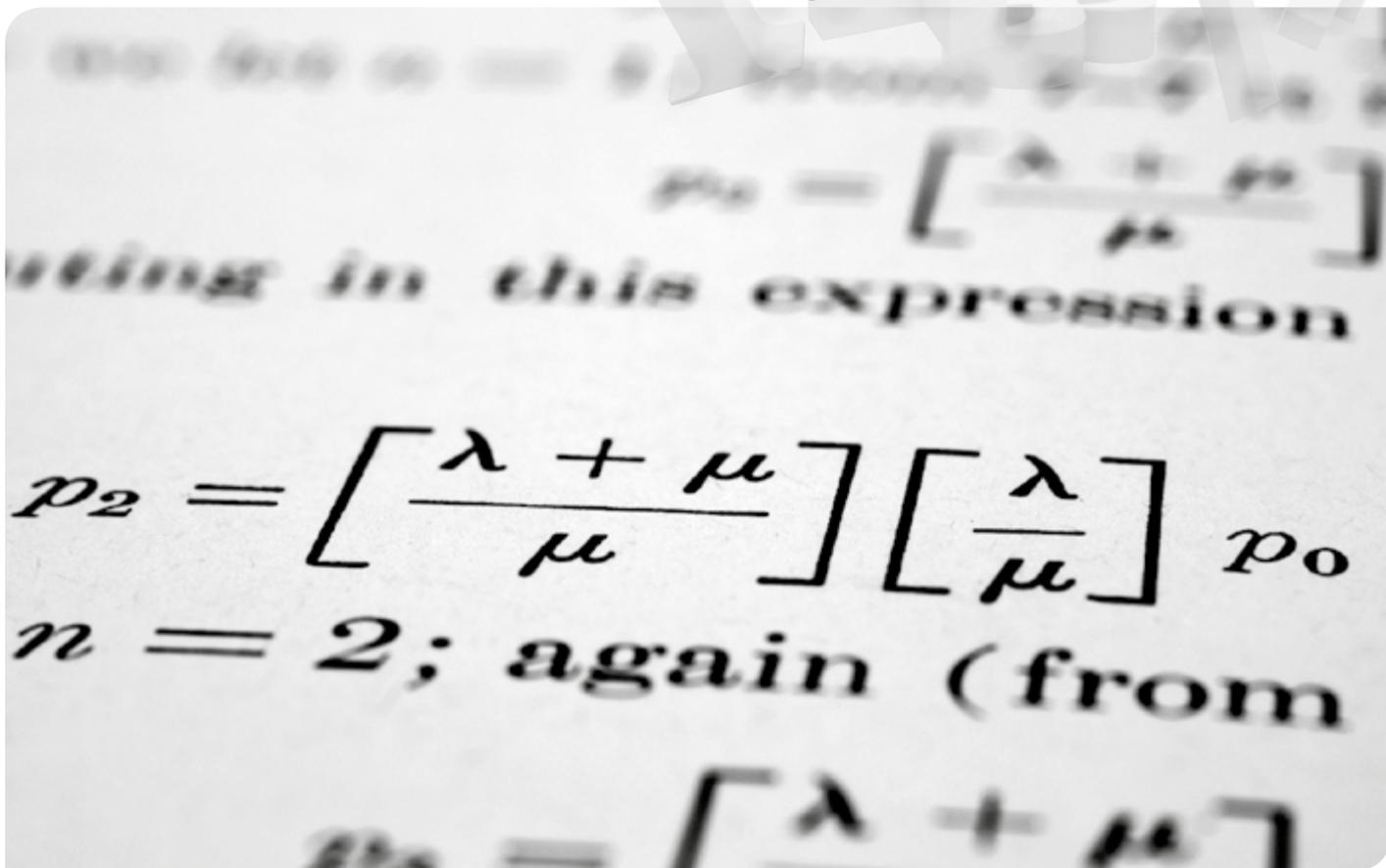
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Why bother about wine clarity?

Wine clarity refers to the amount of suspended particles in a wine and is used as a measure of quality. Wine haze or cloudiness results in great loss for the wine industry. It is caused when the grape proteins in wine interact with other wine components to form unstable structures. These clump together in such large molecules that they are visible as wine haze.

Naina knows his number (theory)



Many a PhD student might agree that the most difficult part of their studies is to explain to others exactly what they have spent years researching. In some study fields it's even harder to do so than in others, as only a select few people have delved deeply into their intricacies.

Just ask Dr Naina Ralaivaosaona. He received his doctorate in mathematics in March 2012 at Stellenbosch University for a study in number theory on limit theorems for integer partitions and their generalisations. These limit theorems are used to predict the number and

characteristics of smaller numbers that, when added together, make up a large number.

He isn't daunted at all by the fact that most people have no idea what his work is all about. Words such as 'fun', 'beautiful' and 'exciting' bubble through his conversation while he reminisces about the process of completing his research under supervision of Prof Stephan Wagner of the Department of Mathematical Sciences (Mathematics, Applied Mathematics, Computer Science).

These words are also often used when he tells about his unparalleled attraction to the field of mathematics since childhood, and how he would like to teach this subject to others as well. He says doing maths is 'like playing a game'.

"When I finished secondary school my brother and I had a little book with formulae in trigonometry," remembers Dr Ralaivaosaona, who hails from a little town called Ambositra in Madagascar. "We not only competed to prove all of them but started off by finding a geometrical proof for the

His dream is to become a researcher in maths and to also teach maths in his home country.



formula $\cos(a+b)=\cos(a)\cos(b)-\sin(a)\sin(b)$.”

Even though his father wanted him to become an engineer, Dr Ralaivaosaona chose to become an undergraduate at the University of Antananarivo, spending four years on mostly mathematics and physics. After being the top student for three years running, one of his lecturers encouraged him to follow the ten month postgraduate course at the African Institute for Mathematical Sciences (AIMS) in Muizenberg, Cape Town, in 2006.

“If you are a student in mathematics in Madagascar and you don’t have money, AIMS is the only hope you have to continue your studies,” he explains. After AIMS, he followed the Certificate of Advanced study in Mathematics, known as Part III, or Maths tripos, at Cambridge University.

His dream is to become a researcher in maths and to also teach maths in his home country. “So to have a

doctoral degree is one step nearer to achieving this goal,” he explains why he started his PhD studies at Stellenbosch University in June 2009.

He first came across number theory, the theme of his PhD research, in books he read in the AIMS library. “Number theory is a subject that is very attractive but also very challenging,” he explains. “Many branches of mathematics are contributing to it, and that is a beauty.”

“At first I was given problems that I thought to be unsolvable, but then I learned from people around the department to concentrate on one thing and to try really hard,” this 27-year old explains how he has matured during the process of completing his PhD.

He had the opportunity to present his work at specialised conferences and workshops in among others South Africa and Germany. When, however, he had to speak in front of a general audience at the first ‘Voices in Science’ PhD Colloquium at Stellenbosch University, he realised that ‘it couldn’t be business as usual’.

He opted not to focus on the intricacies of limit theorem and integer partitions, but to rather share the everyday aspects of maths that inspire him to use words such as ‘fun’, ‘exiting’ and ‘beautiful’. And it worked – this natural teacher had the audience hanging on his lips!

“It was valuable to learn how to present my work to different kinds of audiences, and how to publish my research,” believes Dr Ralaivaosaona, who is a teaching assistant at AIMS.

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Wood solutions

Scientists believe that they can build biorefineries in which plants can be converted into a viable alternative to fossil fuel. The difficulty, however, lies in how to adequately unlock the power trapped within the ‘wood’ of all plants.

Plants are made up of three compounds, namely cellulose, hemicelluloses and lignin. To be of value as raw material in biofuels production, these three compounds need to be extracted from plant material in such a way that they stay chemically and structurally intact.

As part of his PhD research in chemical engineering Mr Danie Diedericks is investigating which methods of extraction are the most effective and least wasteful.

In the dilute acid process, for instance, an acid such as sulphuric acid is used to extract hemicellulose from the wood. Because hemicellulose degrades easily, only parts of it remain useful after the acid treatment. Also, a solid and useless mixture of the other two compounds is left behind.

Mr Diedericks chose to focus on ionic liquid, which was recently discovered to have the ability to dissolve wood.

“Once the wood was dissolved we attempted to extract the three components, but this only worked for two of the three compounds,” Mr Diedericks remembers the process. “The unstable hemicellulose remained dissolved in the ionic liquids.”

While testing various methods, he stumbled on a novel method: a combination of the above two.

“First the hemicellulose is extracted with the dilute acid process, and then the remaining solids containing the other two compounds are subjected to the ionic liquid treatment and separation,” he explains.

This allows plant wood to be successfully separated into its three useful components, ready to be used further in the process of creating biofuels.

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Healthy ecosystems supply us with the goods and services that support human wellbeing. However, unsustainable human activities to meet the increasing demand for these goods and services have triggered unprecedented biodiversity losses.

We need to worry about biodiversity loss because our lives depend on it. The increase of the human population over the past six decades from 2.5 billion to 7 billion have forced rapid and extensive changes to ecosystems globally, largely in response to man's increasing demands for food, fresh water, timber, fiber and fuel.

Ecological restoration, which is practised widely in South Africa, presents an opportunity to reverse the damage we have caused. Admittedly, restoration cannot be considered simply as a substitute for the conservation of self-sustaining, healthy ecosystems. Where conservation alone is no longer feasible due to the advanced state of degradation, ecological restoration offers an acceptable alternative.

Successful and efficient restoration work must be based on the appraisal and use of evidence that show the effectiveness of alternative options. Evidence-based practice is emerging as the gold standard in conservation and related fields, including restoration. Part of my PhD research work in conservation ecology aims to assess the evidence-based approach, by focusing specifically on the evidence generation step of the process.

Baseline condition assessment, proper goal setting and sound monitoring of the impacts of interventions are essential conditions in generating evidence.

Several restoration programmes and projects in South Africa were investigated, while interviews with people involved in these initiatives and projects were also conducted. The findings show that there are several success stories in which good work is being done, but there are some areas of concern. For example, there is

Healing earth's damaged ecosystems

Ecological restoration, which is practised widely in South Africa, presents an opportunity to reverse the damage we have caused.



Baseline condition assessment, proper goal setting and sound monitoring of the impacts of interventions are essential conditions in generating evidence.

good collection of baseline information, but sometimes the information collected is not related to restoration goals and monitoring. Also, to some extent goals are poorly defined and there is limited monitoring of impacts. The study recommends that these gaps be addressed.

The proper generation, dissemination and use of evidence can help to heal damaged ecosystems effectively. Healing damaged ecosystems will,

in turn, ensure humanity's wellbeing, now and in the future.

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Blame your genes when drugs make you sick



Why study CYP2D6?

Cytochrome P450 2D6 is one of the most important enzymes involved in the metabolism of xenobiotics in the body. It produces an enzyme responsible for metabolising about one in every four currently prescribed drugs, including antipsychotic drugs that are used to treat schizophrenia.

Why is it that some of us can take medicines with no ill effects, while others seem to display the entire range of side effects described in the package insert? Are drugs tested on one population automatically suitable for all other populations?

These were the questions that Dr Galen Wright set out to answer as part of his doctoral research in genetics in the Faculty of AgriSciences.

“Recent research has shown that different reactions to medicines can partly be explained by our genetic make-up,” says Dr Wright, who graduated in March 2012. “Scientists have found that certain genes produce enzymes responsible for processing drugs in the body.”

It is the differences in these genes that can lead to different responses to drugs.

Thanks to commercially available genetic tests individualised treatment is possible, which reduces the risk of treatment failure as well as side effects. However, these commercially available tests have been designed for foreign populations and may not be currently suitable for use in all South African populations.

“African populations have been underrepresented in past research, with the majority of studies focusing on individuals of European and Asian descent,” says Dr Wright.

“Africa was the initial home of all human populations, and African people have the highest levels of genetic diversity worldwide,” he explains. “Therefore there might be genetic differences in African populations that are not included in current tests.”

Dr Wright set out to investigate whether there were undocumented genetic variations in a particular gene, called *CYP2D6*, in the South African Xhosa population. He also analysed schizophrenia patients in this population group, because *CYP2D6* is an enzyme that influences the successful use of the antipsychotic drugs in treating this psychological condition.

The study was done under supervision of Dr Louise Warnich of the SU Department of Genetics, and Prof Dana Niehaus of the SU Department of Psychiatry.

Dr Wright made two interesting discoveries. “We found that the mutation patterns of *CYP2D6* in the Xhosa population differ from that of other populations,” he says. “We also found novel *CYP2D6* genetic variation in some of the Xhosa schizophrenia patients.”

It was also found that 12.5% of the analysed Xhosa population either had no functional copies of *CYP2D6* or had more than two functional copies of the gene. “This means that they may not respond optimally to relevant medications being prescribed to them,” warns this postdoctoral research fellow at the South African National Bioinformatics Institute (SANBI).

“Our results emphasise that it’s not viable for all South African populations to use commercially available genetic tests that have been designed for foreign populations,” he sums up the findings, which were also published in the scientific journal *Annals of Human Genetics* in 2010.

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Cosmopolitanism

Islamic education and Muslim women: can we talk?

In order to understand the role of Muslim women in a cosmopolitan society, you need to understand Islam and Islamic education.

Muslim women, by virtue of their specific practices, shape a particular experience of their world, and the world of them. There is a particular (mis)conception of Muslim women, which has serious implications for identity, belonging, participation and democratic citizenship.

In recent case study research, I explored whether it is possible for Muslim women to enjoy a comfortable and equal relationship in a diverse or cosmopolitan society.

The research study was done within the Muslim community of the Western Cape. I found that diversity is not only found in a multicultural society such as the Western Cape, but also within the community of Muslim women themselves. This can be seen in how Muslim women show their identities, how they dress and how they express themselves from a less to a more compliant Islam.

One critical finding is how some Muslim women struggle to exercise their Islamic identity in a public space.

Shameema is teased by her community when she wears her *hijab* (head-scarf), since she is accused of betraying her African traditions. Yumna relates that Muslim women who wear it are looked



at and treated differently. Nadia, an accountant, draws a distinction between the professional treatment she receives from Muslim and non-Muslim males. She says that Muslim males do not regard her as their professional equal. Leila, a student in the hospitality industry, is forced to discard her *hijab* in order to find an internship. And as a gay Muslim woman, Thania has had to turn away from the traditional way in which she was raised, in order to reconcile her Islam with her sexuality.

What does a reformed approach to Islamic education look like, and what does this mean for Muslim women and men? How can Muslim women be accommodated within a cosmopolitan society, and how can a cosmopolitan society contribute to the practices of Muslim women? These questions all have implications for democratic citizenship education.

The link between Islamic education and cosmopolitanism lies in its treatment of others. What matters, though, is the extent to which the lived experiences of Muslim women and a cosmopolitan society are able to justly copy what a society based on democratic principles ought to look like.

One critical finding is how some Muslim women struggle to exercise their Islamic identity in a public space.

In my research on the philosophy of education, I found that the intent to understand the Muslim woman's educational context opens itself to many interpretations. This is a reflection of the different understandings of the practices of Islam both within and outside of cosmopolitanism. Cosmopolitanism, in taking note of these differences, and those of all others, has to focus on what we have in common, rather than what we do not.

The research was done to explore and interrogate the identity of Muslim women and their lived experiences in a post-apartheid society, and to understand whether a commensurable relationship with cosmopolitanism is possible. Although Muslim women serve as the basis and context of the research, the implications of this study are not limited to Muslim women.

Ms Nuraan Davids is completing her doctorate on the philosophy of education in the Department of Policy Studies at Stellenbosch University.

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INJECTABLE CONTRACEPTIVES: GOOD OR BAD?



In Ravensmead and Uitsig – two Cape Flats communities heavily burdened by tuberculosis (TB) – three in every five women prefer the so-called ‘three months’ injectable contraceptive Medroxyprogesterone acetate (MPA) to any other form of family planning.

Some studies have found that women who use MPA are more likely to contract HIV and have an increased HIV load in their vaginas. According to a recent article in *The Lancet*, injectable contraceptive use also increases the spread of HIV to male partners.

However, before Dr Léanie Kleynhans started her research towards her doctoral degree in molecular biology under the supervision of Dr Katharina Ronacher, no one had yet investigated the effect of MPA in the context of TB.

MPA is recommended for women with tuberculosis (TB) because unlike ‘the pill’, its efficacy is not reduced by anti-TB drugs.

However, MPA differs from other contraceptives in another important

way: it functions in a similar manner as the endogenous stress hormone cortisol.

“Stress has been shown to increase the risk of developing TB,” says Dr Kleynhans. “Since MPA functions similar to the stress hormone, we wanted to investigate the effect of this contraceptive on the immune system of women who are exposed to people with TB.”

She found that MPA limits the normal functioning of certain immune cells to the same extent as cortisol does. MPA users were also found to have lower levels of the immune cells called monocytes, which are one of the first cell populations to encounter bacteria and alert the immune system of the infection. How these changes affect women with TB still needs to be investigated, but mice injected with MPA had more TB causing bacteria in their lungs than untreated mice.

Preliminary tests on the injectable contraceptive Norethisterone (NET), which can also safely be used with anti-TB drugs, seem to suggest that

More on MPA

- Medroxyprogesterone acetate (MPA) also known as Depo-Provera or Petogen is an injectable contraceptive that works effectively for three months.
- It is the most widely used contraceptive in developing countries.
- At a cost of only R6,03 per injection, it is much cheaper to use than the two months injectable contraceptive Norethisterone (NET) or Nuristerate that costs R12,91 per shot.
- Unlike most oral contraceptives, the efficacy of MPA and NET is not reduced by anti-TB drugs.
- NET and MPA are both available at no cost to women at South African clinics.

this contraceptive does not have this same limiting effect on the immune system of a woman.

“NET could perhaps be recommended as an alternative for women with TB until further studies conclusively demonstrate whether MPA use has negative implications on TB disease severity,” believes Dr Kleynhans, a member of the SUN Immunology Research Group in the Department of Biomedical Sciences at Stellenbosch University.

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We believe that if young people are guaranteed adequate treatment, at appropriate low doses with an injectable, they will live better lives.

Schizophrenia is a brain disorder that usually develops in the late teens and early twenties. It is called “the greatest youth disabler” because it often prevents those affected by it from fulfilling their ambitions and dreams.

We believe that intervention early on can change the long-term outcome of a person living with schizophrenia. Therefore our research focuses on the first episode of schizophrenia that a person has, or on the period when a person is diagnosed with the illness for the first time.

Living with schizophrenia

CASE STUDY

Brenda suffered a mental breakdown during the last few months of her diploma studies at a local university. While she was doing her in-service training she started believing that people at work were plotting against her and that they were talking behind her back. She believed she overheard people outside her office saying bad things about her. She became extremely scared and anxious when on one occasion she believed she could hear her thoughts being broadcast over the PA system.

Her family sought help after she shared these strange experiences with them.

After a few weeks of seeing a team at Stikland Hospital near Cape Town, and getting appropriate treatment, Brenda became increasingly depressed and anxious as the reality of having schizophrenia dawned on her.

Ten years ago her brother was also diagnosed with schizophrenia. He was admitted twice to psychiatric hospitals after he became unmanageable at home. Thanks to taking his medication most of the time, he does not hear any voices any more, nor has strange beliefs. He is now ‘just chilling’ at home and not doing much with his life.

Luckily for Brenda, things have turned out remarkably well. She completed her in-service training a year after starting treatment. She now works in a banking institution. She continues with her monthly injections, has never had a relapse, and is engaged to be married.

What is schizophrenia?

Typical symptoms include hearing voices, having strange beliefs, a difficulty concentrating and poor short term memory.

New evidence suggests that if you can treat a young person with schizophrenia really well, you can change the future of that young person. This means there is increasing hope that people with schizophrenia can have long meaningful lives.

Until recently, those with schizophrenia had to take many tablets every day. Our research shows that young people with a first episode of schizophrenia can be successfully treated by using a long-acting

injectable antipsychotic that lasts two to four weeks.

These injectables were traditionally reserved for older people who have had many relapses and often had to be readmitted to hospital because they had stopped taking their medication. We now know, however, that this also happens to young people. Most of them tend to stop taking their medication as soon as they start feeling well.

Most of our patients' symptoms were significantly reduced after being treated with the injectable and they had minimal side effects. After a while they enjoyed the benefit of not needing to take tablets every day and being able to get injections from our clinic that last in their system for a few weeks.

We believe that if young people are guaranteed adequate treatment, at appropriate low doses with an injectable, they will live better lives.

The increasing prevalence of the drug tik in our communities is playing havoc on even the best treatment strategies.

However, the increasing prevalence of the drug tik in our communities is playing havoc on even the best treatment strategies. People with schizophrenia are particularly vulnerable to the side effects of tik. You simply cannot live well if you have schizophrenia and continue to smoke this powerful and cheap stimulant.

Dr Bonga Chiliza is completing his PhD in psychiatry in the Faculty of Health Sciences. He is a senior psychiatrist and lecturer in the Department of Psychiatry at Stellenbosch University.

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Is obesity really bad for the heart?

Obesity is a major health risk and is responsible for diseases such as insulin resistance, Type 2-diabetes and heart disease. However, scientists have recently been baffled by the so-called obesity paradox.

“Numerous studies over the past ten years have shown that obese patients with heart disease have a significantly better recovery rate than their lean counterparts,” says Dr Wenjun Fan, who is working towards his doctorate in the Department of Biomedical Sciences (Medical Physiology) in the Faculty of Health Sciences.

Dr Fan set about to investigate how the hearts of obese laboratory rats respond to heart attack.

“We wanted to know how these would differ from the responses of the hearts of normal weight rats,” he explains “We also wanted to investigate the respective roles of three enzymes that are associated with protection against a heart attack.” These enzymes are PKB, ERK and JNK (protein kinase B,

extracellular signal-regulated kinase, and c-jun-N-terminal kinase).

The results showed that the hearts of the obese rats functionally recovered better than those of the control group, and were significantly less damaged.

These changes were associated with increased activation of the enzymes PKB, ERK and JNK within the cell, suggesting a role for these enzymes in the recovery of hearts after a heart attack.

The enzyme JNK appeared to be of particular importance since when it was artificially inhibited, recovery was especially poor.

Dr Fan says his results confirm recent clinical trials, and highlights the possible positive role played by the three enzymes, in particular the enzyme JNK, in the beneficial effects of obesity on the heart's response to a heart attack.

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More to CONSERVATION than just gorillas



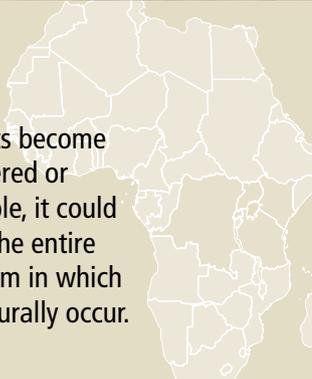
A whole conservation ‘industry’ was created after the release of the movie *Gorillas in the Mist* about Dianne Fossey’s studies on the gorillas of the rain forests. Unfortunately, the tourism income that has subsequently been generated thanks to people’s fascination with gorillas, has skewed the conservation priorities and regulations of Central East African countries to almost exclusively favour larger mammal species.

I am no Dianne Fossey and I doubt that anyone is going to make a movie of my research in the rain forests of Central East Africa any time soon. However, this is not necessarily because I lack star quality, but rather because my subjects do.

For the sake of conservation, however, it is just as important to study rodents as it is to research gorillas, if not even more so.

The presence of rodent species can tell conservationists a lot about the biodiversity of an area. The more rodent species that are found, the larger the variety of other plant and animal species there are likely to be. This is because each species has its own diet and habitat requirements.

If rodents become endangered or vulnerable, it could impact the entire ecosystem in which they naturally occur.



Rodents are far more numerous than gorillas and other larger mammals. They are found over a larger area, which enables the measurement of biodiversity on a much greater scale.

Rodents are not simply an indication of biodiversity to be used to reflect on the health of a particular ecosystem. They actually play a very direct and active part in maintaining the natural ecosystem. It is common knowledge that large forests have a buffering role against climate change, as plants absorb the carbon dioxide responsible for heating the planet.

The many rodent species found in a forest contribute to its maintenance. By eating fruits and seeds, they help

to spread tree and plant species over a long distance.

Rodents are also the main prey of predators such as cats, raptors and snakes. When no prey items can be found, predators often turn their eye on livestock. If rodents become endangered or vulnerable, it could impact the entire ecosystem in which they naturally occur.

Conservation efforts in East Africa until recently only focused on larger mammals, with little research being done on rodent species and their whereabouts. Because many species are still unknown to science, or are confused with existing ones, I decided to study rodents in the Albertine Rift. It is part of the African Great Rift Valley and includes parts of eastern Democratic Republic of the Congo (DRC), western Uganda, Rwanda, Burundi, western Tanzania and north-eastern Zambia.

I used the soft fur mouse (*Praomys*) to assess the diversity and variability of rodents and to see how populations varied from north to south and east to west. This was done by DNA testing and the measurements of skull shapes and sizes.

 **IN BRIEF**

by Jeanne de Waal

It has not only increased our knowledge of the endemic species in the region, but also helps to prioritise biodiversity conservation.

In the process, two new species were discovered, one of which is most likely to be endemic and to be found nowhere else in the world. Another species was found that was not expected to live in this area, while two known species were found to be endemic.

The findings indicated a high level of biodiversity in the Albertine Rift area. It has not only increased our knowledge of the endemic species in the region, but also helps to prioritise biodiversity conservation.

We need to widen the focus of regulations on biodiversity conservation and protected areas to also include small mammals, and to strengthen regional collaboration to prevent poaching and the export of species. There is also a need for stronger involvement of local communities in developing ecotourism activities that highlight small species, to ensure enough local support to protect them.



Dr Prince Kaleme received his doctorate in Zoology in December 2011. He works in Uganda as a researcher at the Centre for Research in Natural Sciences and as project leader for the Frankfurt Zoological Society.

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Fighting nature with nature – a case study of biological warfare



The Cape Winelands with its beautiful tapestry of vineyards and fruit orchards conjures up images of the good life – fresh air, healthy rural living. But as many allergy and asthma sufferers living there can attest, looks can be deceiving. Creating perfect export grapes and apples often involves the use of pesticides – harmful to humans and the environment.

The fruit industry is under growing pressure to reduce the amount of pesticides used on crops, while still trying to meet market demands for top quality fruit. Scientists might have found an answer in a tiny parasite with a big name – entomopathogenic nematodes.

My PhD research focused on finding an environmentally friendly pesticide against coddling moth, an insect notorious for devastating apple crops. Entomopathogenic nematodes were the ideal candidates for the job. These soil-inhabiting parasitoids are commonly referred to as roundworms, and infect other insects with lethal consequence.

Many types have been isolated from soils throughout the world and have

already been commercially used in Europe and the USA. However, very little is known about Africa's own species. My study, under the supervision of Dr Antoinette Malan of the Department of Conservation Ecology and Entomology, isolated, identified and characterised nematodes occurring in our local soils.

The most promising ones were identified during laboratory screenings. During trials in the field under natural conditions we evaluated the biological and ecological factors that were contributing to the successful use of these nematodes.

Results from the study illustrated some of the important baseline requirements for the use of nematodes in controlling coddling moth and can play a role in the eventual commercial use of naturally occurring nematodes as an alternative to harmful pesticides.

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Do good fences make good neighbours in South Africa?

Social capital refers to the features of social life – networks, norms and trust – that enable participants to act together more effectively to pursue shared objectives.

South Africans are more tolerant of each other than they were in 1995, even though levels of trust and of social interaction between South Africans have declined.

These are some of the trends analysed by Dr Cindy Lee Steenekamp, who received her doctorate in political science in December 2011 by investigating the levels of so-called social capital in post-apartheid South Africa.

“Social capital refers to the features of social life – networks, norms and trust – that enable participants to act together more effectively to pursue shared objectives,” explains Dr Steenekamp, who is the manager of the Graduate School of the Faculty of Arts and Social Sciences at Stellenbosch University.

It is becoming increasingly popular as a measure of societal health.

“Empirical studies across the world have shown that high levels of social

According to Dr Steenekamp, our country can generate and enjoy the benefit of more social capital by creating platforms where South Africans from different cultures and backgrounds can meet as equals, with shared objectives and goals.

capital are associated with enhanced health and well-being of societies, including improved performance on productivity and other economic indicators,” she says. “This link is taken seriously enough that international agencies such as the World Bank and the International Monetary Fund now drive research on social capital as a core element of social policy agendas.”

In describing the aim of her study, Steenekamp points out that social boundaries or fences between race groups have been constructed in South Africa.

Dr Steenekamp used the three measures of social capital – trust, networks and norms – to find out what impact these fences have had on the development of social capital in the post-apartheid era.

Contrary to expectations, social trust – the confidence that others will act as they say or are expected to act – was lower among South Africans in 2006 than it was in 1990, although there has been some recovery since 2001.

Activity in social networks also declined between 1995 and 2006. “With the exception of church and religious organisations, voluntary association is fairly low amongst South Africans and has gradually declined since 1995,” says Dr Steenekamp. She found that social network association has declined by 7% amongst the Black community; 3% amongst Coloureds; and 2% amongst Whites. The percentage for Indians remained the same.

The one aspect of social capital in which South Africans improved since 1995 has been in the area of social norms, such as tolerance and acceptance of diversity. Between 1995 and 2006, South Africans showed an increase in tolerance towards people of a different race and people living with HIV/Aids,

and a decrease in tolerance towards drug addicts, heavy drinkers and homosexuals.

According to Dr Steenekamp, the most likely impediments to the growth of social trust are the growth of inequality, unemployment and poverty, combined with high incidence of crime and perceived corruption. Low social network levels can be accounted for by the lifestyles of modern South Africans.

“The spread of gated communities and boom neighbourhoods, surrounded by high walls and electric fences, have become a potent symbol of perhaps a new kind of apartheid,” she believes.

Although there have been considerable improvements in race relations and workplace integration, residential patterns remain largely segregated. The social lives of Black and White South Africans still rarely cross, despite similar interests such as watching sports and enjoying a traditional braai; and similar traditions such as Sundays being reserved for church and family gatherings.

“On the positive side, the liberal Constitution and human rights doctrine, the Truth and Reconciliation Commission (TRC) and the role of various civil society organisations have made some inroads in knocking down fences,” argues Dr Steenekamp, in explaining the improvement in levels of tolerance for diversity in South Africa.

According to Dr Steenekamp, South Africa can generate and enjoy the benefit of more social capital by creating platforms where South Africans from different cultures and backgrounds can meet as equals, with shared objectives and goals. “Social development and upward mobility through the continued growth in the middle class will stimulate participation in social networks – such as those created at schools and universities – and build social trust and tolerance,” she believes. “This will create a cooperative and tolerant culture, without the need for social fences.”

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The Afrikaners, Capitalism and Weber's ghost

Dr Mohamed Rashid Begg first encountered the thoughts of the German sociologist Max Weber when he was still a first year student at the University of Toronto in Canada.

Weber's views on the link between money and religion stayed with him, and ultimately became the theme of his doctorate in sociology, which Dr Begg received in December 2011 at Stellenbosch University.

"As I progressed through Weber's works I became increasingly convinced that the Protestants to whom he was referring had strong psycho-social connections with the Afrikaners," remembers Dr Begg, who is a lecturer in the Department of Sociology and Social Anthropology at Stellenbosch University.

"My doctorate study aimed to demonstrate that Weber's thesis could help us understand South African history better, and more specifically the historical unfolding of Afrikaner Calvinism and its meeting with modern industrial capitalism after 1910," he says.

In *The Protestant Ethic and the Spirit of Capitalism* which Weber published in 1904, he discusses the influences that the great 17th century Dutch Reformed Church synods, Dordrecht and Westminster, had on the early Calvinist religion.

"The latter were the very synods whose reformed dogmas were used in the Cape after the establishment of a Dutch settlement in 1652," says Dr Begg. "In fact, through the Dutch East India Company (VOC) and the Reformed Church, the Dutch authorities insisted on religious and denominational exclusivity at the Cape."

This religious position was maintained among the early European settlers of the region for more than a century, from 1652 to 1774.

"So white Afrikaners have Protestant roots very similar to the Protestants that Weber referred to," Dr Begg believes.

He followed Weber's methodology to show how the early European settlers of the 17th century, who later became known as the Afrikaners, embraced the



My doctorate study aimed to demonstrate that Weber's thesis could help us understand South African history better, and more specifically the historical unfolding of Afrikaner Calvinism and its meeting with modern industrial capitalism after 1910.

Protestant ethic and displayed Calvinist values like hard work, honesty and frugality.

"They believed in the Calvinists' doctrine of predestination," he says. "These values took root and survived, despite opposing and divergent forces, until a time when a significant segment of Afrikaners as a self-identified *volk* were confronted with modern industrial capitalism."

Dr Begg says that Weber helps one understand how entrenched religious attitudes held by the Afrikaner – such as the belief in individual responsibility for one's position on earth – found affinity with the underlying *Geist* or spirit of capitalism, of investing the profits of your hard-earned capital of capitalism. "This helps to explain how the white Afrikaners were able to dominate not only politically but also economically for so long," he says.

He drew on Weber's 'ideal types' and the metaphor of the 'switchmen' to show how Calvinist ideas shaped the South African social reality. Switchmen are in charge of switching trains to the proper tracks at a rail junction.

Weber held that man's conduct is not governed by ideas, but by material and ideal interests. He also believed that frequently the 'world images' which have been created by 'ideas' have, like switchmen, determined the tracks along which action has been pushed by the dynamic of interests.

"In other words, the driving force of action is interest but the ideas can determine the particular direction of the action, which is quite a different understanding of history than that of, say Marxist revisionism," Dr Begg explains.

For him, a Weberian analysis adds to an understanding of religion and

capital in the Afrikaner case study. "On a more nuanced level, it also helps our historical-sociological understanding of how capitalism developed in an arena where Calvinists were playing second fiddle to British Imperialism," Dr Begg says.

"The success of the Afrikaners to engage modern capitalism under these circumstances says much about the Calvinist ideas that kept the *volk* on track and the relevance of Weber's famous thesis," he believes.

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The German sociologist and political economist Max Weber's *The Protestant Ethic and the Spirit of Capitalism* is rated as one of the most influential and much debated books of the Twentieth Century – more than 100 years after being written. In it Weber points out the relationship between religion and money. He argues that a powerful synergy is created when Calvinist values and modern capitalism meet.

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