



UNIVERSITY OF THE  
WITWATERSRAND,  
JOHANNESBURG



# WITS

## EXCEPTIONAL RESEARCH

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2016/17

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





## Wits has implemented programmes across faculties to drive African and female appointments.

The Diversifying the Academy Programme is a R45 million long term investment.

28 academics (60% female) in the Diversifying the Academy Programme  
45 academics (40% female) in the Enabling Grants Programme

### Other projects include:

12 academics in the Vice-Chancellor's Employment Equity Fund (60 since inception)  
8 academics in the New Generation Academic Programme  
8 academics in the Inclusive Professoriate Programme

# TABLE OF CONTENTS

WITS Research - 2016/17

5

Local relevance and global impact in the Fourth Industrial Revolution  
- Professor Adam Habib

6

Research on the Rise  
- Professor Zebulon Vilakazi

7

Research and Knowledge Leadership at Wits  
- Dr Robin Drennan

8

Research Quantity

9

Research Quality

10

Highly Cited Researchers

11

Most Published Wits Authors

12

South African Research Chairs

14

NRF- Rated Researchers

16

Research Bytes

18

Faculty of Commerce, Law and Management

26

Faculty of Engineering and the Built Environment

32

Faculty of Humanities

40

Faculty of Health Sciences

48

Faculty of Science

55

Wits Health Consortium

56

Wits Enterprise

Produced by Communications and Wits Marketing on behalf of the Wits Research Office





“  
I salute you for  
the incredible  
work that you  
do to change the  
world for the  
better.”

**Professor Adam Habib**  
Vice-Chancellor and Principal  
University of the Witwatersrand

# Local relevance and global impact in the Fourth Industrial Revolution

The last five years at Wits University (2012–2017) have been exceptional, with research output rising by 45% during this period. The extraordinary increase has in no way compromised quality – over 85% of Wits academics publish in quality, international journals. This is the very core of why universities matter – we create new knowledge and the high level skills required to address the challenges that societies face today, but we also equip graduates with the skills to tackle problems that may arise in the future.

Wits punches above its weight in the world – our researchers are developing life-saving vaccines, finding the genes that cause cancer, developing precision medicine, tackling diabetes and malaria and improving the accuracy of TB testing. Others are working to change policies – like the implementation of a sugar tax or working to create an HIV-free society.

Some of the most highly cited and visible researchers ranked in the top 1% in the world are based at Wits. Some seek to shed light on our past. The new Centre of Excellence in early Human Behaviour is one such example, as are the discoveries related to Homo Naledi, Little Foot and even the discovery of a lost continent under Mauritius.

Another stronghold is capital, politics and the economy. In 2017, we launched the Southern Centre for Inequality Studies, the first research institute of its kind in the global south that will produce interdisciplinary research and develop a progressive policy programme to overcome inequality in South Africa, and advance our understanding of inequality in the global south.

Innovation is a hallmark of the Wits School of Mining Engineering which celebrated 120 years in 2017. The School is now working on new mining technologies and grappling with issues related to deep level mining, big data analysis, mechanisation and safety. A new digital mining laboratory with state of the art technology has just been opened.

## Wits is App'tly Rising

Wits University has embraced the Fourth Industrial Revolution and infuses technology through all aspects of University life, including teaching, research and learning. Wits has invested R500 million in an ICT upgrade, adopted a new cutting-edge research strategy, and introduced innovative blended learning options, including an online digital campus, new online courses and programmes and invested in high-tech classrooms and e-zones.

Six Massive Open Online Courses (MOOCs) have been launched in the last two years via WitsX, hosted on the EdX platform developed by MIT and Harvard, the first South African university to be hosted on this prestigious platform.

From new discoveries in quantum communications, light and bandwidth to major global breakthroughs in astronomy, electronics and physics, Wits researchers compete globally and impact locally. Technology is increasingly being used in research on smart cities, elephants, aardvarks and sungazers. In 2017, Wits students created “Brainternet” and developed a low-cost bionic prosthesis to give amputees a hand. The Tshimologong Digital Innovation Precinct is the new tech hub of SA, where virtual reality, augmented reality, artificial intelligence and digital creatives congregate to inspire, innovate and incubate new ideas and disruptive technologies for the 21<sup>st</sup> Century.

## Growing Employable Graduates

In 2017, over 8 700 students graduated from Wits, who according to the latest Times Higher Education's Global Employability Survey are the most employable graduates on the continent.

Two Wits researchers featured in TIME magazine's list of its top 100 most influential people. Professor Glenda Gray who has pioneered advances in preventing mother-to-child transmission of HIV and Professor Lee Berger, a well-known palaeoanthropologist were recognised by the international publication.



Professor Glenda Gray



Professor Lee Berger

## Conclusion

Of course, none of the achievements described above would be possible without the efforts of the world-class researchers at Wits, and those who support and invest in them. And they are truly global leaders – from the 28 A-rated researchers and many Distinguished Professors, to the up and coming young scholars – I salute you for the incredible work that you do to change the world for the better.



“  
With a 45%  
increase in  
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Wits’ research is,  
on average, 30%  
better than the  
world average.”



**Professor Zeblon Vilakazi**  
Deputy Vice-Chancellor: Research and Postgraduate Affairs  
University of the Witwatersrand

# Research on the Rise

*If I have seen further, it is by standing on the shoulders of giants – Isaac Newtown (1675)*

It is an honour and a privilege to walk amongst intellectual giants on the campuses of Wits University. At every turn, we run into talented researchers, scholars and students who are creating new knowledge and who are experts in their relevant fields, and who are increasingly working across disciplines, schools, faculties and institutions. I can confidently say that we are interdisciplinary and that multidisciplinary and transdisciplinary research is becoming common cause at Wits. Our strength lies in our ability to conduct research that contributes to solving complex problems, drawing on research, skills and talent across faculties and disciplines.

Wits' research extends beyond local boundaries, and partnerships with the north are becoming more equitable, especially in terms of funding. For example, we have experts based in Braamfontein conducting global research at CERN in Switzerland (and several other countries), and a new multi-million rand Southern Centre for Inequality Studies that will address critical issues in the global south, based on research from the south. Our pan-African public health programmes like the Consortium for Advanced Research Training in Africa (CARTA) aims to build and retain a vibrant African academy able to lead world-class multidisciplinary research that impacts positively on public and population health.

In 2016, the African Research Universities Alliance (ARUA), co-founded by Wits, was strengthened. ARUA galvanises the strengths of research-intensive universities in Africa to compete in the global knowledge system through innovation and technology.

With a 45% increase in research output (2012-2017), Wits' research is, on average, 30% better than the world average according to the Web of Science. Further, we have consistently had two or more scholars in the top 1% of global scholars by citations. Our overall productivity is also good. It currently stands just above one unit of research (as defined by the Department of Higher Education and Training) per permanently employed academic, per year, considering only publications. When postgraduate student graduations are added, the productivity moves to above 2.5 units per person per year.

Wits' success in research is only possible because of the talented people who are instrumental in advancing the University's 2022 vision of transforming into a locally relevant, globally competitive research-intensive, postgraduate University.

You will read more about Wits University's research progress in this publication. For stories, videos and podcasts demonstrating Wits' research, visit [www.wits.ac.za/research](http://www.wits.ac.za/research) and click on Research News or view our research video playlist via Wits University's YouTube account.

“  
Universities are  
expected to solve  
societal problems  
and generate  
economic growth  
through their  
research efforts.”



**Dr Robin Drennan**  
Director: Research Development  
University of the Witwatersrand

# Research and Knowledge Leadership at Wits

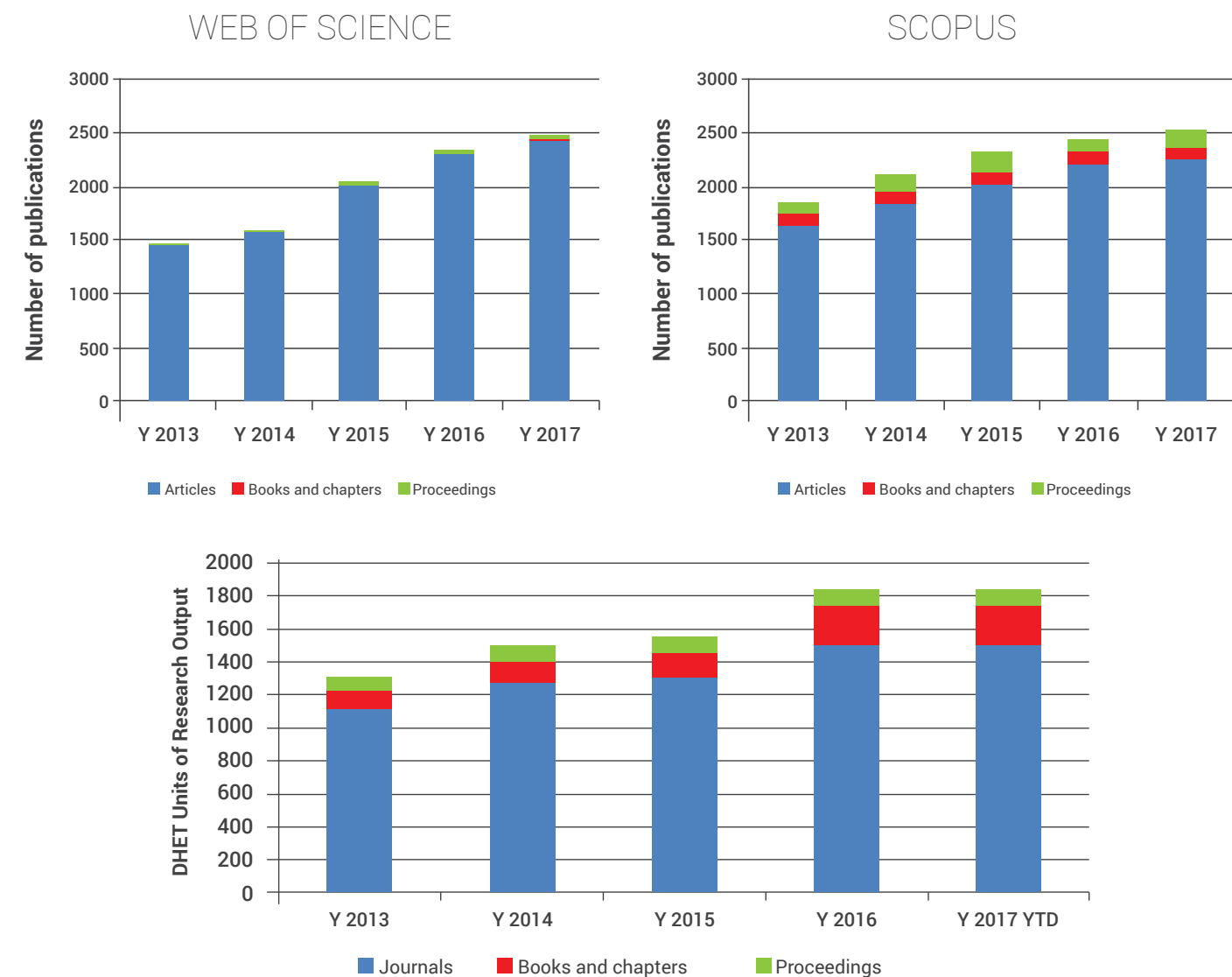
Modern universities are called upon to do more than ever before. Primarily, they are expected to teach at the highest level but more than producing trained thinkers and professionals, they are expected to prepare people to be good citizens. It has long been known that research activity is important to ensure that teaching is at the forefront of the knowledge boundary. However, the expectation of universities to conduct research goes far beyond that requirement. Indeed, universities are expected to solve societal problems and generate economic growth through their research efforts. Additionally, the practice of academic citizenship is expected to yield beneficial academic involvement in the social, environmental, technical and political spheres. Therefore, the adage that universities create, share and use knowledge to the full has never been truer than now.

In this context, it is wonderful to work with researchers and to be charged with the responsibility to promote research at Wits, as one has a front row seat to observe how academics in modern universities rise to these challenges. In the following pages, you will glean some insight into research that Wits-affiliated academics produced in 2016/17 in terms of the quantity, quality and impact of research at Wits.

# Research Quantity



Three indicators are commonly used to monitor the amount of research that is produced in the name of the University – the Web of Science (ISI), the Scopus Bibliometric Databases, and the annual Research Output Report submitted to the Department of Higher Education and Training (DHET). To make these metrics as consistent as possible, focus is restricted to journal articles, books, book chapters and conference proceedings.



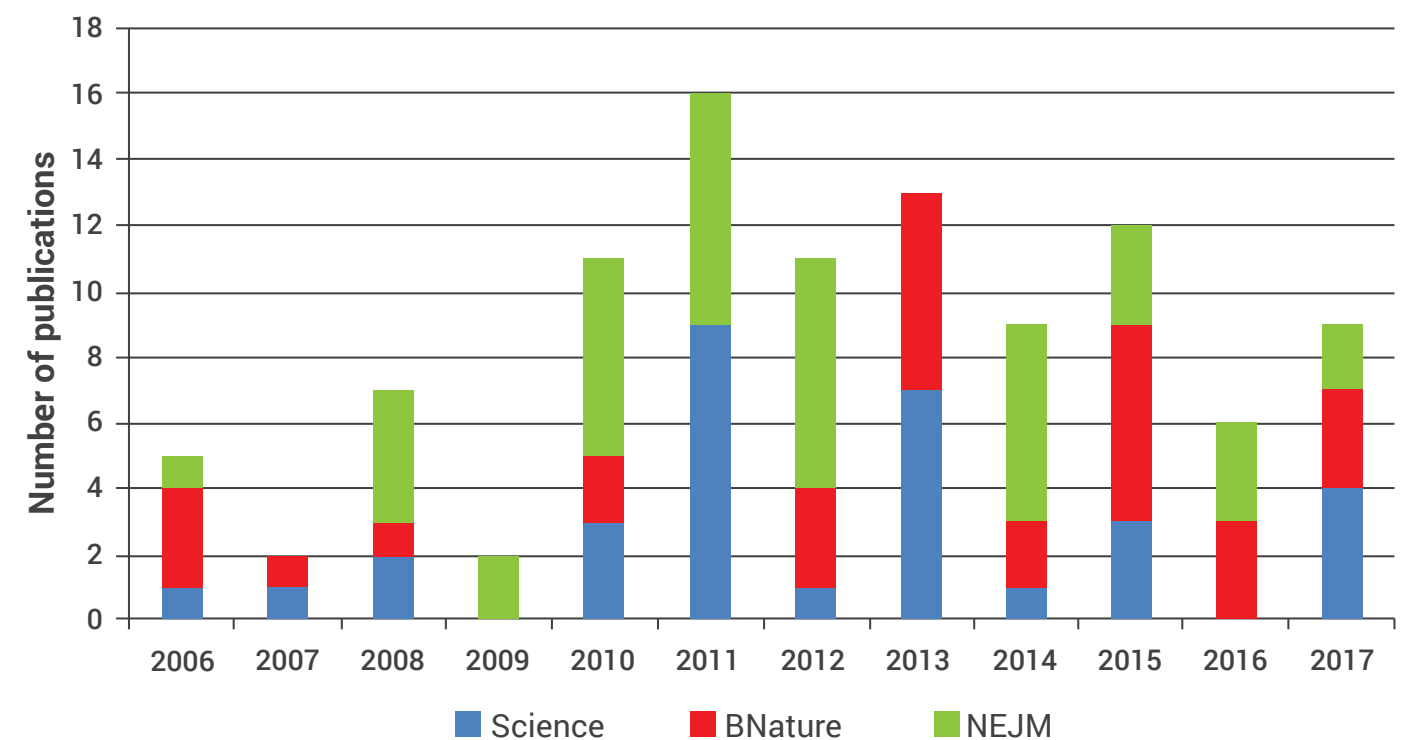
Over a five-year period (2013–2017), the Web of Science shows a total growth of 68% in published items, with journal articles dominating books, book chapters and conference proceedings. In the same period, the overall growth in the Scopus Index (which also counts published items) is a more modest 37%, with books, book chapters and conference proceedings playing a more prominent role. Considering units of research output (based on fractional author counts, using a different scale) the growth over the same period was 40%.

# Research Quality



The quality of Wits' research remains high and is indeed growing over time. Over the last five years (2013–2017), the annual category normalised citation impact has averaged at 1.41, which is 41% above the global average of one. During this period citations grew from 1 399 to 30 153 per annum and the University has achieved an H-index of 88 with an average number of citations per article of 8.26. The H-index is an author-level metric that attempts to measure both the productivity and citation impact of the publications of a scholar.

Another measure of quality, often used by ranking agencies like the *Times Higher Education*, are the number of publications a university publishes in the multidisciplinary journals of *Science*, *Nature* and the *New England Journal of Medicine*, all three of which have impact factors well above 35. The chart below shows Wits' recent history in these journals:



Turning now to the individuals who contributed towards this research, it is worth noting that most Wits academics are research active and all their contributions are recognised and applauded. However, several warrant special acknowledgement:



# Highly Cited Researchers

Highly Cited Researchers represent some of the world's leading scientific minds. Over 3 000 researchers earned this distinction by writing the greatest number of reports officially designated by Essential Science Indicators as Highly Cited Papers – those ranking among the top 1% most cited for their subject field and year of publication, earning them the mark of exceptional impact.

Name	Year			
	2017	2016	2015	2014
	Lee Berger Lynn Morris	Chris Mathew Christopher Henshilwood Lynn Morris	Chris Mathew Francesco D'Errico Lynn Morris	Lyn Wadley Rachel Jewkes Christopher Henshilwood



Professor Lyn Wadley



Professor Christopher Henshilwood



Professor Lynn Morris



Professor Chris Mathew

# Most published Wits Authors

The 25 most published Wits authors in 2017 (permanent appointees and/or those affiliated to Wits) include the following, ordered by decreasing percentage documents cited by others:

Name	Faculty	% Docs Cited	Times Cited	Number of Docs
Myles Connor	Health Sciences	90.91	8 212	11
Xifeng Ruan	Science	85.07	6 882	402
Bruce Mellado	Science	84.47	6 671	380
Ian Sanne	Health Sciences	90.60	6 059	117
Shabir Madhi	Health Sciences	89.18	5 811	231
Frederick Raal	Health Sciences	91.38	4 581	58
Paul Ruff	Health Sciences	72.73	3 459	22
Trond Torsvik	Science	96.77	3 118	62
X Chen	Health Sciences	97.75	2 354	89
Wendy Stevens	Health Sciences	93.59	2 192	78
Osman Sankoh	Health Sciences	75.68	2 148	37
Matthew Fox	Health Sciences	80.23	2 009	86
Lynn Morris	Health Sciences	72.73	1 919	66
Lyn Wadley	Science	83.02	1 883	53
Keith Klugman	Health Sciences	90.00	1 820	70
Viness Pillay	Health Sciences	74.01	1 699	177
Shane Norris	Health Sciences	77.48	1 683	151
Helen Rees	Health Sciences	77.03	1 657	74
Yahya Choonara	Health Sciences	72.73	1 638	165
Kathleen Kahn	Health Sciences	79.58	1 606	142
Sydney Rosen	Health Sciences	81.82	1 600	44
Neil Coville	Science	90.68	1 571	118
Deepak Kar	Science	71.64	1 548	201
Maureen Coetzee	Health Sciences	79.03	1 546	62
Saraladevi Naicker	Health Sciences	77.78	1 534	36



Professor Bruce Mellado



Professor Yahya Choonara and Professor Viness Pillay



Professor Helen Rees



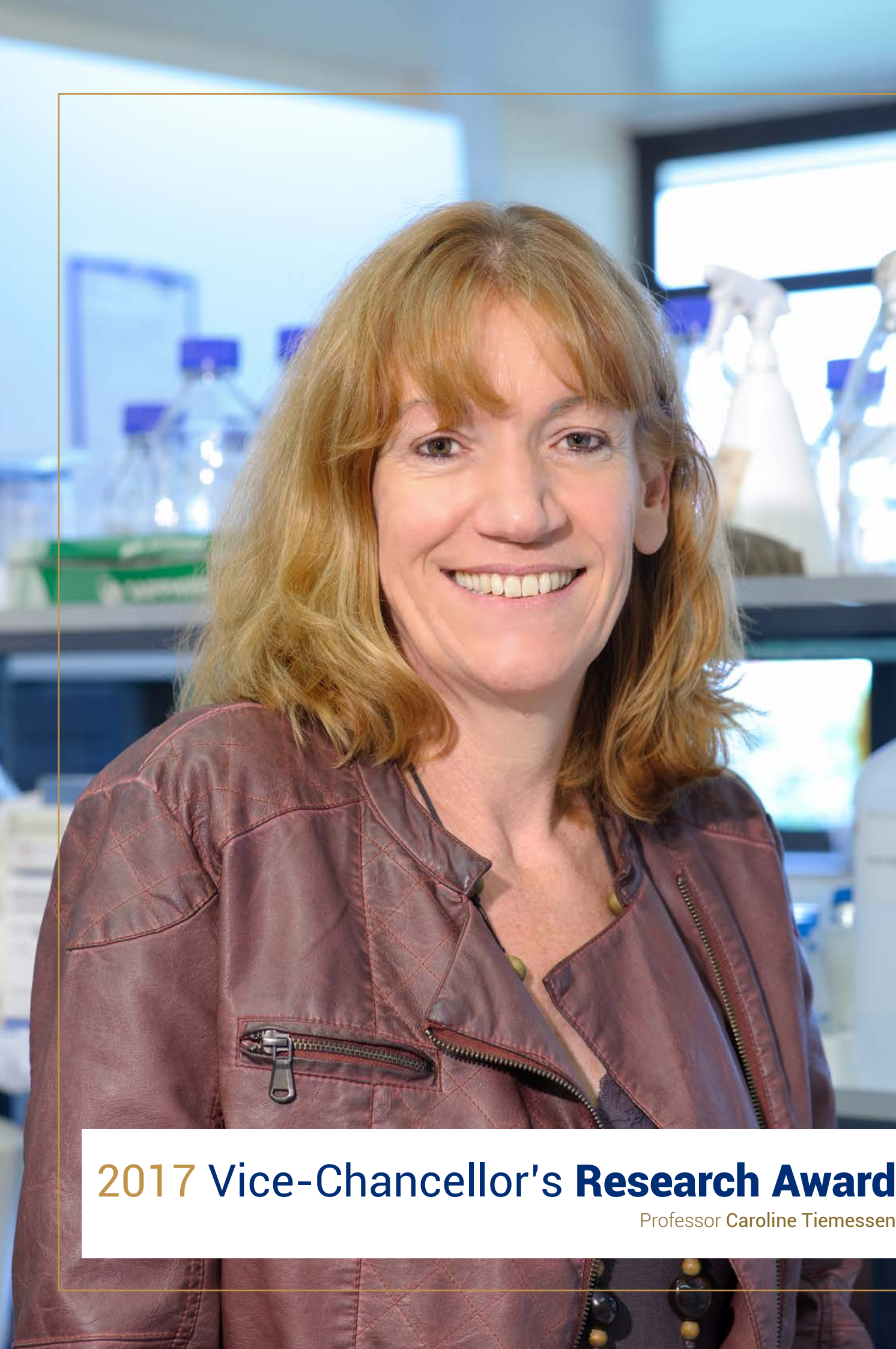
Professor Shabir Madhi



# South African Research Chairs

The following Wits academics held prestigious South African Research Chairs in 2017:

Name	School/Entity	Title of Chair
Jill Adler	School of Education	Mathematics Education
Maureen Coetzee	Malaria Entomology Research Unit	Medical Entomology and Vector Control
Sergio Colafrancesco	School of Physics	Radio Astronomy
Robert De Mello Koch	School of Physics	Fundamental Physics and String Theory
Heinrich Dirr	School of Molecular and Cell Biology	Protein Biochemistry and Structural Biology
Raymond Durrheim	School of Geosciences	Exploration, Earthquakes and Mining Seismology
John Eyles	School of Public Health	Health Policy and Systems
Rosemary Falcon	School of Chemical and Metallurgical Engineering	Clean Coal Technology
Lawrence Hamilton	School of Social Sciences	Political Theory
Philip Harrison	School of Architecture and Planning	Spacial Analysis and City Planning
Christopher Henshilwood	Evolutionary Studies Institute	The Origins of Modern Human Behaviour
Vishnu Jejjala	School of Physics	Theoretical Particle Cosmology
Loren Landau	African Centre for Migration and Society	Mobility and the Politics of Difference
Shabir Madhi	Respiratory and Meningeal Pathogens Research Unit	Vaccine Preventable Diseases
Thokozani Majozi	School of Chemical and Metallurgical Engineering	Sustainable Process Engineering
Penny Moore	School of Pathology	Virus-host Dynamics for public health
Orde Munro	School of Chemistry	Bio-Inorganic Chemistry
Sehliselo Ndlovu	School of Chemical and Metallurgical Engineering	Hydrometallurgy : Innovation and Sustainability
Noor Nieftagodien	School of Social Sciences	Local Histories and Present Realities
Viness Pillay	School of Therapeutic Sciences	Pharmaceutical Biomaterials and Polymer-Engineered Drug Delivery Technologies
Michele Ramsay	School of Pathology	Bioinformatics of African Populations
Laetitia Rispel	School of Public Health	Health Workforce for Equity and Quality
Mary Scholes	School of Animal, Plant and Environmental Sciences	Global Change and Systems Analysis
Melissa Steyn	School of Social Sciences	Critical Diversity Studies
Caroline Tiemessen	School of Pathology	HIV Vaccine Translational Research
Hamsa Venkatakrishnan	School of Education	Numeracy



2017 Vice-Chancellor's Research Award  
Professor Caroline Tiemessen



# National Research Foundation

## A-rated Scholars

The following 28 academics are the leading international scholars in their field (2017)

Name	Faculty	Specialisation
Jill Adler	Humanities	Mathematics education, teacher education
Lewis Ashwal	Science	Geochemistry, petrology, mineralogy, tectonics, planetary science, meteorite mineralogy
Darren Brouwer	Health Sciences	Dermal exposure, occupational health, human exposure risk assessment, environmental and occupational epidemiology, inhalation exposure assessment
Charles Feldman	Health Sciences	Pneumonia, respiratory diseases, HIV co-infection, antibiotics
Andrew Forbes	Science	Optics and lasers, quantum physics, applied physics
Glenda Gray	Health Sciences	HIV vaccine South Africa, mother to child HIV transmission prevention, adolescents, HIV prevention clinical trials
Lawrence Hamilton	Humanities	African political thought, political philosophy, political theory, history
Christopher Henshilwood	Science	Middle Stone Age, Late Stone Age, Modern human behaviour, archaeology
Isabel Hofmeyr	Humanities	Postcolonial literary studies, Oceanic studies
Rachel Jewkes	Health Sciences	Gender violence, sexual violence
Daniel Lewis-Williams	Science	Cognitive archaeology
Florian Luca	Science	Analytic number theory
Shabir Madhi	Health Sciences	Vaccine-preventable diseases, paediatric infectious diseases
Fazal Mahomed	Science	Lie symmetry and operator methods, differential geometry, computational fluid mechanics
Lenore Manderson	Health Sciences	Global public health, chronic illness, gender and health, ethnicity and disease, social inequality
Christopher Mathew	Health Sciences	Cancer genetic aspects, genetic association studies
Achille Mbembe	Humanities	Philosophy, political theory, African history
Lynn Morris	Health Sciences	Virology, infectious diseases
Norman Owen-Smith	Science	Mammal ecology, savannah ecology, population ecology, ecology and behavioural ecology
Claire Penn	Humanities	Health communication, speech-language pathology
Linda Richter	Health Sciences	Child development, family, community based HIV prevention and treatment interventions, social welfare
Bruce Rubidge	Science	Karoo biostratigraphy, basin analysis, Karoo sedimentology, Permo-Triassic therapsids, vertebrate palaeontology
Robert Scholes	Science	Savannah ecology, applied remote sensing
Roger Sheldon	Science	Heterogeneous catalysis, homogeneous catalysis, biocatalysis, green chemistry, sustainability
Beric Skews	Engineering and the Built Environment	Shock waves, flow visualisation, compressible gas dynamics
Roger Smith	Science	Karoo sedimentology, vertebrate taphonomy, ichnology (trace fossils), palaeosols, biostratigraphy
Lyn Wadley	Science	Archaeology, Middle Stone Age, cognitive archaeology, experimental archaeology
Yevhen Zelenyuk	Science	General topology, topological algebra



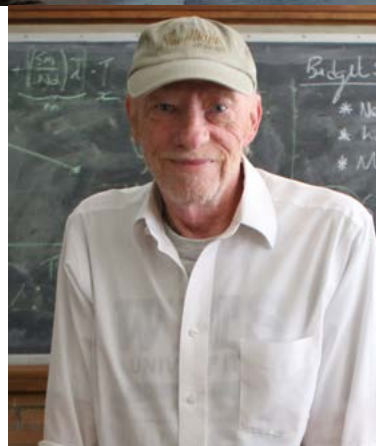
Wits' success in other NRF rating categories is summarised below, showing the number of category-rated researchers in the five faculties that make up the University.

NRF - rating	Commerce, Law and Management	Engineering and the Built Environment	Health Sciences	Humanities	Science	Total
A	0	1	9	5	13	28
B	9	8	30	23	52	122
C	17	25	37	53	70	202
P	0	0	0	0	1	1
Y	13	7	12	17	21	70
Total	39	41	88	98	157	423



# Research Bytes

## “Lost continent” found under Mauritius



Professor Lewis Ashwal and his team reported the discovery of 2 500–3 000 million-year-old zircons within 9 million-year-old volcanic rocks from Mauritius. *Nature Communications* published this high-profile paper early in 2017 and a media campaign resulted in close to 750 000 views of a video produced by Wits Communications. In this groundbreaking discovery, Ashwal and his team confirmed the existence of a “lost continent” under the Indian Ocean island of Mauritius that was left over by the break-up of the supercontinent, Gondwana, which began about 200 million-years ago. The piece of crust (subsequently covered by young lava during volcanic eruptions on the island) seems to be a tiny piece of ancient continent, which broke off from the island of Madagascar, when Africa, India, Australia and Antarctica split up and formed the Indian Ocean. By studying the mineral, zircon, found in rocks spewed up by lava during volcanic eruptions, Ashwal and colleagues from the German Research Centre for Geosciences and the University of Oslo found that remnants of this mineral were far too old to belong on the island of Mauritius.

## Wits research on HIV viral load urges updates to WHO therapy guidelines



A study by Wits academics and peers demonstrated that clinical interventions for HIV should take place at lower viral loads than those proposed by the current World Health Organization (WHO) guidelines. The study, published in *Lancet Infectious Diseases* in November 2017 found that the current WHO-defined threshold for virological failure does not identify a large subset of patients who are at increased risk of poor outcomes of antiretroviral (ARV) therapy. Thus, clinical intervention should take place at lower viral loads than those proposed by the current WHO guidelines. Dr Sergio Carmona in the Division of Molecular Medicine and Haematology in the School of Pathology at Wits and Head of the Viral Load Unit at the National Health Laboratory Services said: “This study provides clear evidence that clinical interventions should take place at lower viral loads than those proposed by the current WHO guidelines. We need to support the scale-up of viral load testing in low and middle-income countries as well as encourage adherence to ARVs and close follow-up of viral load results.”

## NRF's first ever A-rated political scientist in Wits-Cambridge exchange to redress historical colonial power relations



An academic exchange programme launched in October 2017 by the SARCHI/Newton Bilateral NRF/British Academy Research Chair in Political Theory at Wits and the Department of Politics and International Studies at Cambridge University aims to balance historical colonial power relations by empowering the Global South through research and engagement. The programme is one of the central pillars of the Chair in Political Theory, the purpose of which is to deepen understanding, and thus citizen agency, in politics by building research networks in political theory between the two institutions. Lawrence Hamilton, Professor of Political Studies in the School of Social Sciences at Wits holds the Chair. In November 2017, the NRF awarded Hamilton an A-rating. He is the first political scientist in the history of the NRF rating system to be A-rated.

## DigiMine tackles missing miner problem with wireless sensor networks



The Wits School of Mining Engineering, ranked 15<sup>th</sup> in the world in the QS World University Rankings in 2017, hosts the digital mining laboratory (DigiMine), created from converting the Chamber of Mines building on West Campus in 2017. The DigiMine features a surface from the flat roof, a vertical shaft via a stairwell in the fourth quadrant, and a mine with a control room in the basement. Rapid laboratory and infrastructural progress has advanced research output. The DigiMine has produced 22 journal articles, four PhD and five MSc graduates since 2014. In December 2017, the DigiMine demonstrated how a matchbox-sized circuit board could save lives by transmitting the vital statistics and location of miners missing underground. This was a collaboration between the Wits Mining Institute, the School of Electrical and Information Engineering, and the Communication Networks Laboratory based at the University of Bremen in Germany.



## Interrogating the “inequality trap” from the global South

In October 2017, Wits University established the Southern Centre for Inequality Studies, which is a multi-year, multi-partner research and policy project focussing on understanding and addressing inequality. Professor Edward Webster is the Interim Director of the Centre. The starting premise is that while technical solutions to addressing inequality are very important, they will not be politically feasible, unless the social and political forces driving high levels of inequality in South Africa are clearly understood and addressed. However, a focus on overcoming inequality has often been at the expense of an adequate and simultaneous focus on how to grow the productive forces and overcome poverty in a sustainable way – the “inequality trap”. Inequality is an intersectional, multi-dimensional problem that must be understood and addressed across an individual's life cycle, and throughout the state, civil society, and the economy. The Centre addresses the challenge of how to build productive capabilities alongside changing power relations and participation in the economy to inform a progressive policy agenda. Inequality is a global problem, and studying and addressing it in South Africa will enable us to enter into a dialogue about inequality in other settings, particularly in the rest of the global South.



# FACULTY OF COMMERCE, LAW & MANAGEMENT

## Message from the Dean

**Professor Imraan Valodia**

Dean of Commerce, Law and Management

University of the Witwatersrand



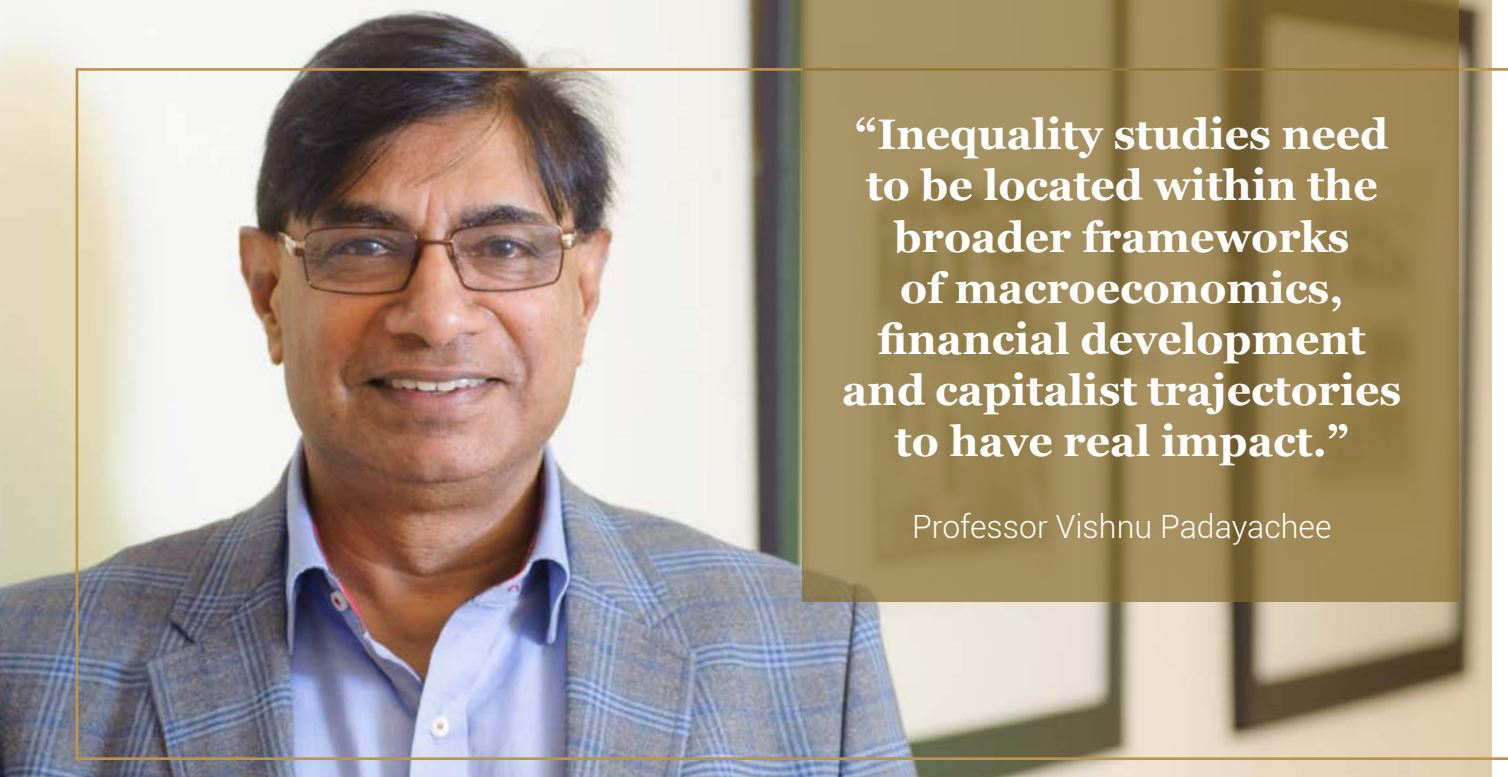
The Faculty of Commerce, Law and Management pursues a vibrant research agenda that changes the way we do business, practice law and economics, and inform public policy. Research in the Faculty remains internationally visible, reputable and collaborative in areas of economics, finance, business, law, governance and public administration.

The 2016/7 period focussed on building research capacity and productivity at the school level. Publication in this period spanned 118 academic journals, 23 scholarly books, and numerous conference proceedings. Almost half of Faculty staff members hold PhDs, 47 of whom are National Research Foundation-rated researchers. Funding is allocated to increase research capacity by growing the postdoctoral cohort.

The School of Economic and Business Sciences established a new behavioural research laboratory, and a joint PhD in Law programme with Erasmus University, Rotterdam. The Energy Leadership Centre launched during this period along with the Southern Centre for Inequality Studies and the African Centre for Conflict Management. The book *Fees Must Fall: Student Revolt, Decolonisation and Governance in South Africa* was published amidst public lectures and debates hosted by the Faculty on topics of corruption and state capture, South Africa's global reputation, Brexit, the economic divide, solutions to energy challenges, and corporate governance.

The Faculty strengthened links with the City of Johannesburg through the establishment of the Chair in Economic Development, and welcomed new Chairs in Digital Business and African Philanthropy. These complement existing Chairs, Distinguished Professor appointments, and high profile figures that joined the Faculty.





“Inequality studies need to be located within the broader frameworks of macroeconomics, financial development and capitalist trajectories to have real impact.”

Professor Vishnu Padayachee

# The character of capitalism in South Africa before and since democracy

Professor Vishnu Padayachee in the School of Economic and Business Sciences at Wits holds the Derek Schrier and Cecily Cameron Chair in Development Economics.

The Chair fosters research in sustainable development and democracy, macroeconomic policy and corporate transformation within the framework of South Africa's transition to democracy.

In his research, Padayachee explores four related themes:

- Varieties of South African capitalism,
- New directions in central banking and monetary policy,
- South Africa's great economic policy debate, and
- Inequality, macroeconomics and capitalism.

“My research interrogates the meaning and nature of capitalist development in the modern world and in post-apartheid South Africa, based on the view that capitalism settles differently in each social formation, with implications for national economic policy making. I examine the character of capitalism in South Africa before and since democracy and compare contemporary South African capitalism with other models of capitalism,” says Padayachee.

Increasingly Padayachee's research will incorporate corporate governance under different models of capitalism. The current turmoil in global banking and finance has raised questions about the objectives and role of central banks and the instruments of monetary policy. The role of central banks in modern economies has changed significantly over the past 30 years and will continue to change in ways which may well threaten the very existence and *raison d'être* of these institutions this century.

The 'great economic policy debate in South Africa' refers to the evolution of ANC economic and social policy from 1943 to 1996. Padayachee's research focus here is on economic history and political economy, and how this shapes contemporary policy choices.

“A component of this research is the publication of a manuscript that attempts to answer if it was this history that informed the policy choices of the African National Congress in the 1990s,” he says.

Padayachee envisages a study into the relationship and connection between inequality, financial stability, macroeconomics and capitalism. There is a dearth of research in this field despite evidence that global finance is a principal source of changing global patterns of pay inequality in most countries, both developed and developing.

Padayachee concludes: “Inequality studies need to be located within the broader frameworks of macroeconomics, financial development and capitalist trajectories to have real impact.”



# Economic constraints

Why only a few African women marry

“The research shows that although private transfers are an important source of income for the household, social grants (or public transfers) contribute significantly more to poverty reduction,”



Professor Dorrit (Dori) Posel

Professor Dorrit (Dori) Posel holds the Helen Suzman Chair in Political Economics at Wits.

Posel is an applied economist who analyses quantitative micro-data. She uses these micro-data to understand economic behaviour in and across households and the labour market, and to evaluate the ways in which we measure well-being.

Her research over the past eight years has explored marriage and union formation in South Africa to understand the reasons for – and implications of – low marriage rates, particularly among African women.

The research is distinctive in that it combines the econometric analysis of micro-data, which reveals economic constraints to marriage, with the collection and analysis of qualitative data to probe why these economic constraints are binding, particularly in the context of bride-wealth practices.

“Low marriage rates have not been offset by rising rates of co-habitation, and low rates of union formation, even in the context of childbirth, help to explain why the majority of African children grow up in households without their fathers,” says Posel.

For many South Africans, the nuclear family is not the dominant social unit. Rather, people live in complex and often multi-generational households with permeable boundaries.

Posel's other projects explore:

- the private transfer of resources between households (remittances and maintenance payments),
- how one compares economic resources across households of diverse size and structure, and
- whether the allocation of time in the household differs amongst women and men, even in complex households.

“The research shows that although private transfers are an important source of income for the household, social grants (or public transfers) contribute significantly more to poverty reduction,” says Posel.

Further, the research suggests that the measure of inequality in South Africa would decline by up to six percentage points if we adjusted for large differences in household size and composition, and that a traditional gender division of labour persists in all household types in South Africa, even amongst the elderly.



# CALS assists communities to access water – a basic human right

Water is a basic necessity yet thousands of South Africans are living without water. There may be many different reasons for this water scarcity including climate change and droughts, but often it is due to failures of government. This is according to Zeenat Sujee, an Attorney in the Basic Services Programme in the Wits Centre for Applied Legal Studies (CALS).

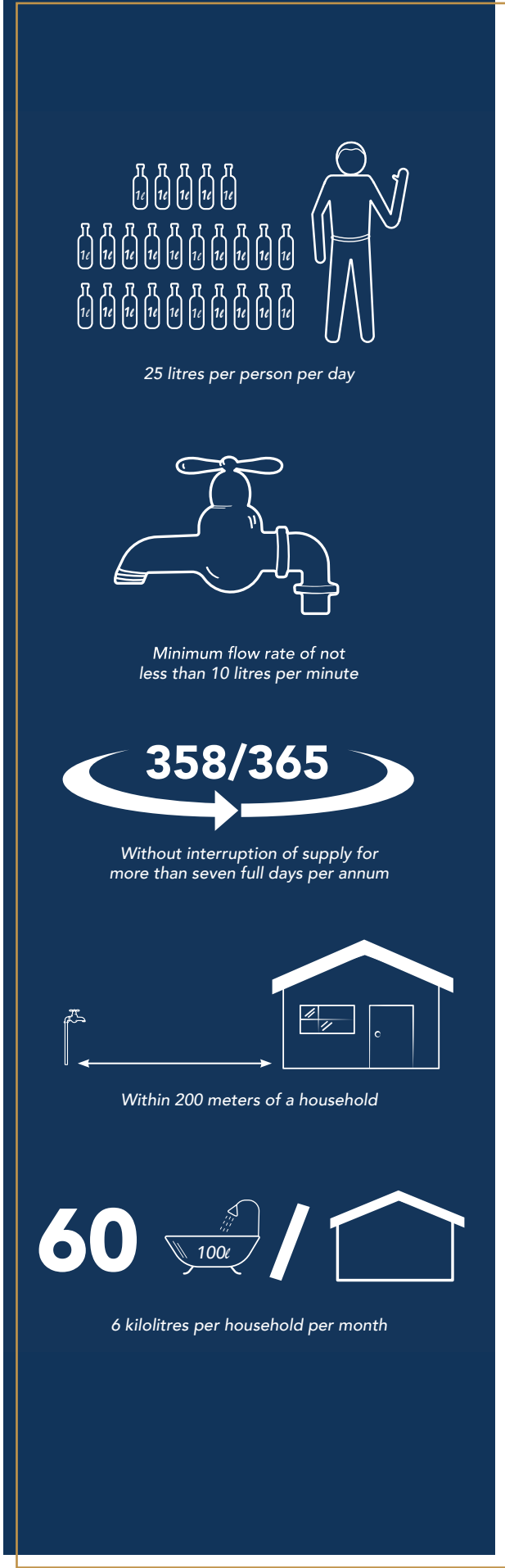
Despite the scarcity of water, Section 27 of the Constitution of South Africa gives everyone the right to access sufficient water.

The failure of municipalities to provide water, especially in rural areas, has dire consequences. One such case involved five community villages situated at least 30km outside of Marble Hall, Limpopo. The communities stopped receiving water after the municipality shut down a water treatment plant in 2009. The termination of water was unlawful and the community was forced to collect water from a crocodile-infested river, where a child was attacked. Women were violated while collecting water. School children attended school thirsty and with unwashed clothing. Menstruating girls were absent from school.

These communities, represented by CALS at Wits, approached the High Court for assistance. Through a settlement negotiation, the Court ordered that water be supplied through JoJo tanks as an interim measure. The municipality failed to comply with the court order. Consequently, CALS initiated contempt proceedings.

The second aspect of the application was to deal with the long-term water supply. In August 2017, Judge Hans Fabricius requested that the parties discuss a workable solution. His view was that the community be treated with respect and that the municipality fulfill its constitutional obligations. Again, the parties negotiated and agreed that the municipality would install more JoJo tanks and deliver water every day. It was further agreed that the municipality would supply water through reticulation twice a week. Again the municipality failed to comply. The community approached the High Court for contempt of court and Judge Fabricius requested that the Minister of Water and Sanitation intervene.

The municipality failed to meet its obligations to supply water in terms of law and only reacted once litigation was instituted. Litigation, although not always favoured, is always the last tool – and the only option – for redress when communities have no access to water supply. It is unfortunate that communities must endure a protracted process to secure this basic constitutional right.



## New Chair in Digital Business

The Wits Business School (WBS) appointed Professor Brian Armstrong, one of the foremost ICT industry leaders in South Africa, to the WBS/Telkom Chair in Digital Business – the first of its kind in Africa.

“In the past five years or so, there has been much hype around ‘digitalisation’. But while it is a very real part of our world, and applies to every aspect of business, it is a concept that is over-traded but under-researched. Most of the information we have about digitalisation is anecdotal – there is no body of knowledge available which is underpinned by rigorous academic research,” says Armstrong.

It is for this reason that the WBS established the Chair in Digital Business through a five-year funding commitment from Telkom. The Chair will ensure that the WBS is at the forefront of developing important research as well as teaching programmes that are essential for doing business in today’s digital world. The ‘flagship’ programme of the Chair is a Master’s degree in Digital Business. “New and rigorously conducted research will underpin curriculum development, and there will be exciting opportunities for people to participate and share in this research,” adds Armstrong.

His vision for the Chair is threefold: to be a centre of excellence in digital business in South Africa and Africa, to become fully sustainable, and to have an impact on society.

“Our outputs must be seen and felt in our society; the Chair must have an impact on the South African and African business communities,” he concludes.





## The Southern Centre for Inequality Studies: a new approach to tackling inequality

It is widely accepted that SA is one of the most unequal societies in the world. The top 10% of the population earn about 60% of all income and own 95% of all assets. But there are significant and critical gaps in the understanding of how this inequality is produced, and the systems of power that support its reproduction. This is according to Professor Edward Webster, Professor Imraan Valodia and David Francis from the Southern Centre for Inequality Studies launched at Wits in 2017.

There has been no significant reduction in inequality in post-apartheid South Africa. At the start of the 1990s, South Africa had the highest Gini coefficient of all 57 countries for which there were data at that time, at 0.66. South Africa remains one of the world's most unequal countries: estimates vary depending on the measurement used, but recent calculations show the Gini coefficient for income remaining at 0.66 in 2015. The Gini coefficient is a measure which reflects levels of inequality, where 0 is absolute equality, and 1 is absolute inequality. Importantly, the Gini coefficient has historically been focused on income and not on assets and wealth.

Excellent research has been conducted on poverty in South Africa, including an emerging field of technical research that measures the magnitude of inequality. But they believe that the time has come for a new approach. This is based on insights from emerging scholarship that's highlighting the confluence of how different systems of power shapes inequality. Of particular importance in South Africa is the nexus of race, class and gender in driving inequality.

To grapple with the multi-dimensional nature of inequality in all its forms, an interdisciplinary approach is required. The Centre will drive a five-year, interdisciplinary project on inequality. The project, the first of its kind in the global South, includes approximately 80 researchers from a number of universities across South Africa as well as other research entities from the global South.

A research agenda on inequality that is rooted in the south is long overdue given that countries share a range of common problems within the global economy. By drawing on the intellectual resources in South Africa and beyond, they hope to bring new knowledge, new insights and new policies to overcome the challenge of inequality. The Centre will be drawing on academic excellence of economists, historians, educationalists, sociologists, legal academics, healthcare researchers and a range of other disciplines to build the most comprehensive picture of inequality in the South.

The Centre will also tackle questions of power related to gender, race and class; and wealth inequality.



## Studying the making of smart cities

Professor Ronald Wall is an economic geographer and urban planner and the Johannesburg City Chair in Economic Development at Wits.

The City of Johannesburg initiated and funded the Chair, which focuses on applied results and the provision of strategic knowledge to inform the City's policy-making.

Wall's research explores themes of urban and regional competitiveness, foreign direct investment, multinational corporations, smart city studies, happiness economics, food security, and inequality.

"I conduct international studies on urban and regional economic development focusing on the interdependence of globalisation and urbanisation," says Wall.


He applies Geographic Information Systems (GIS) and statistical techniques to databases that are concerned with economic networks (trade, corporate ownership and investment flows) in thousands of cities, as well as the urban characteristics of these cities – innovation levels, governance, inequality, labour and infrastructure.

Wall's work is unique not only because it focuses on cities in the developing world, but because it observes cities as integral parts of global and regional economic systems.

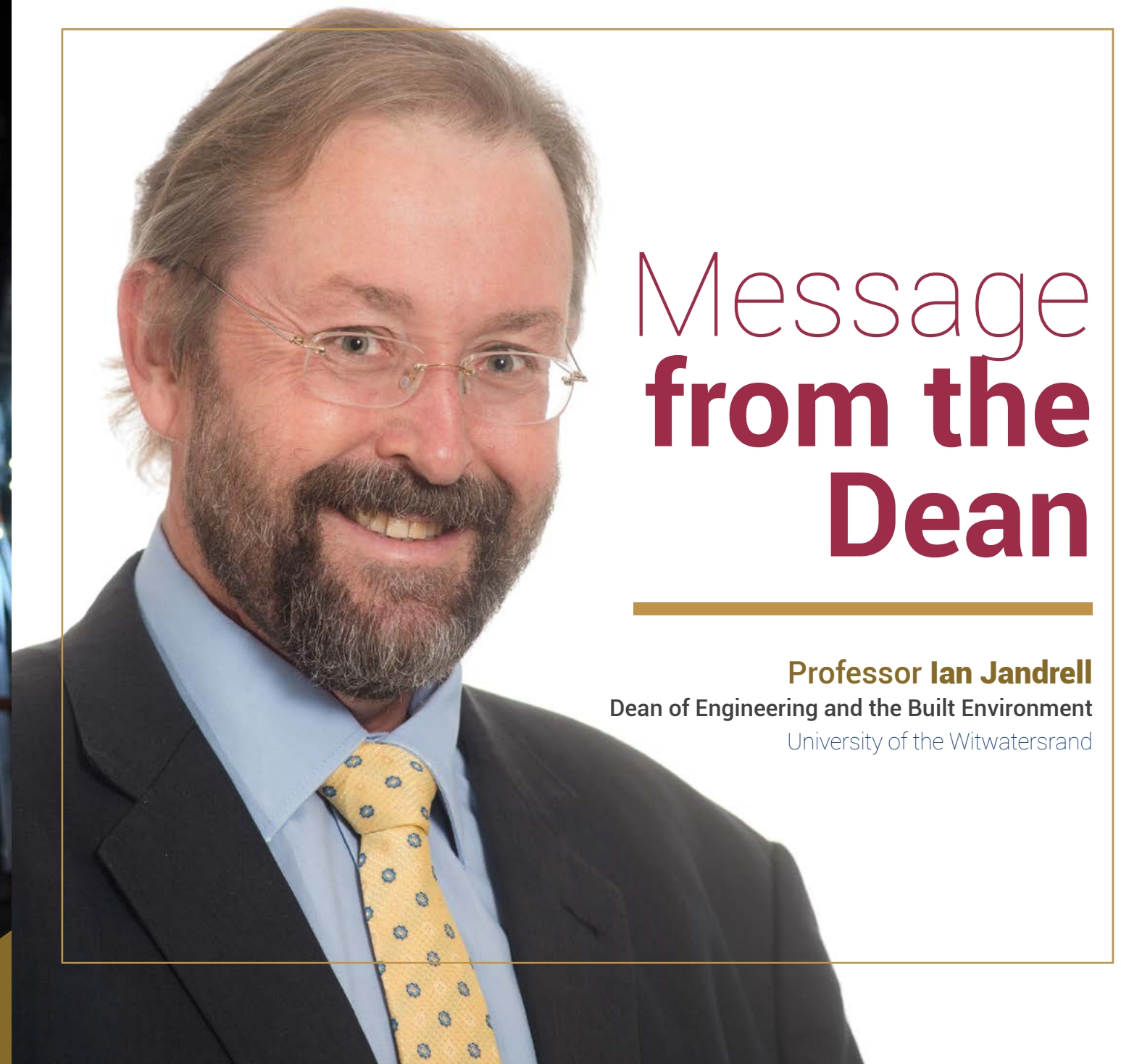
"This is important to a city like Johannesburg as the research provides a relative, comparative understanding of the city's power and position within the global, African and South African economy."

This enables one to trace Johannesburg's changing competitiveness in the world economy, as well as compare the determinants of this to thousands of other cities.





# FACULTY OF **ENGINEERING** AND **THE BUILT** **ENVIRONMENT**



## Message from the Dean

**Professor Ian Jandrell**  
Dean of Engineering and the Built Environment  
University of the Witwatersrand

**T**he Faculty of Engineering and the Built Environment comprises five engineering and two built environment schools, two 21<sup>st</sup> Century institutes and seven externally funded centres (most recently the Centre in Water Research and Development – CiWaRD). The Faculty has a strong research and postgraduate community, essential for its long-term research and graduate targets.

During 2016/17, the enrolment of postgraduate students (excluding honours and postgraduate diplomas) exceeded targets. There were 2 036 enrolments in 2016 (up by 4.8%) and 2 164 enrolments in 2017 (up by 3.1%). The Faculty increased the number of research publications submitted to the Department of Higher Education and Training from 162.69 units in 2015 to 187.87 units in 2016. The number of NRF-rated researchers increased from 22 in 2016 to 27 in 2017, with the NRF renewing the A-rating of Professor Beric Skews in the School of Mechanical, Industrial and Aeronautical Engineering for the fifth consecutive time. The Academy of Sciences of South Africa inducted the DST/NRF South African Research Chair in Sustainable Process Engineering, Professor Thokozani Majosi as a member. Professor Sehliselo Ndlovu was appointed as President of the Southern African Institute of Mining and Metallurgy at the same time that Professor Craig Sheridan became President of the South African Institute of Chemical Engineers and Industrial Engineers. This is the first time in the School's history that members of staff have simultaneously presided over these industry bodies.

The Centre for Urbanism and Built Environment Studies in the School of Architecture and Planning in partnership with the African Urban Research Initiative (AURI) established the AURI Scientific Committee in 2016, of which Professor Marie Huchzermeyer is an elected member.





# Corridors of freedom and transformation through transit

Researchers have confirmed that transit-orientated development is a good choice to ensure a spatially transformed Johannesburg in 2057.

The South African Research Chair in Spatial Analysis and City Planning (SA&CP) at Wits University, the Agence Française de Développement, and the City of Johannesburg launched the Spatial Transformation Through Transit-Orientated Development (ToD) in Johannesburg in 2017.

"The collaboration brings together institutions, each playing quite different roles in society, around a compelling agenda; that of building an urban future which meets the needs of and responds to the hopes of all segments of our society," says Professor Philip Harrison, SA&CP Research Chair.

A series of reports are the culmination of 18 months of research into transit-orientated development, which refers to concentrating urban development around stations to support transit use, and developing transit systems to connect existing and planned concentrations of development.

According to the report, the international experience supports the case for transit corridors in Johannesburg – they are useful and necessary planning instruments in urban regeneration, they improve sustainability, increase access for poorer communities, and improve rates bases in strategic areas.

"The international experience supports the case for transit corridors – it is the right programme for our spatial, social and economic goals. The current forms and institutional arrangements demonstrate some of the key features of successful corridors found elsewhere," says Dr Margot Rubin, co-author and senior researcher in SA&CP at Wits.

Johannesburg's Transit Corridors programme is an ambitious mega project that builds on what already exists. Although ToD in Johannesburg has a 40-year time horizon, it has already seen some successes over four years. These include the provision and use of the Bus Rapid Transit (BRT) system by certain communities, significant public environment and infrastructure upgrades, and the construction of vital services such as clinics in areas that were previously underserved.

Researchers have recommended that the City develop a "toolbox of incentives" to enhance partnerships with private sector developers, and urged the City to pay close attention to safety and security, urban management and employment across the corridors. Public participation protocols require rethinking and possibly reconfiguration, the report says, because in their current formulation, they are not sufficiently able to include the voices of the poorest and most marginalised. Furthermore, public participation needs to be seen as a long term relationship with communities and stakeholders.

"The spatial and economic issues bedevilling Johannesburg are entrenched. Mega projects and ToD take time but it's worth staying the path. And partnerships do work we should think through more partnerships," says Rubin.

# Can you read my mind?

In research thought to be a world first, biomedical engineers at Wits connected a human brain to the internet in real time. The "Brainetnet" project streams brainwaves onto the internet. Essentially, it turns the brain into an Internet of Things (IoT) node on the World Wide Web.

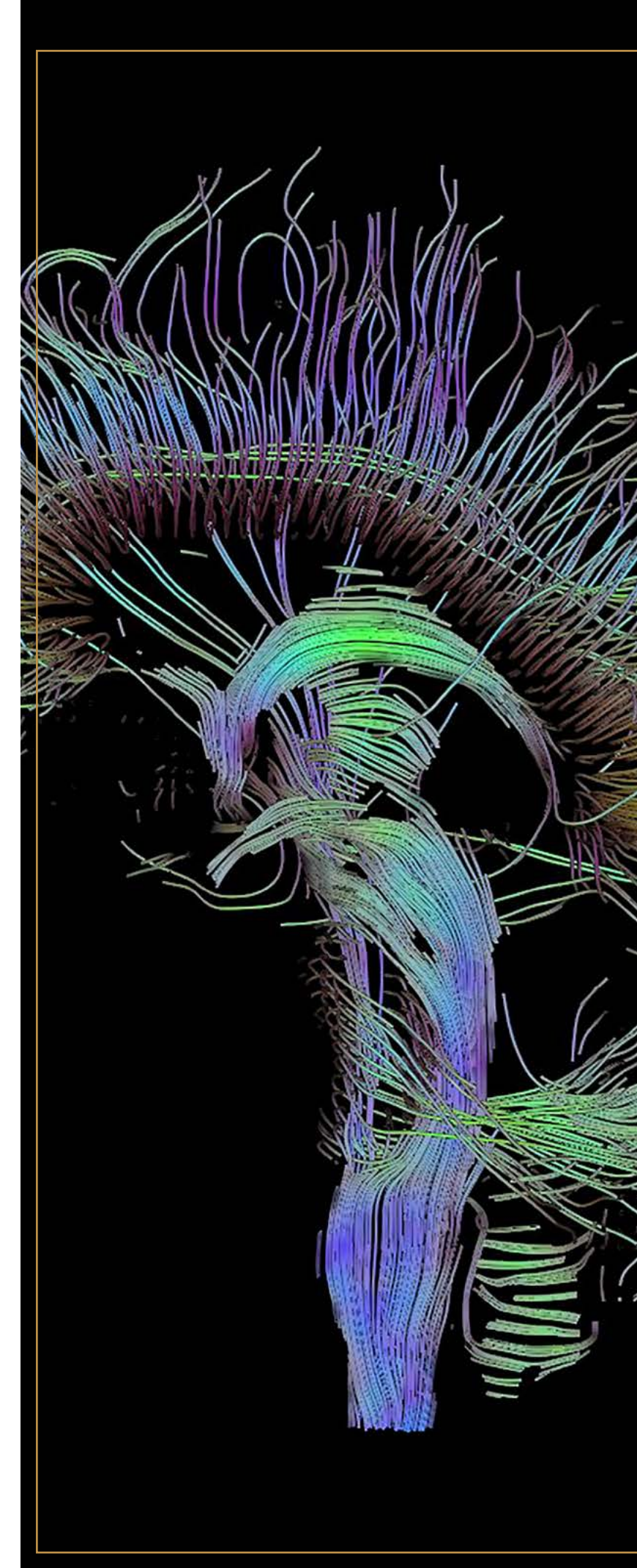
Brainetnet works by converting electroencephalogram (EEG) signals (brain waves) in an open source brain live stream.

A person wears a powered, mobile, internet accessible Emotiv EEG device for an extended period. During this time, the Emotiv transmits the EEG signals to a Raspberry Pi – a credit card sized little computer – live streams the signals to an application programming interface (code that allows software programmes to communicate), and displays data on a website that acts as a portal. This is currently an open website where the public can observe the individual's brain activity.

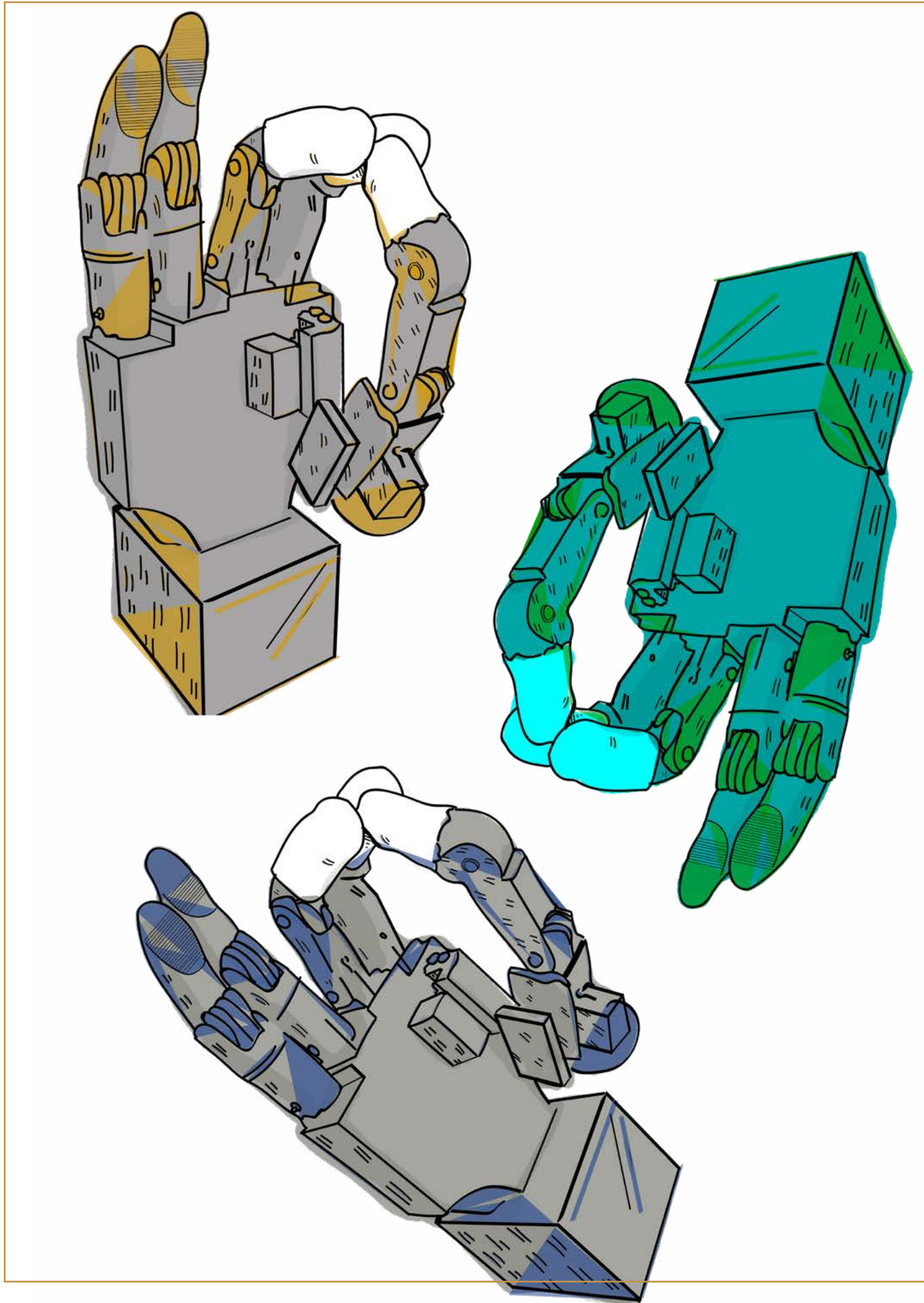
Brainetnet is the brainchild of Adam Pantanowitz, a Lecturer in the Wits School of Electrical and Information Engineering, who supervised fourth-years Jemma-Faye Chait and Danielle Winter in its development.

"Brainetnet is a new frontier in brain-computer interface systems. There is a lack of easily understood data about how a human brain works and processes information. Brainetnet seeks to simplify a person's understanding of their own brain and the brains of others. It does this through continuous monitoring of brain activity as well as enabling some interactivity," explains Pantanowitz.

"Ultimately, we're aiming to enable interactivity between the user and their brain so that the user can provide a stimulus and see the response. Brainetnet can be further improved to classify recordings through a smart phone app that will provide data for a machine-learning algorithm. In future, there could be information transferred in both directions – inputs and outputs to the brain," he concludes.







# Interpreting brainwaves to give amputees a hand

**B**iomedical engineers at Wits are researching how brainwaves can be used to control a robotic prosthetic hand. Such a brain computer interface (BCI) will enable amputees and people with motor impairments to regain some hand mobility.

BCIs can use electroencephalograms (EEGs) – brainwaves – to interpret human intentions from electrical signals in the brain and use these to control an external device such as a prosthetic hand, computer, or speech synthesiser. The prosthetic robotic hand relies on EEGs extracted via electrodes on the skull, or electromyography (EMG) obtained from electrodes recording muscle signals, for information. A BCI will interpret these signals and translate them to instruct the movements of the artificial hand.

"I envisage a BCI capable of controlling a robotic prosthetic hand that will enable people with motor disabilities to write, hold a glass or shake hands," says Abdul-Khaaliq Mohamed, Lecturer and PhD candidate in the School of Electrical and Information Engineering at Wits. Most BCI experiments to date have centered on basic hand movements such as finger taps, button presses or simple finger grasps. Mohamed's research group focusses uniquely on a combination of hand movements including wrist extension, wrist flexion, finger flexion, finger extension and the tripod pinch.

"In South Africa, stroke victims may benefit significantly from this technology," says Mohamed. "Stroke afflicts an estimated 132 000 South Africans per year."

Currently, a prosthetic hand costs around US\$100 000 (about R1,35 million), an investment, out of reach for most South Africans. Thumbs-up for this research that will use 3D-printing to create a prosthetic hand for US\$78 (R1 053), thereby increasing access to healthcare for many.



# FACULTY OF HUMANITIES

## Message from the Dean

**Professor Ruksana Osman**  
Dean of Humanities  
University of the Witwatersrand

**T**he Faculty of Humanities, comprising five schools and 12 research entities, hosts five NRF A-rated researchers, eight endowed multi-sector Chairs, and four prestigious South African Research Chairs.

In 2016/17, the Faculty produced the highest number of accredited publications and subsidy-yielding outputs in its history, recording over 462 units, with 80% more citations than the normalised global average. Postgraduate registration and throughput has increased year-on-year and the Faculty produced 1 568 postgraduates including 106 doctoral graduates during this period. The Faculty formalised some 20 partnerships across the globe towards realising its internationalisation and transformation objectives. In this regard, the Inclusive Professoriate Programme enables the advancement of black academics.

The Faculty continued its vibrant research culture through facilitating knowledge transfer and engagement through public events. In the 2016/2017 period, the Wits Institute for Social and Economic Research and the Society, Work and Development Institute advanced inter-sectoral research in South Africa's contemporary socio-political milieu. This research explores collective violence and protests, the politics of mining, and South Africa's place in the BRICS geoformation, amongst other aspects.

As testament to its well-established and increasing reputation as a world-leading hub of humanities research, the Faculty received significant funding in 2017, notably from the Andrew W. Mellon Foundation. The Foundation's commitment of resources to the *Violent States, States of Violence* research project and *Narrative Enquiry for Social Transformation* initiative is commensurate with the Faculty's standing as a globally recognised contributor to knowledge creation in the 21<sup>st</sup> Century.



**“We cannot talk about economic development and social cohesion without taking into account the issue of language because languages are central to social cohesion. You can’t expect a Zulu and a Tswana person to socially cohere if there is no crossover of language.”**

Professor Leketi Makalela



## Talking tech and African Languages

Discussions on the status of African languages portray a dim view. For centuries, African languages have been under threat as one conqueror after another has imposed their preferred language on various nations on the continent. Subsequently, African languages have low status in our institutions and continue to be marginalised in all spheres of power, including government quarters.

In South Africa, English continues as the *lingua franca*, despite government policies that protect and promote vernacular languages. There have been warnings about the death of these languages. However, indigenous languages are far from extinct says Professor Leketi Makalela, Head of Languages, Literacies and Literatures in the Wits School of Education.

“Where government has failed, technology is bringing hope to the people,” says Makalela. “African languages were probably going to die, were it not for technology, social media and popular culture. Technology is going to take African languages forward and these languages are going to evolve to fit into the digital age and any future world shift.”

Ironically, this change is one of the major criticisms levelled against technology, and especially social media, where variations of spelling abound, and where the platforms are also implicated for contributing to the decline in literacy and writing standards.

“People are concerned about change and this has been an ongoing major debate in human language development. The great divide is about whether the change results in decay or progress. A conservative will say it is decay because there is nostalgia for the past and everything is being disorganised by modernity. This has to do with aging as well – the older you are, the more you want to keep things the same,” says Makalela, who is also the Editor-in-Chief of the *Southern African Linguistics and Applied Language Studies Journal* and Chairperson of the Umalusi Council's Qualifications Standards Committee.

To put things into perspective, Makalela says the primary question that needs to be asked in such debates is: What is the purpose of language?

“We need to question what language is and why we have language as human beings before we look at the structure (syntax and spelling). People obsess about the aesthetics of the language and yet language is here for meaning-making. The ‘net speak’ and contraction of words are a natural evolution of language and a reflection of the time. The structure of language keeps changing because people are changing.”

One of the significant, laudable changes brought about by social media is that they break down linguistic barriers. Makalela believes we should celebrate that communication technology is contributing to the decolonisation of languages.

“The Balkanisation of African states in 1884 in Berlin was attached to the languages. The Bantustan policy of apartheid architect H.F. Verwoerd was based on supposed linguistic differences,” says Makalela. “African languages were separated intentionally, not because they were or are different, but because the strategy was to divide and conquer. Technology has now made it easy for linguistic groups to realise how similar they are than they were previously told.”

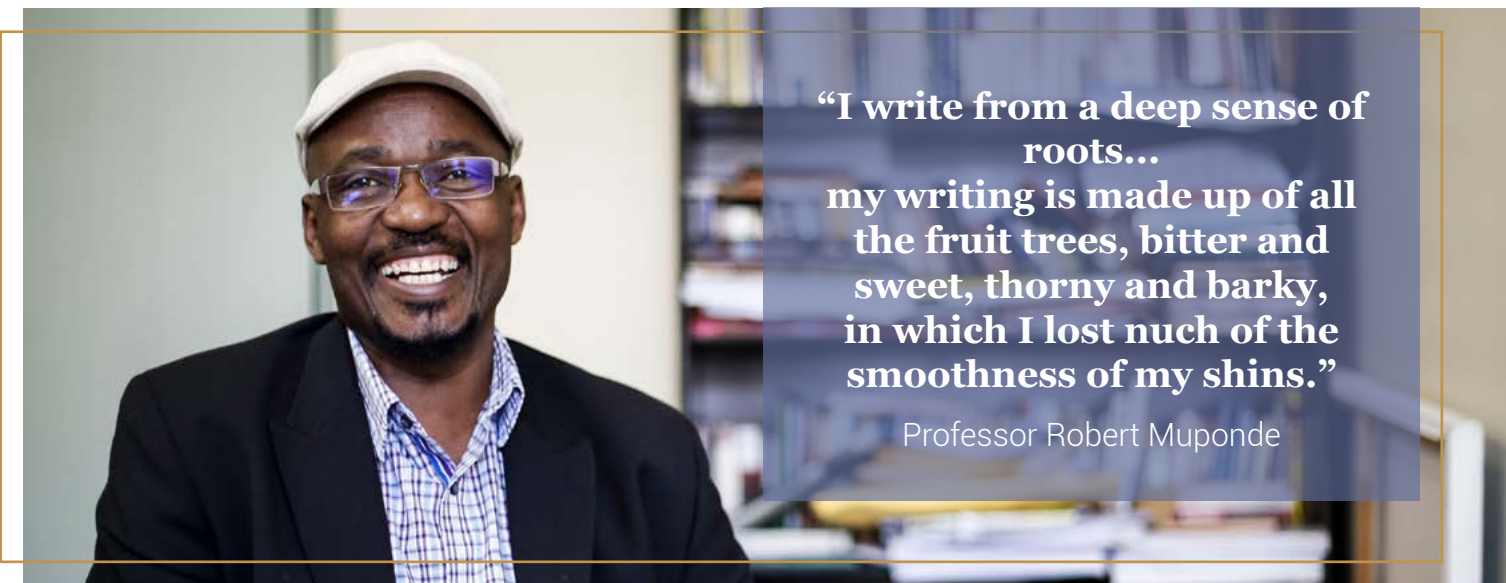
Communities such as #BlackTwitter, mother-tongue appreciation groups on Facebook and blogs where young creatives share works in their languages and culture are defying institutions and moving languages into the 21<sup>st</sup> Century. Local television programmes are also playing their part in promoting multilingualism with many creative works moving between three and more languages, recreating and reinforcing the South African linguistic reality.

“We cannot talk about economic development and social cohesion without taking into account the issues of language because languages are central to social cohesion. You can’t expect a Zulu and a Tswana person to socially cohere if there is no crossover of language,” he adds. “One of the barriers that must be removed to drive this growth is for linguistic groups to be open to the influence of non-mother tongue speakers,” explains Makalela.

“There seems to be a sacredness and unwillingness to allow others to learn African languages, which often makes it closed to outsiders. If we really want our languages to flourish, we have to open the doors to non-mother tongue speakers so that there is nothing like KZN isiZulu vs Gauteng isiZulu (which is seen as weak isiZulu). In fact, it’s a time to redefine what we call standards.

English became a dominant language because it opened its doors to non-mother tongue users. The type of English used today is heavily multi-lingual with 80% of the words in the language not original English. In addition, 80% of users are not traditional mother tongue speakers. English thrives and lives on donations from other languages.”

Another area where Makalela would like to see transformation is the use of technology in the classroom to promote multilingualism. “While technology is often seen as eroding African values, accelerating moral degeneration and the loss of ubuntu, practice is suggesting that it is having an opposite effect on languages. Let us focus on creating shared meaning and understanding through opening up our languages and using technology to contribute towards fostering social cohesion in our diverse society.”



**“I write from a deep sense of roots... my writing is made up of all the fruit trees, bitter and sweet, thorny and barky, in which I lost much of the smoothness of my shins.”**

Professor Robert Muponde

## Some kinds of childhood

The books of Professor Robert Muponde illustrate how critical redress in cultures of representation can yield cross-disciplinary innovation in global humanities.

Muponde is a writer and an intellectual in the Department of English at Wits. He has edited titles which have contributed to an intellectual infrastructure in the study of Zimbabwean literature and culture.

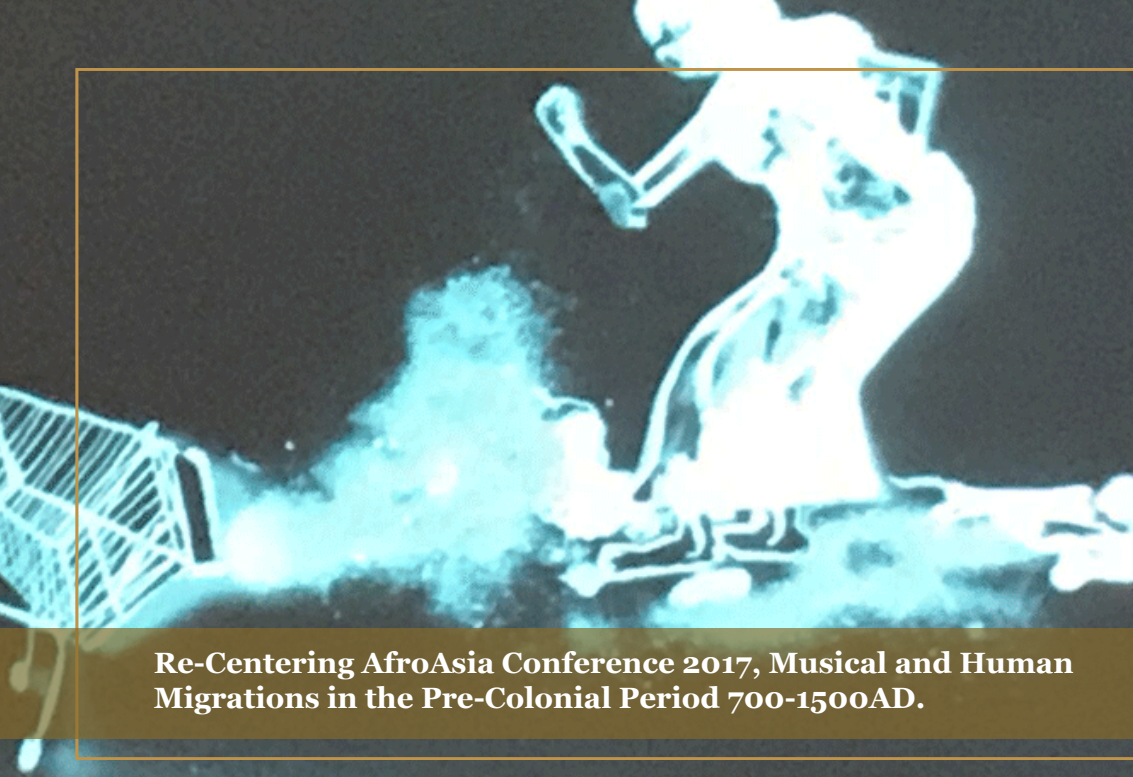
These titles include *No More Plastic Balls: New Voices in the Zimbabwean Short Story*, which is now a set book at A-Level schools in Zimbabwe. *Sign and Taboo: Perspectives on the Poetic Fiction of Yvonne Vera* remains a major reference book.

*Versions of Zimbabwe: New Approaches to Literature and Culture* has become the canonical go-to for anyone beginning explorations of Zimbabwean literature while *Manning the Nation: Father Figures in Zimbabwean Literature and Society* is on the reading lists for gender studies in South Africa and African Studies institutions in Africa and abroad.

Muponde's monograph, entitled *Some Kinds of Childhood: Images of History and Resistance in Zimbabwean Literature*, focuses on the child/childhoods to connect creative works to historical trajectories and political and social movements. The monograph has been described as an important contribution to the field of Zimbabwean literature and beyond.

Muponde's subsequent study on the configurations of childhoods takes the form of creative non-fiction, *Ecology of Childhood: The Scandalous Times of a Book Louse* for a book provisionally titled *Cultures of Representation*, which will include an anthology of critical essays.





Re-Centering AfroAsia Conference 2017, Musical and Human Migrations in the Pre-Colonial Period 700-1500AD.



# Creative Research: Putting imagination in the conversation

There's a new approach to research, which acknowledges that creative output has equal academic value to empirical investigation. In 2007, the National Research Foundation (NRF) recognised creative work as research. This means that scholars working in the creative arts can be NRF-rated and their works considered legitimate research outputs.

Creative research has gained credence across the world in recent decades and at Wits since 2008 when Senate confirmed that the University's research plans and policies can define artists who produce peer-reviewed creative work as "research active". The Research Office at Wits awards one point for work deemed equivalent to an article and up to five points for work deemed equivalent of a scholarly monograph.

"Creative research is very important to Wits. The beauty of working at a university such as Wits is that one comes across all types of research and all of it is important in achieving our goal of becoming an internationally competitive and locally relevant university. The Faculty of Humanities has a process of peer reviewing creative research. Such approved research attracts the normal Research Incentive [RINC] as does all other accredited research," says Dr Robin Drennan, Director of Research Development at Wits.

## Theorising in and through the arts

Professor Brett Pyper, Head of the School of Arts at Wits, points out that there are many possible ways in which creative work can produce, circulate, or question knowledge – "We theorise in and through the arts." He cites Professor Gerrit Olivier (a former Dean of Humanities and Head of the School of Arts), who notes that advancing creative research entails considering "whether artistic products are research or whether they *are the equivalent of research* or whether they *accompany, incorporate or inspire research* while at some level remaining something *different from research*."

This entails foregrounding the central place of the imagination in all academic inquiry, while the historical presence of the arts within the University is indicative of the recognition that the arts advance the academic project – whether or not they are reducible to prevailing notions of "knowledge production." In fact, their value may lie precisely in challenging prevailing epistemologies.

The School of Arts and the Wits City Institute (WCI) are involved in the *Re-Centering AfroAsia* project, an artist-led residency that combines (*inter alia*) the arts, architecture, and science. Based at the University of Cape Town but supra institutional in execution, the project explores the traffic of people and products from pre-colonial Africa and the Indian Ocean through musical practice.

It's a multi-pronged research mapping, and archiving project that aims to revolutionise humanities research in South Africa and to create an Afro-Asian community of scholarship. The WCI is constituted as such a network of researchers and associated entities.

The WCI's network model enables Wits to provide institutional support for developing city research. Funded by the A.W. Mellon Foundation's Architecture, Urbanism and Humanities initiative, the WCI has successfully established communities of interest. It's a 21st Century institute at Wits with a national, regional and – increasingly – international research landscape.

"Sometimes the relationship of Africa with other Diasporas is available only through the imagination, not just the empirical," says Pyper.

## Writing imaginative research

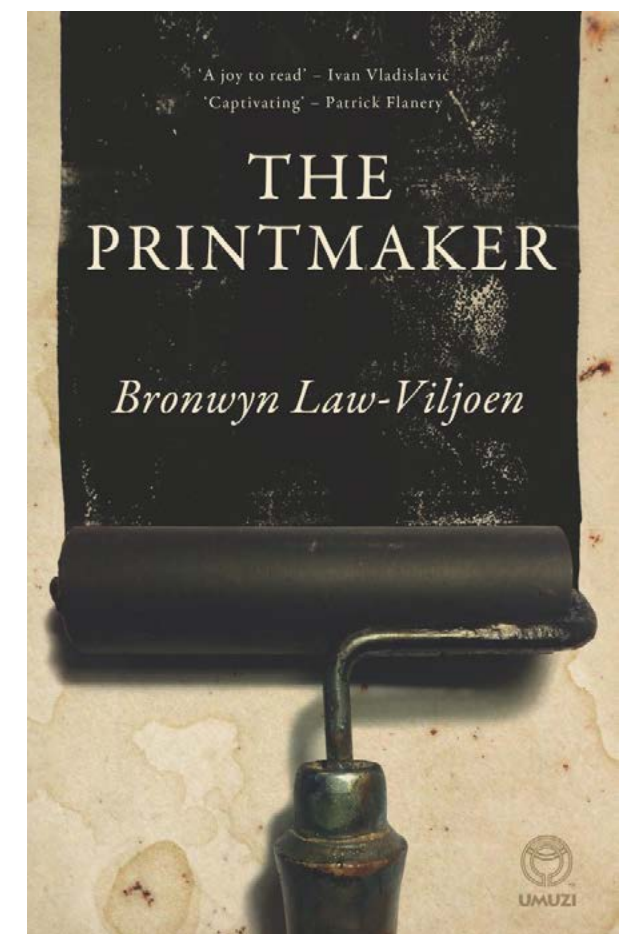
Imagination – through creativity – is a requirement for admission to the PhD in Creative Writing that Wits offers. Applicants must hold an MA in Literature or Creative Writing and have published at least one book of writing in a creative writing genre through a reputable publisher.

A PhD in Creative Writing at Wits requires a long-form essay (equivalent in scholarly rigour though not in length to a thesis) and a substantial creative work (novel, play script, or collection of poetry, essays or short stories respectively).

Associate Professor Bronwyn Law-Viljoen is head of Creative Writing at Wits and author of *The Printmaker*. She wrote this debut novel as part of her PhD. Set in modern day Johannesburg, *The Printmaker* is based on a real person, Marcus Glaser, who left his estate (including 6 000 never-before-seen prints) to a friend. The research involved in conjuring March Halberg (Law-Viljoen's printmaker) from Glaser, imagining the art-historical training and predilections of such a character, and representing the highly technical art of printmaking is no less rigorous than any other research-intensive inquiry.

"Wits recognises and rewards high quality contributions that are original and innovative in their methods of enquiry, their interpretation, and the insights they offer. Creative research contributions should also embody research, demonstrate a rigorous understanding of and approach to creative processes, and have a significant and demonstrable impact on the field," says Drennan.

Images: Noëleen Murray and Jonathan Cane







# Nduka Mntambo

## CITIES AS MOVING TARGETS

Film-maker Nduka Mntambo is fascinated with Johannesburg. His PhD uses creative research to explore the city as a moving target.

"This is my space," Mntambo waves an arm around his small, surprisingly bright office in the basement that houses the Film and TV division in the School of Arts at Wits.

He's always been interested in space. Having previously worked as a production designer, Mntambo built and tore down sets as required. He became interested in space and in trying to understand Johannesburg as it is represented in film.

"What is it about this city and its structures? When you do production design you have to research the space. There's lots of moving around, buying materials in the city. That's when I started to understand the different parts of the city: Diagonal Street by the old stock exchange, that colossal glass building, the small beautiful shops selling *muti*..."

Mntambo was born in Sebokeng in 1979. He attended Fundulwazi Secondary School where he participated in a youth acting group. After matric he enrolled at Vista University to read law.

During this time he auditioned for a part in a show at the Market Theatre. "Gamakhulu Diniso, a satirist, was my mentor. I took the job at the Market Theatre and never looked back."

Mntambo abandoned law and enrolled at Wits for a BA in Dramatic Art, specialising in film and TV production. He began doing shows at The Wits Theatre – behind the scenes rather than on stage.

"I remember for a class that started at 08:15, I would need to be at the train station at 05:15. There's a coach of worship, a coach where people smoke weed. I would get in, get to Park Station, walk to Wits."

Mntambo's sister, who was studying teaching at Vista, got her brother into reading. He read one of her set works, *100 Years of Solitude* (1967) by Nobel laureate Gabriel García Márquez.

"It's an incredible story of a family in South America told over 100 years in the style of magic realism – an epic. It literally changed the trajectory of my life. My world just opened," says Mntambo.

He went on to teach at the University of Johannesburg for four years then returned to Wits to read for his PhD.

At this time his fascination with Johannesburg really took root. He names *Welcome to our Hillbrow*, by Phaswane Mpe as a seminal influence. This novel is about a young black man inhabiting "this space" and represents Mntambo's first foray in reading Johannesburg.

Mntambo immersed himself in this new, young Johannesburg – an exciting, contradictory and dynamic space characterised conversely by Sandton versus Alexandra, and the flight of capital to the northern suburbs.

At Wits his MA experimental film, *If This Be a City* (2015) is a gritty, visceral re-imagination of the *flâneur* figure – a person who walks the city in order to experience it. It is an exploration of the politics of space, citiness and desire.

"I tried to capture the register of the city – mapping the city with your body. Usually a black man is seen as a figure of violence and fear. How do we invert these tropes?"

*If This Be a City* was selected to be part of the Johannesburg Pavilion at the Venice Biennale 2015 and was also part of the Urban Flux Film Festival, which was an official project of the France South Africa Seasons 2012/2013.

In collaboration with Mwenya Kabwe, a lecturer in Dramatic Art at Wits, Mntambo conceived *Tomorrow we will remember the things we have forgotten: prompts and projection*, a multimedia installation presented at the Afrikan Freedom Station as part of Artseach Symposium from 9 to 11 March 2017. This project is an iteration of a creative research doctorate that privileges the idea that artistic research is a viable and important research methodology and means of knowledge production.

*The Cities as Moving Targets* body of work reflects on contemporary African urban film practice that is characterised by epistemic and aesthetic disobedience.

"I am interested in thinking creatively about the evolving filmic grammars of researching and representing urban spaces in selected African cities."

A continuation of Mntambo's MA, this doctoral research integrates research field trips to Ghana, film, performance and mobile sculptures.

"I'm really interested in form in film making. But films are not neutral. Part of my work is to make explicit that a film is a construct – that there is a maker who comes with his own experiences and prejudices," says Mntambo.

The Amsterdam School for Cultural Analysis Cities Project invited Mntambo to present at the Urban World-Making conference in June 2017. Furthermore, his paper *The Cinematic City: Desire, Form and the African Urban* was accepted for presentation at the 2017 African Literature Association annual conference at Yale University.





# FACULTY OF HEALTH SCIENCES



## Message from the Dean

**Professor Martin Veller**

Dean of Health Sciences

University of the Witwatersrand

**T**he Faculty of Health Sciences is the largest Faculty of its kind in South Africa with a global reputation for producing highly skilled research and scholars. The Faculty's 85 NRF-rated researchers, eight South African Research Chairs and other scholars publish over 1 000 papers per year in high impact journals. The citation rates of these scholars are evidence of the Faculty's research quality, which positively affects local policy and impacts on the lives of thousands worldwide.

The Faculty strengthened its research development processes through sustainable, robust initiatives to increase research output and postgraduate throughput. The percentage of postgraduate students graduating compared to the total number enrolled per year increased from 17.4% in 2016 to 22.2% in 2017 (606 out of 2 720 enrollments, compared to 470 out of 2 880 in 2016), demonstrating the Faculty's contribution towards driving the University's postgraduate and research intensive agenda.

Publications submitted to the Department of Education and Training (DHET) by Faculty increased by 120% between 2010 and 2016. During 2016/2017, the Faculty submitted 1 663 publication units to the DHET (926 of which were Scopus and 737 in Pubmed) compared to 1 021 units in 2016. The School of Clinical Medicine contributed the highest number of publications in 2016 (over 180 units), followed by the School of Public Health (over 100 units) and then the School of Pathology (100 units).

The Faculty will continue increasing training to meet South Africa's healthcare needs, improve innovation and research output that is responsive to communities and partnerships, and that drives transformation.





Credit Comugnero Silvana Fotolia

## SA child living with HIV maintains remission without antiretroviral drugs since 2008

A nine-year-old South African diagnosed with HIV at a month old who received antiretroviral treatment during infancy has suppressed the virus for almost 9 years.

Dr Avy Violari, Head of Paediatric Research at the Wits Perinatal HIV Research Unit (PHRU) in the Faculty of Health Sciences reported the case at the 9<sup>th</sup> International AIDS Society Conference on HIV Science in 2017. Violari is a co-leader of the *Children with HIV Early Antiretroviral Therapy* trial.

“To our knowledge, this is the first reported case of sustained control of HIV in a child enrolled in a randomised trial of antiretroviral treatment interruption following treatment early in infancy,” says Violari.

Before starting ART, the child had very high viral loads, but at about nine weeks old, the ART suppressed the virus to undetectable levels. Investigators halted treatment after 40 weeks as per the trial randomisation. They closely monitored immunity and the child has remained in good health during years of follow-up examinations.

Although it was not standard practice in South Africa to monitor viral load in people who were not on ART, recent analyses of stored blood samples taken during follow-up visits showed that the child has maintained undetectable levels of HIV-1 since treatment interruption.

Professor Caroline Tiemessen, the senior author of this case and Research Professor in Virology in the School of Pathology at Wits University, led the key laboratory investigations. She was the winner of the Vice-Chancellor’s Research Award in 2017.

“We believe there may have been other factors in addition to early ART that contributed to HIV remission in this child. By further studying the child, we may expand our understanding of how the immune system controls HIV-1 replication,” says Tiemessen, who is also the NRF/DST Research Chair in HIV Vaccine Translational Research and head of cell biology at the Centre of HIV and STIs of the National Institute of Communicable Diseases in Johannesburg.

The South African child was diagnosed as HIV-1 positive during 2007 at 32 days old and was then enrolled on the clinical trial.

HIV-1 infected infants in the trial were assigned at random to receive one of three treatments – either deferred ART or early limited ART for 40 or 96 weeks. The South African child was assigned to receive early ART (AZT, 3TC, Lopinavir/ritonavir) for 40 weeks.

When this child was nine-and-a-half years old, investigators conducted laboratory and clinical studies to assess the child’s immune health and the presence of HIV-1. They detected a viral reservoir that had integrated into a tiny proportion of immune cells, but they otherwise found no evidence of HIV-1 infection.

The child had a healthy level of key immune cells, a viral load that was undetectable by the routine laboratory diagnostic assays, and no symptoms of HIV-1 infection. The researchers detected a trace of immune system response to the virus but found no replication competent HIV-1.

Researchers confirmed that the child does not have genetic characteristics previously associated with spontaneous control of HIV-1 in adults, suggesting that the 40 weeks of ART provided during infancy may have been key to achieving HIV-1 remission in this case.



Credit: Michèle Ramsay

## Scientists find **genetic mutation** responsible for rare skin disease in Afrikaners

Scientists have discovered the genetic mutation that causes the rare skin disease, keratolytic winter erythema (KWE), or ‘Oudtshoorn skin’, in Afrikaners.

Researchers at the Sydney Brenner Institute for Molecular Bioscience (SBIMB) and the Division of Human Genetics at Wits, in collaboration with peers in Europe, the US and Canada published this research in the *American Journal of Human Genetics*.

KWE causes a redness of the palms and soles with consecutive cycles of peeling of large sections of thick skin, often exacerbated during winter months. Oudtshoorn is a town in the Western Cape province of South Africa where the disorder was present in large families.

Afrikaners are Afrikaans-language speakers descended from predominantly Dutch, German and French settlers, who arrived in South Africa in the 17<sup>th</sup> and 18<sup>th</sup> centuries. Afrikaners have a high risk for several genetic disorders, the best known being familial hypercholesterolaemia (inherited high cholesterol leading to heart attacks early in life) and porphyria (sensitivity of the skin to ultra-violet exposure and adverse reactions to specific drugs).

These disorders are common because of founder mutations brought to South Africa by small groups of immigrants who settled in the Cape of Good Hope and whose descendants are now spread throughout the country. KWE is one of these less well-known founder genetic disorders.

In addition to identifying the genetic mutation for scientific purposes, this research now enables dermatologists to make a definitive diagnosis of KWE in patients. It further enables researchers to understand similar skin disorders and is a starting point for developing possible treatments.

### Gene mutations

Thandiswa Ngcungcu, supervised by Professor Michèle Ramsay, Director of the SBIMB embarked on research in this area for Ngcungcu PhD. It involved large-scale DNA sequencing during an internship on the Next Generation Scientist Programme in Novartis, Basel. The mutation was not detected by conventional data analysis so copy number variants (genetic changes) – where regions of the genome are duplicated or deleted – were investigated. Ngcungcu and the researchers then discovered a mutation in a region between genes that was present in all South African KWE-affected individuals studied.

During this time Dr Torunn Fiskerstrand, University of Bergen, Norway, independently discovered the genetic cause of KWE in Norwegians. Ramsay and Fiskerstrand collaborated. The different DNA duplications in the South African and Norwegian families overlapped at a critical genomic region called an enhancer (which ‘switches on’ the gene) – providing strong evidence that this was, in fact, the KWE mutation.

For over a year the scientists researched how this duplicated enhancer caused KWE. They demonstrated that the mutation causes a nearby gene to produce more protein than normal and that this abnormal expression was the likely cause of the skin peeling. Solving the mystery of KWE was a journey of data analysis, ancestry mapping, genomic comparison and global collaboration. Ngcungcu continues her work as a postdoctoral fellow examining the genetics of another skin disorder, albinism, and as a Lecturer in the Division of Human Genetics.



# Bittersweet monopoly



## Capitalising on consumers' sweet spot has dangerous implications for public health.

Research conducted by public health experts at Wits University and their associates worldwide have explored how multinational global corporations that sell sugar-sweetened beverages (SSBs) and fast foods undermine health, and have proposed how fiscal measures can protect health.

The Priority Cost Effective Lessons for System Strengthening South Africa (PRICELESS SA) is a research unit in Public Health at Wits, which provides information to improve the allocation of resources for national priorities that address public health.

## Money where the mouth is

"Fiscal policies for health involve raising the price of a product to deter its use, or decreasing the price of a product to stimulate use, and income transfers to vulnerable populations to increase affordability of health products and/or services," says Professor Karen Hofman, Director of PRICELESS SA, who launched the *Fiscal Policies for Population Health in SA* report in January 2017.

Frank Chaloupka, Professor of Economics and Director of the Health Policy Center at the University of Illinois Chicago visited the School of Public Health in November 2016, and presented research to the South African Treasury on the effects of prices, policies, and other environmental factors on diet, physical activity, and obesity. Sugar-sweetened beverages in particular are linked to obesity, type 2 diabetes and dental problems.

Chaloupka's research showed that a 10% increase in the price of SSBs resulted in a 12.1% reduction in consumption of these products. Thus, the basic laws of economics apply: price increases reduce consumption and thus ultimately result in healthcare improvements.

"There are just a handful of behaviours that contribute to a lot of these non-communicable diseases (NCDs) if you look at the leading causes of death: Tobacco use, unhealthy diets, physical inactivity, and excessive alcohol use. It suggests to me if we can do something to change those behaviours, it will have an impact," said Chaloupka. But changing behaviour is difficult – particularly amidst million-dollar advertising onslaughts.

## Monopolising mindscape

Rob Moodie is Professor of Public Health at the College of Medicine, University of Malawi, and Professor of Public Health at the University of Melbourne's School of Population and Global Health. Speaking at the Wits School of Public Health in October 2016, he interrogated strategies that the junk food industries use to drive sales and increase profits.

"Transnational corporations are major drivers of non-communicable disease epidemics. These corporations profit from increased consumption of tobacco, alcohol, processed food, etc.," says Moodie, adding that junk food industries use their size, power and influence to market their products and position.

"The global beverage industry spends billions on product advertising and then blames individuals for not practicing self-control – much focused on children", says Moodie. In South Africa advertising spend by Coca Cola increased 33% from 2014 (R193m), to R259m in 2016. Seventy percent of advertising is on television. Marketing has specially targeted the poor in South Africa as their growth strategy.

## "Taste the feeling"...

On January 19, 2016 US-based magazine *Advertising Age* published an article about Coke replacing its 'open happiness' tagline with 'taste the feeling'.

"Setting an enormous brand like Coke on a new marketing course is a massive undertaking and comes as the brand battles category headwinds, most notably declining soda consumption amid growing health concerns," wrote E.J. Schultz, journalist and Chicago Bureau Chief at *Advertising Age*.

"Coke would adopt a 'one-brand' approach that will unite multiple varieties like Diet Coke and Coke Zero", wrote Schultz, because "there are moments when this consumer wants to reduce their sugar intake," according to Coke's Global Chief Marketing Officer, Marcos de Quinto.

Moodie says Coke uses massive sponsorship of sport and music as a critical component of its corporate social responsibility strategy.

"The primary health risk posed by the consumption of these drinks is the high caffeine and sugar content which in excess have dire consequences. The reality is that the move to introduce a tax – also known as a health promotion levy – is necessary, as diets and lifestyles are changing in South Africa and we face a tsunami of obesity related diseases. A sugary beverage tax tries to reduce consumption of harmful products through increasing price but there are other drivers which also need attention – advertising to children in particular," says Hofman.

## Vigorous energy drink sales

Preference for food and beverage products is shaped by brand image through tactical marketing and advertising strategies. A key factor influencing consumption of processed food and drinks is how they are marketed to potential consumers, and this is especially true of newer entrants like energy drinks.

In August 2017, researcher Nicholas Stacey at PRICELESS led a new study that shows that energy drinks have achieved the highest recent sales volume growth in SA. Between 2009 and 2014, the annual volume of sports and energy drinks rose from about 98 million litres to 168 million litres, rising from approximately two to three litres per capita in only five years.

The fact that across beverage categories, energy drinks – which contain the highest sugar content – have achieved the highest recent sales volume growth in SA shows that advertising and sales of sugary drinks targeting adolescents and young South Africans in particular, is on the rise.

## Insidious strategies

Aside from an avalanche of advertising, junk food multinationals have seemingly innocuous strategies to persuade, promote, and profit. Moodie cites several methods used to increase consumption despite the threat that these products pose to public health:

- Investing in partnerships, corporate social responsibility, and physical activity programmes (being 'part of the solution'),
- Commissioning research to discredit any moves to regulate the industry,
- Using PR to sway public opinion and influence reporters, and
- Monitoring key public health researchers.

A recruitment advertisement in October 2017 for a Communications Manager (Field Brand Reputation) for McDonald's in Boston, USA, calls for a person who "will work to ensure a steady drumbeat of local people, food and community stories that support corporate and local business opportunities. In addition the role will focus on enabling operators to effectively engage with key influencers, media and stakeholders."

Hofman says, "All the big food groups are doing this." Multinationals appoint people who are tasked with positioning the firm as 'part of the solution'.

The sugar industry has used the threat of exaggerated, widespread jobs losses if government imposes the touted tax on sugary beverages. Hofman claims, however, that there are already fewer jobs, since small-scale cane growers have stopped planting while the sugar giants (Illovo, Tongaat Hulett, and Transvaal Sugar Ltd) are diversifying to remain profitable.

Research indicates that climate change and drought has forced this diversification, which has enabled multinationals to capitalise. Tongaat Hulett's disposal of land in KZN (and investment in cane-growing land elsewhere in southern Africa) is another strategy to remain profitable, as is Transvaal Sugar's merger with RCL Foods.

"Allegations of job losses have less to do with the proposed sugary drinks tax and more to do with global multinationals dominating the local market. The question is the extent to which South African workers benefit?" asks Hofman.

## Just desserts

Hofman cites a study by the American Chamber of Commerce, which showed that by 2030 non-communicable diseases will be costing the South African economy 7% of GDP. The impact of NCDs is not only deaths and years of life lost, but also on quality of life and morbidity – amputations, blindness, and kidney failure caused by diabetes because of consuming too much sugar. According to the Head of Orthopedic Surgery at the Charlotte Maxeke Hospital, the wards are overflowing with diabetes patients who have on average five amputations before they die.

On November 7, 2017, the Standing Committee on Finance decided that a decision for the Rates and Monetary Amounts and Amendment Revenue Laws Bill could proceed to the National Assembly. The Bill provides in general terms for a Health Promotion Levy and a schedule to the bill specifies that this will take the form of a tax on sugary beverages. Treasury introduced the tax in April 2018.





**Professor Bavesh Kana**  
 Head of the Centre of Excellence in Biomedical TB Research  
 University of the Witwatersrand

# Wits researchers publish landmark study in TB

**R**esearchers at the Centre of Excellence for Biomedical TB Research (CBTBR) at Wits have published a landmark study that advances the fundamental understanding of tuberculosis (TB). The study reveals profound insights into the way TB mycobacteria grow and adapt and sheds light on the complexity of successful treatment in patients with TB.

In this study, Wits scientists interrogated the presence and variance of “sleeping-state” *M. tuberculosis* bacteria in the sputum of TB patients. The research, published in the *American Journal of Respiratory and Critical Care Medicine*, provides anecdotal evidence pointing to the presence, in sputum, of what the scientists call “differentially culturable tubercle bacteria” – “sleeping organisms”.

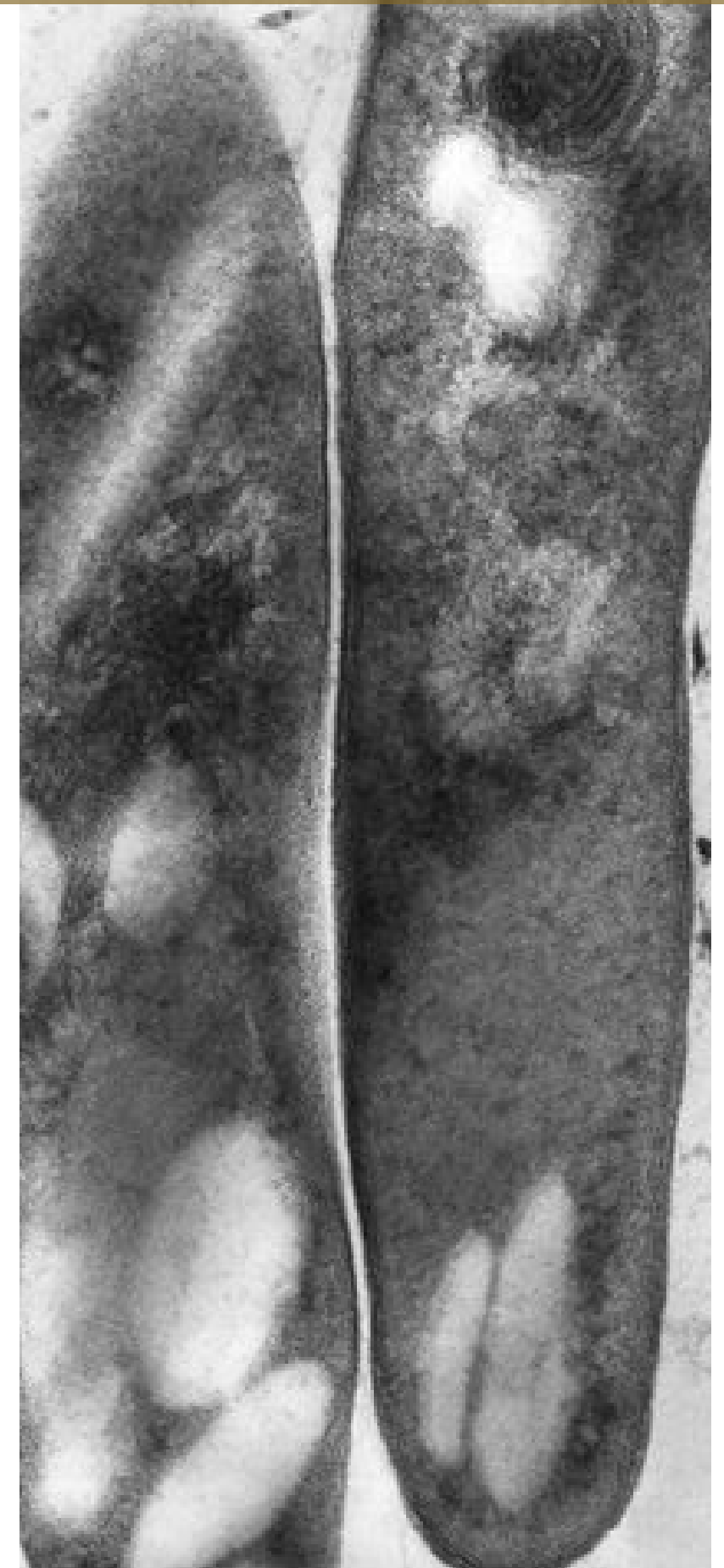
This intriguing observation was interrogated in a cross-sectional observational cohort of patients infected with TB or TB-HIV, from various clinics in Soweto. The research team was able to detect five operationally distinct sub-classes of tubercle bacteria in the sputum of TB patients already diagnosed with TB. This indicates a previously unappreciated degree of complexity in the prevailing bacteria in individuals suffering from this disease.

These sub-populations are expected to respond differentially to TB therapy and they most likely form the microbiological basis for the protracted six-month treatment required to achieve a functional cure in TB patients.

Sputum from TB-HIV-1 infected individuals, with CD4 counts >200 cells/mm<sup>3</sup>, displayed higher levels of “sleeping state” organisms than sputum from TB-HIV-1 infected individuals with CD4 counts <200 cells/mm<sup>3</sup>, suggesting that the immune response is critically related to these populations of bacteria.

In addition, the detection of these “sleeping state” organisms allowed for the diagnosis of tubercle bacteria in patients who are conventionally difficult to diagnose using the standard suite of tests for TB detection.

As a result, these new methods developed by Wits researchers provide exciting future avenues for TB diagnostic development, with the ultimate goal of being able to reach, diagnose and treat every TB patient.





# FACULTY OF SCIENCE

## Message from the Dean

**Professor Ebrahim Momoniat**

Dean of Science

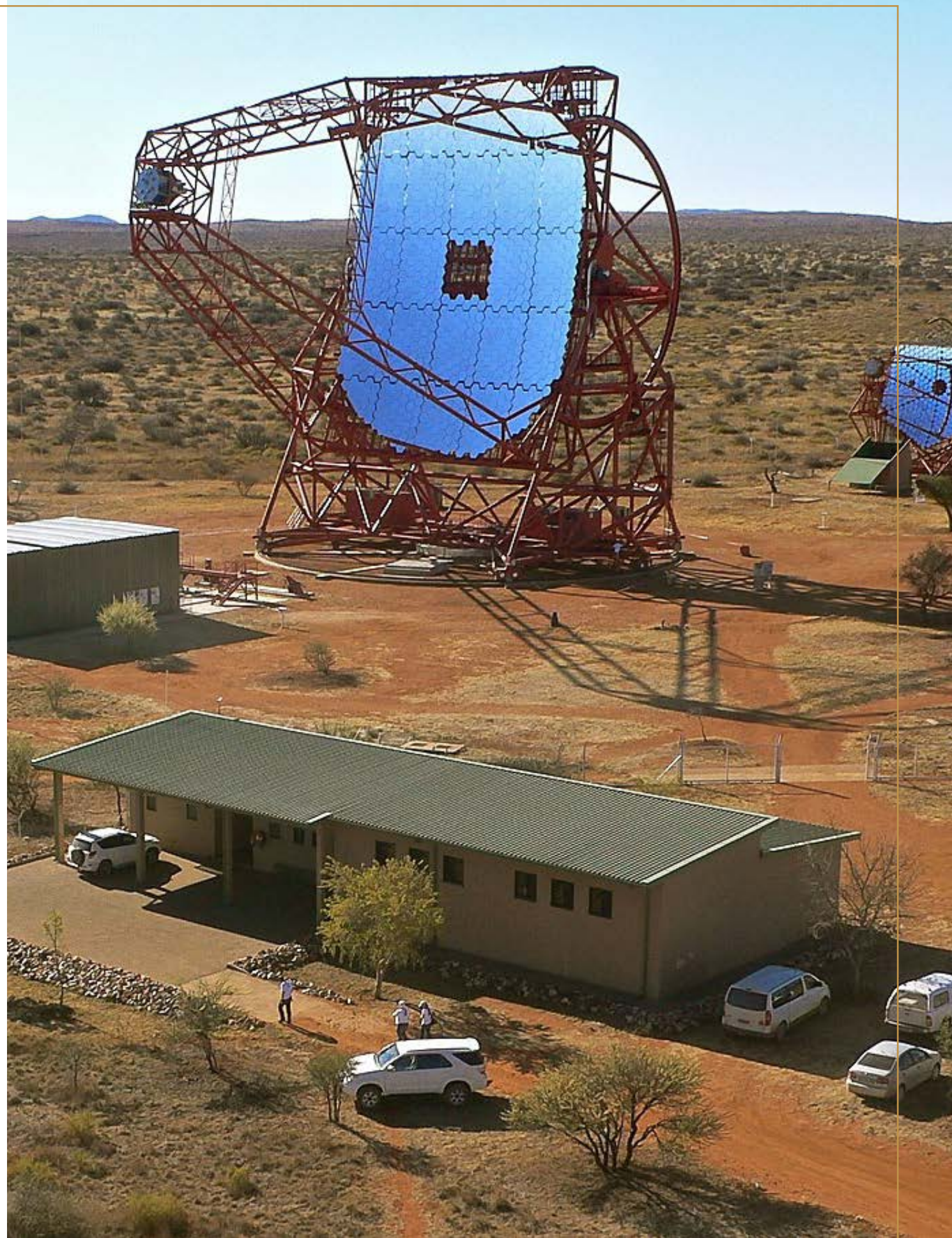
University of the Witwatersrand

In 2016, the Faculty earned the highest number of publications in its history with 441.91 units (up from 325.06 units in 2015). Academics published in high-profile journals, including *Nature Geoscience*, which featured research led by Dr Katie Smart and Professors Raymond Durrheim and Judith Kinnaird in the School of Geosciences. Professor Andrew Forbes in the School of Physics published in *Nature Physics* and earned an NRF A-rating in 2017 whilst Professor Robert de Mello Koch published in the *Journal of High Energy Physics*. Dr Paloma de la Peña and Professor Lyn Wadley (who earned an NRF-A1 rating in 2017) in the Evolutionary Studies Institute and the School of Geography, Archaeology and Environmental Studies (GAES) published in the *Journal of Human Evolution*. Professor David Pearce of the Rock Art Research Institute published in *Antiquity*, while Professor Roger Sheldon in the School of Chemistry earned an NRF A-rating in 2017 and published in *Green Chemistry*.

In 2016, Professors Florian Luca and Yevhen Zelenyuk in the School of Mathematics were NRF A-rated and Professor Fazal Mahomed, Director of the DST/NRF Centre of Excellence in Mathematical and Statistical Sciences became a Fellow of the African Academy of Sciences. I received the Vice-Chancellor's Research Award in 2016 and Professor Lee Berger was named South Africa's 'most visible scientist' in 2017. He was also one of two Wits scientists on the list of Highly Cited Researchers in the world. Professor Ed Witkowski won the 2016 Wits Faculty Supervisor's Award. In 2017, the Royal Society of South Africa elected me as a Fellow, Forbes became a Fellow of the Optical Society, and Professor Bob Scholes was appointed a Fellow of the World Academy of Sciences.

Emerging researchers also fared well during this period. In 2016, Professor Nosipho Moloto in the School of Chemistry received an NRF Research Excellence Award for Female Early Career Emerging Researchers. Dr Musa Manzi of the Wits Seismic Research Centre received the American Geophysical Union's Africa Award for Research Excellence in the Earth Sciences, as well as an NRF Early Career/Emerging Researcher Award in 2017. Dr Alan Cornell in Physics won the Wits Friedel Sellschop Award for Young Researchers whilst Dr Tiisetso Lephoto from the School of Molecular and Cell Biology received an NRF Excellence in Science Engagement Award. Professor Daniela Bezuidenhout from the School of Chemistry received the South African Chemical Institute's Raikes Medal in 2017. Dr Jennifer Fitchett received the Centenary Award for Early Career Researchers from the Society of South African Geographers and Grant Bybee in Geosciences became a Fellow of the Geology Society of South Africa.





# International breakthrough paves the way for future Multi-Messenger astronomical observations

For the first time in history, Wits researchers have witnessed electromagnetic signals that are associated with the gravitational wave emission from the coalescence of two massive neutron stars.

Working with data from the High Energy Spectroscopic System (HESS) telescope in Namibia, as well as with data from the AGILE Italian satellite, Professor Sergio Colafrancesco and his team from the School of Physics complemented a large variety of electromagnetic (e.m.) observations that were able to record signals from the same neutron star merger event.

These e.m. signals range from the detection of a gamma-ray burst about 2 seconds after the gravitational wave event detected by Ligo-Virgo, over near-infrared, optical and UV emission from decay of radioactive nuclei created in the resulting kilonova, to X-ray and radio emissions detected several days and weeks after the event. This first and extremely successful observation campaign is marking the beginning of truly Multi-Messenger Astrophysics.

The collision of the stars was such a massive event, that it emitted in gravitational waves the energy equal to three solar masses (three times the mass of the Sun), that was picked up by both the Ligo and Virgo Gravitational Wave interferometers. This event was announced at an international media conference in Washington.

"The Virgo and Ligo teams picked up the signals of the gravitational waves, and triggered the pointing of our telescopes in the direction in which they detected it. We narrowed down the area and pinpointed the source of the gravitational wave event to the collision of the two neutron stars," says Colafrancesco.

While the HESS telescope was trained on the event, it followed up a gamma ray burst in the same part of the sky, which exploded only two seconds after the merging of the two neutron stars.

"This is the first time ever that an astronomical event such as a gamma ray burst, and other relative electromagnetic signals, was observed alongside an event large enough to emit gravitational waves," says Colafrancesco.

Gamma ray burst are explosions in distant galaxies that release extremely high amounts of energy. They are the brightest electromagnetic events known to occur in the universe, and are very rare, with only a few occurring in a galaxy every million years.

"It was previously believed that gamma ray bursts might occur when a high mass star collapses to form a neutron star or a black hole, or during the merger of two binary neutron stars – as in this case – but now, for the first time, we have the actual evidence for it," says Colafrancesco.

Gravitational waves are only emitted by as massive objects in the universe interact with each other, such as black holes or neutron stars that merge.

The collision and merging of the two neutron stars was observed (by Ligo in Hanford, Washington in the USA, and in Livingston, Louisiana in the USA, and by Virgo, in Cascina, Italy) on 14 August 2017. The observation was named GW170817.

A neutron star is a very compact star, that is not as compact as a black hole, but their merger might result in a black hole.

In the case of the GW170817 event, the two neutron stars, with respective masses in the range 0.86 to 2.26 times the mass of the Sun merged into a single star with a mass of about 2.82 times that of the Sun. In this coalescence event, an amount of energy equal to about 0.3 times the mass of the Sun was emitted in form of gravitational waves.

This energy was picked up by the three advanced gravitational wave laser interferometers, located thousands of kilometres away from each other when the passage of the gravitational wave provides an oscillation of the lengths of their two arms, at the same frequency of the incoming gravitational wave. This displacement effect is very tiny: as an example, the gravitational wave generated by the merging of two neutron stars in a galaxy close to ours will stretch the distance Earth-Sun (150 million of km) by the size of an atom.

"This is the start of new Multi-Messenger Astronomy, where various techniques such as the gravitational wave laser interferometers – which is a displacement measuring tool – and astronomical techniques such as telescopes sensitive to e.m. radiation are used together to study one single event, especially when the event is so big that it emits gravitational waves," says Colafrancesco.

Scientists from over 70 observatories involved in the observation gathered large amounts of valuable data from the event, including learning what the source of the gravitational waves was. They also learned how an event that emits gravitational waves relates to other kinds of radiation, such as gamma rays, infrared radiation and radio waves, emitted from space.

"We now know for certain that an event associated with gravitational waves is related to the emission of electromagnetic radiation, as in a gamma ray burst," says Colafrancesco.





# Little Foot takes a bow

After 20 years of painstaking excavation and preparation, Professor Ron Clarke unveiled to the world the most complete Australopithecus fossil ever found, at Wits in December 2017.

Little Foot is the only known virtually complete Australopithecus fossil discovered to date. It is by far the most complete skeleton of a human ancestor older than 1.5 million years ever found. It is also the oldest fossil hominid in southern Africa, dating back 3.67 million years.

Discovered by Professor Ron Clarke from the Evolutionary Studies Institute, the fossil was given the nickname of “Little Foot” by Prof. Phillip Tobias, based on Clarke’s initial discovery of four small foot bones. Its discovery is expected to add a wealth of knowledge about the appearance, full skeletal anatomy, limb lengths and locomotor abilities of one of the species of our early ancestral relatives.

“This is one of the most remarkable fossil discoveries made in the history of human origins research and it is a privilege to unveil a finding of this importance,” says Clarke.

After lying undiscovered for more than 3.6 million years deep within the Sterkfontein caves about 40km north-west of Johannesburg, Clarke found several foot bones and lower leg bone fragments in 1994 and 1997 among other fossils that had been removed from rock blasted from the cave years earlier by lime miners. Clarke sent his assistants, Stephen Motsumi and Nkwane Molefe, into the deep underground cave to search for any possible broken bone surface that might fit with the bones he had discovered in boxes. Within two days of searching, they found such a contact, in July 1997.

Clarke realised soon after the discovery that they were on to something highly significant and then started the specialised process of excavating the skeleton in the cave through 2012, when the last visible elements were removed to the surface in blocks of breccia.

“My assistants and I have worked on painstakingly cleaning the bones from breccia blocks and reconstructing the full skeleton until the present day,” says Clarke.

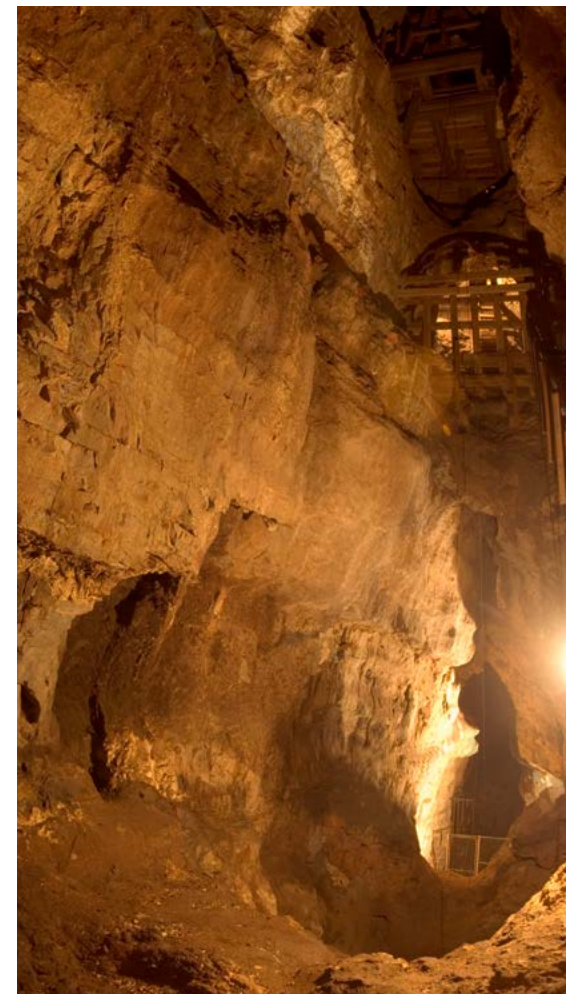
In the 20 years since the discovery, they have been hard at work to excavate and prepare the fossil. Now Clarke and a team of international experts are conducting a full set of scientific studies on it. The results of these studies are expected to be published in a series of scientific papers in high impact, peer reviewed international journals in the near future.

This is the first time that a virtually complete skeleton of a pre-human ancestor from a South African cave has been excavated in the place where it was fossilised.

“Many of the bones of the skeleton are fragile, yet they were all deeply embedded in a concrete-like rock called breccia,” Clarke explains.

“The process required extremely careful excavation in the dark environment of the cave. Once the upward-facing surfaces of the skeleton’s bones were exposed, the breccia in which its undersides were still embedded had to be carefully undercut and removed in blocks for further cleaning in the lab at Sterkfontein,” says Clarke.

Professor Adam Habib, Vice-Chancellor and Principal says: “This is a landmark achievement for the global scientific community and South Africa’s heritage. It is through important discoveries like Little Foot that we obtain a glimpse into our past which helps us to better understand our common humanity.”





# A lure at both ends

## - Puff Adders leave nothing to chance

One of Africa's iconic snakes, the puff adder uses what is termed "lingual luring" to attract amphibian prey closer, and increase the odds of catching it.

The puff adder (*Bitis arietans*) is one of Africa's deadliest snake species, not only due to its venom, but also because of its stealthy behaviour in the way that it hunts by ambushing prey.

It has now emerged that it has another deadly weapon in its arsenal. It not only lies in wait for prey, but it actively lures prey into striking range. By capturing and analysing thousands of hours of video footage of puff adders hunting in the wild, Wits University researchers, Dr Xavier Glaudas and Professor Graham Alexander, have shown that puff adders use what is termed "lingual luring" to attract amphibian prey closer and increase the odds of catching it.

"A puff adder's strike is typically no longer than one or two head lengths (5-10cm) in distance, so it needs a strategy to attract potential prey to come within that striking range in order to catch it," says Glaudas, a herpetologist and postdoctoral fellow at Wits University. "We have found that puff adders use their tongues that resemble an invertebrate that frogs feed on to increase prey capture rate."

Glaudas and Alexander tracked 86 puff adders over three years at the Dinokeng Game Reserve, about 100km north of Johannesburg. Glaudas captured wild snakes and tracked them by surgically implanting radio transmitters into the snakes and releasing them at their place of capture.

"We really wanted to have a closer look into the secretive lives of these fascinating animals, and specifically study their foraging ecology," says Glaudas.

To aid their research, Glaudas and Alexander made use of video cameras, which they set up in front of puff adders that were lying in ambush position.

"We placed our cameras mounted on a tripod about 70cm away from the snake, and the camera continuously recorded what was going on. We came back the next morning to get the memory cards and reviewed everything that happened during the night," says Glaudas. "We gathered over 4 600 hours of video footage of snake foraging. So, that is 193 days of continuous footage – over half a year."

What Glaudas and Alexander saw surprised them. "It was complete luck," says Glaudas. "We know that snakes use their tongues to pick up scent cues in their environment, but these snakes were extending their tongues out of their mouths for up to 30 seconds, which is dramatically longer to what they do when they are just using their tongues to 'smell' their environment. We know of several species that use tongue luring to attract prey. Some wading birds, like egrets do it, as well as alligator snapping turtles, and some aquatic snakes, but this is the first time that it is reported in a terrestrial snake," says Glaudas.

Even more surprising was the fact that the snakes used lingual luring to attract only amphibian prey. "All the cases of lingual luring that we have observed occurred with frogs, which suggests that puff adders are able to distinguish between amphibian prey and other prey like small mammals."

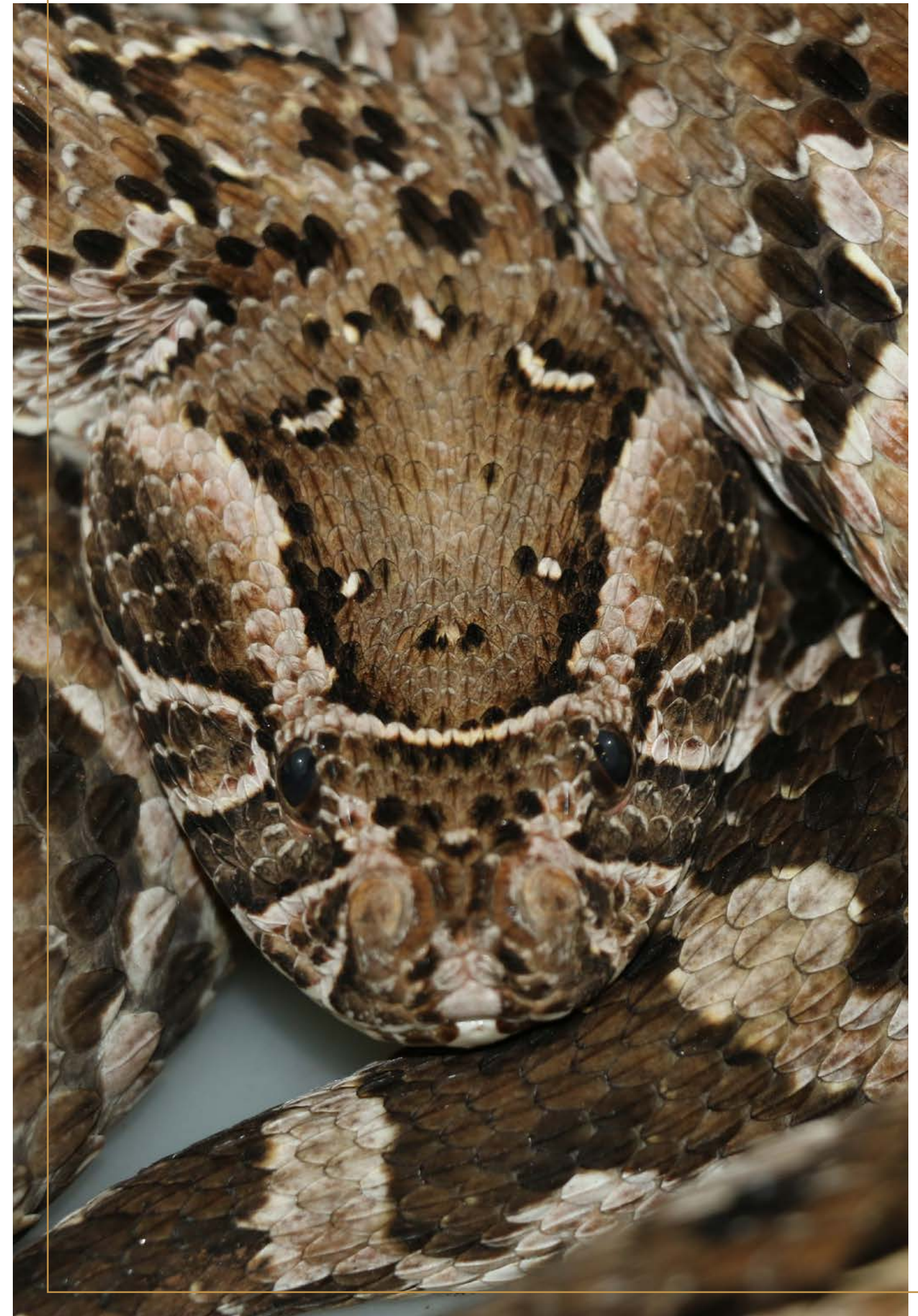
Glaudas and Alexander also witnessed puff adders waving their tails, suggesting the use of their tails as lures as well. However, none of the tail luring behaviour attracted prey within the camera's field of view, and more data on this are needed. "We suspect that this behaviour is also used to attract prey, as it is pretty common in snakes, including adders, but we weren't able to observe prey capture with the videos," says Glaudas.



Dr Xavier Glaudas



Professor Graham Alexander





**“At the Wits Health Consortium, we leverage opportunities that are ancillary and complimentary to those at the Faculty of Health Sciences by creating academic entrepreneurial business units, most of which focus on research.”**

CEO: Alf Farrell



The Wits Health Consortium (Pty) Limited (WHC) is the support operation through which the University conducts research, manages donor-funded activities, pursues entrepreneurial innovation in health and supports clinical trials, mainly in the Faculty of Health Sciences. Registered in 1998, the WHC is wholly owned by Wits University.

Over two decades of operating, the WHC has established a worldwide reputation for responsibly managing sponsored and commercially funded activities worth over US 72 million annually. The WHC manages a sizeable portion of the University's total group income, with funding derived from leading international and domestic agencies, institutes, foundations and donors. These include the United States Agency for International Development, the US National Institutes of Health, The Global Fund, the WHC's Clinical Laboratory Services, the Bill and Melinda Gates Foundation, Wits Clinical Research and others.

The WHC harnesses the commercial potential of the University by limiting unnecessary administrative burdens. This enables clinical researchers and health academics to undertake groundbreaking projects and establish commercially viable operations. These include the Wits Donald Gordon Medical Centre and the Wits Reproductive Health and HIV Institute.

## Tackling tuberculosis in mine workers

Tuberculosis in the Mining Sector in Southern Africa is a programme to create a regionally coordinated response to TB and related illnesses affecting mineworkers, former mineworkers, their families and communities in Southern Africa. The Southern African Development Community (SADC), through the SADC Declaration, galvanised The Global Fund to support a regional TB response in the mining sector. TB has affected mineworkers for over a century. Despite being treatable, TB prevalence rates increase persistently and cure rates remain low. Southern Africa has amongst the highest rates of TB infection globally and the region's mining sector accounts for the highest level of TB infections. Contributing factors include prolonged exposure to silica dust, poor living conditions, high HIV prevalence, and poor access to healthcare. To decrease significantly the incidence of TB in the mining sector, 10 southern African countries (including South Africa) submitted a proposal to The Global Fund, which awarded a landmark grant in January 2016. The Wits Health Consortium is the Principal Recipient to implement the grant with oversight by the Regional Coordinating Mechanism.

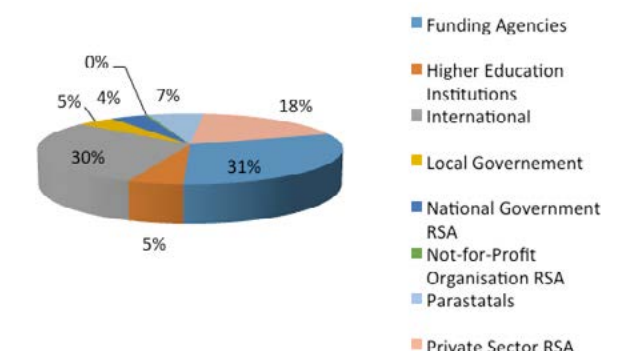
**“Wits Enterprise focuses on the marketing and commercialisation of the University's intellectual capital through short course management, research support, intellectual property management and technology transfer.”**

CEO: Duncan Raftesath



The mandate of Wits Commercial Enterprise (Pty) Ltd (Wits Enterprise) is to provide Wits University with innovation, research and consulting support. The Wits Enterprise Research Support Unit supports the relationships of external stakeholders and funders with Wits academics from various disciplines.

In 2017, the Unit supported more than 120 research and consulting projects across all faculties. These activities yielded R64.8 million in revenue for 2017. Of this revenue, the private industry funding comprised 46 Research and Development consulting and analytical service projects valued at about R12.5 million. The Technology and Human Resources for Industry Programme (THRIP), an outgoing initiative of the National Research Foundation, co-funded approximately R2.3 million across five projects in support of industry funding.



During this period, international organisations funded 24 projects to the value of R20.2 million while funding agencies contributed R20.8 million towards 21 projects. Diverse project research priorities included the arts, energy, information and communication technologies, monitoring and evaluation, labour and economic issues.

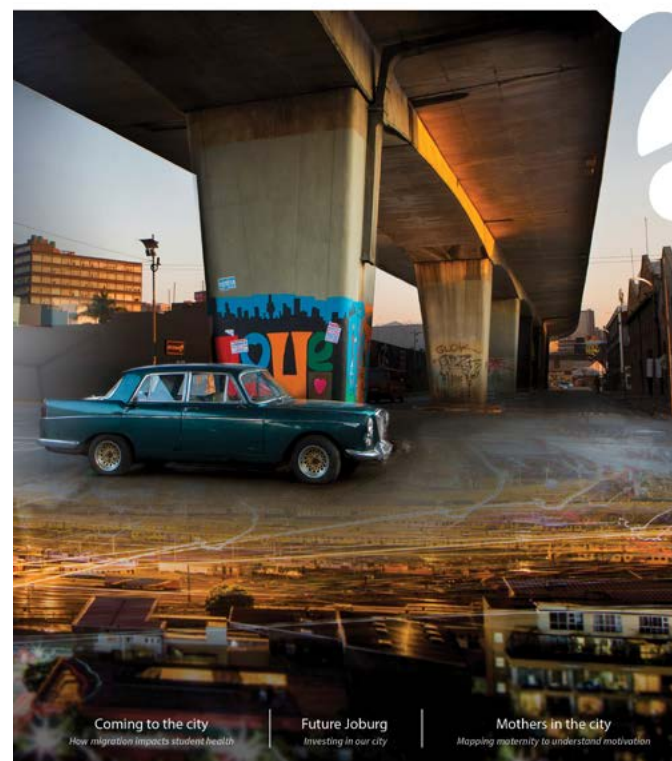
Disclosures received	45
Patents granted	9
Provisional patent applications filed	8
Trade mark applications filed	1
Complete applications (PCT and National) filed	7
Potential licensees, users, partners engaged	83

These projects demonstrate the complexity and diversity of research conducted by Wits University and its contribution to solving national, global and societal challenges.



CURIOS.TY

MAY 2017



CURIOS.TY

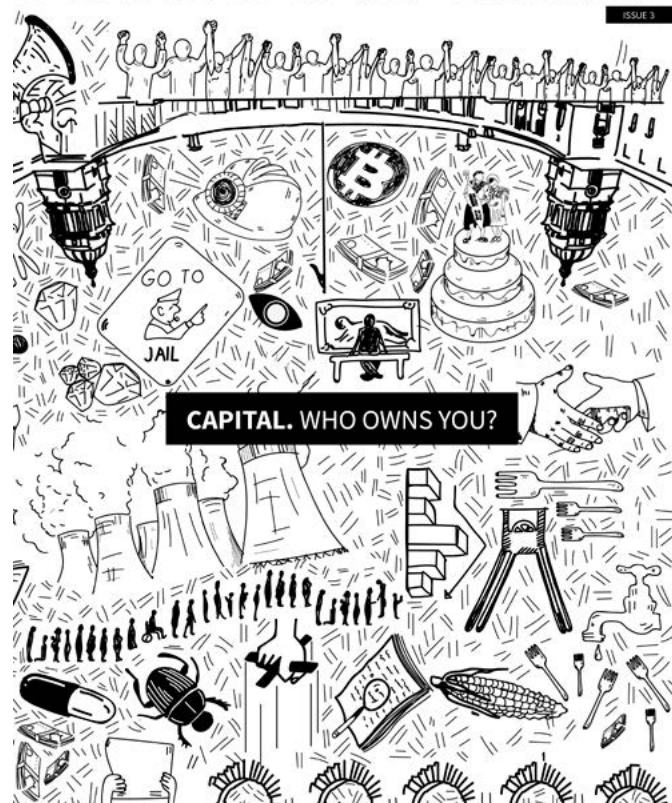
Research · Rethink · Relearn



CURIOS.TY

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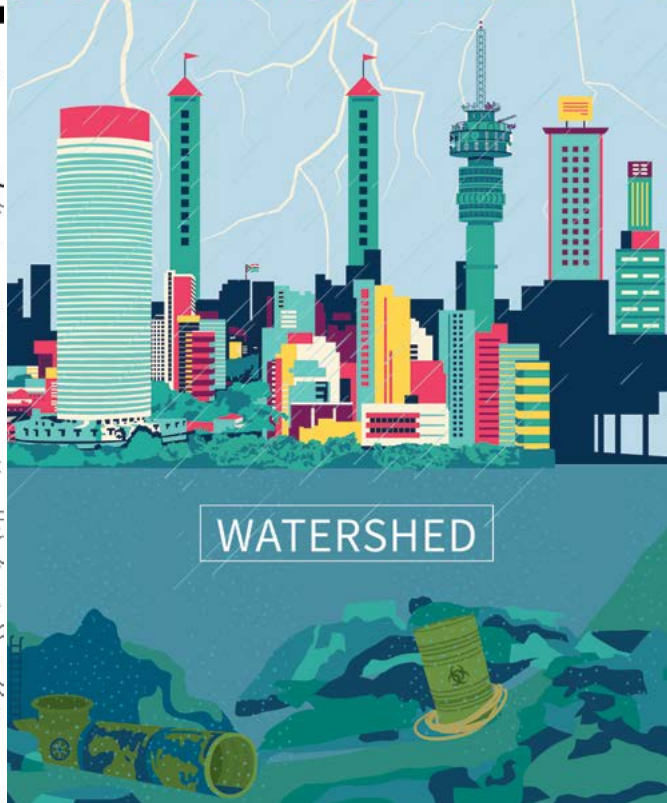
ISSUE 3



CURIOS.TY

Research · Rethink · Relearn

ISSUE 4



Curios.ty is a print magazine and digizine that tells the stories of groundbreaking research at Wits University through the voices of its talented researchers, students and academics. Launched in 2016, the first four editions were themed: **Cities**, **iHuman** (the Fourth Industrial Revolution), **Capital** and Political Economy, and **Water**.

[www.wits.ac.za/curiosity](http://www.wits.ac.za/curiosity)

# ABOUTWITS

96 YEARS OLD (2018)

11 libraries  
17 residences



21 Alumni  
awarded National  
Orders by the  
President

WORLD RANKINGS  
2017/2018

#1 (nationally)  
#181 (globally)  
Centre for World University  
Rankings

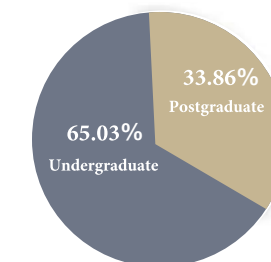
#1 (nationally)  
#201-300 (globally)  
Academic Ranking of  
World Universities

#36  
BRICS Rankings

In top 2 (nationally)  
#251-300 (globally)  
Times Higher Education  
Rankings

#364  
QS World University Rankings

TOTAL STUDENTS  
37 374



7072  
TOTAL GRADUATES (2016)

2  
COMMERCIAL  
COMPANIES

Wits Enterprise & Wits Health Consortium

largest fossil collections in the  
southern hemisphere  
internationally recognised as a leader in  
the palaeosciences

33 SCHOOLS  
3610 COURSES  
28 A-rated researchers  
NRF-Rated Researchers 381  
14 Distinguished Professors  
SARChI Research Chairs 26

home to  
4 Nobel  
laureates

Sir Aaron King  
Nadine Gordimer  
Nelson Mandela  
Sydney Brenner

more than  
160 000  
DEGREES

conferred since the first graduation  
ceremony on 4 October 1922, with around  
70 000 students graduating since 1994.

1125  
Number of Full-Time Permanent Academic Staff  
26.93% international  
64.80% with PhDs

5  
FACULTIES

Science 13.62%

Commerce, Law  
& Management 24.73%

Engineering & the  
Built Environment 19.19%

Health Sciences 16.01%

Humanities 26.45%

Home to the Bidvest Wits  
Football Club

Wits owns the Sterkfontein  
Caves (in the Cradle of  
Humankind World  
Heritage Site)

10 national  
Centres of  
Excellence

highest number of government  
funded Centres of Excellence in  
South Africa





UNIVERSITY OF THE  
WITWATERSRAND,  
JOHANNESBURG

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