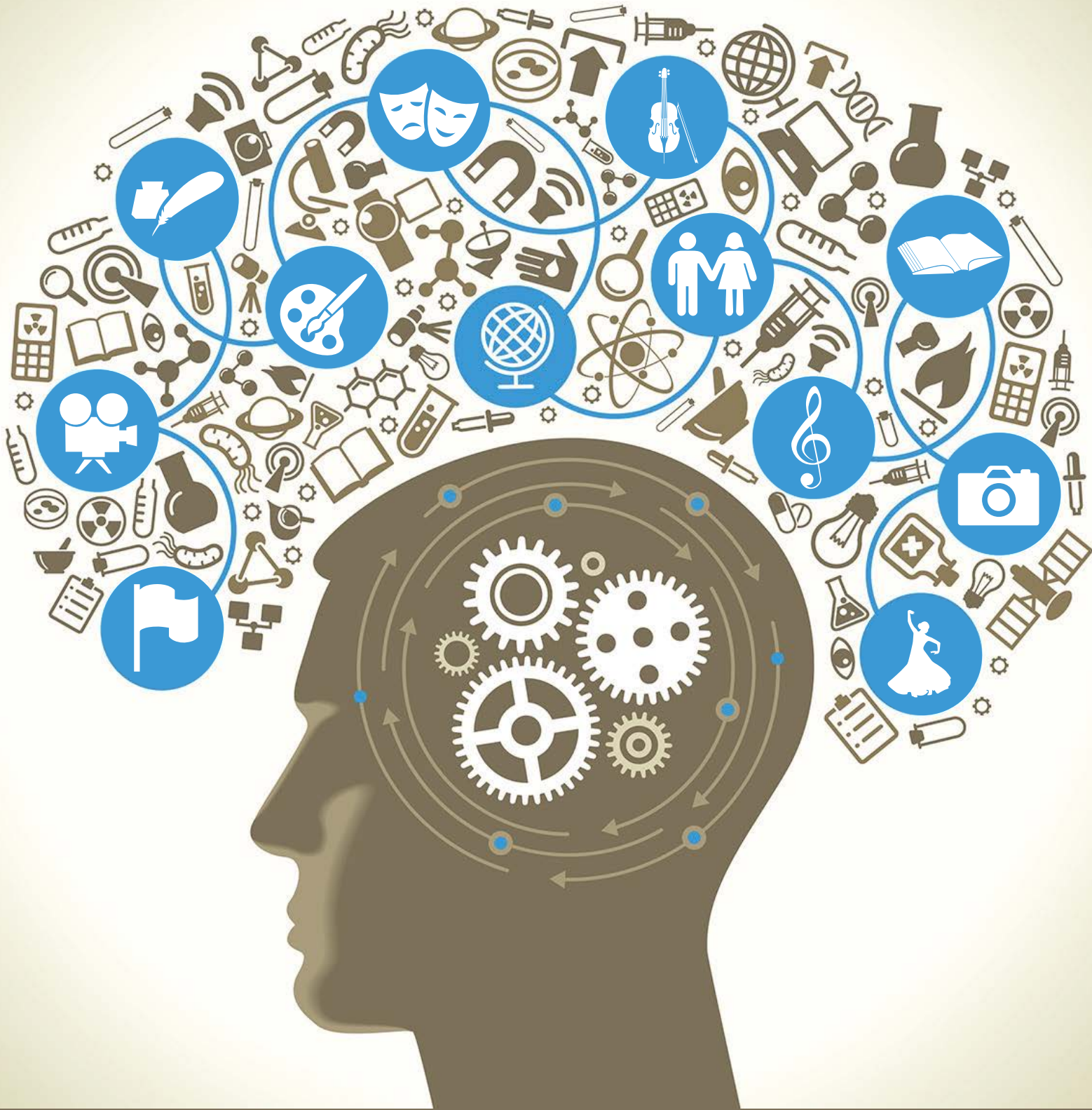


# WITS RESEARCH MATTERS



UNIVERSITY OF THE  
WITWATERSRAND,  
JOHANNESBURG



	PAGE
<b>Local Research, Global Knowledge</b>	<b>4</b>
Prof. Adam Habib, Vice-Chancellor and Principal, University of the Witwatersrand	
<b>Research Statistics</b>	<b>6</b>
<b>Supporting Research for a Better Future</b>	<b>7</b>
Prof. Zebon Vilakazi, Deputy Vice-Chancellor: Research and Postgraduate Affairs	
<b>Research Leadership and Support</b>	<b>9</b>
<b>Research Development</b>	<b>14</b>
<b>Research Talent</b>	<b>16</b>
Distinguished Scholars	
Transforming the Academy	18
Postdoctoral Fellows	20
Postgraduate Students	21
<b>Faculties</b>	<b>22</b>
<b>Faculty of Commerce, Law and Management</b>	<b>22</b>
Dean’s Message – Economics for governance and development	23
The character of capitalism in SA before and since democracy	24
Economic constraints of why few African women marry	25
Studying the making of smart cities	26
<b>Faculty of Engineering and the Built Environment</b>	<b>27</b>
Dean’s Message – Engineering a new reality	28
#Tshimologong: Jozi’s new digital playground	30
<b>Faculty of Health Sciences</b>	<b>31</b>
Dean’s Message – Curbing chronic disease	32
Analysing data to inform public health	33
CARTA: Building research leaders for Africa	34
Researching threats to adolescent survival	36

	PAGE
<b>Faculty of Humanities</b>	<b>37</b>
Dean’s Message – Transforming the humanities	38
Where the power to dominate resides	40
Languages and literacies in the 21 <sup>st</sup> Century	41
The urgency of transformation in the global south	42
Some kinds of childhood	43
<b>Faculty of Science</b>	<b>44</b>
Dean’s Message - Big data for the 4 <sup>th</sup> industrial revolution	45
Data Science: the next frontier	48
GCSRI: Empowering Africa for sustainability	49
<b>Gauteng City-Region Observatory</b>	<b>52</b>
The quality of life in post-apartheid Gauteng	
<b>Wits Enterprise</b>	<b>54</b>
Improving the accuracy of TB testing	55
Extracting maximum value from the Moringa plant	56
<b>Wits Health Consortium</b>	<b>57</b>



## Local Research, Global Knowledge



**Prof. Adam Habib**

*Vice-Chancellor and Principal, University of the Witwatersrand*

Research intensive universities in South Africa are producing more research than ever before, reflected in our collective improvement in many of the global systems. At Wits, our research output has grown by 41% over the past three years (it has doubled in the last seven years), a rise that has also been matched by the increase in publications in prestigious, high impact journals like *Nature* and *Science*. This is a substantial achievement.

According to the 2016 report of the Academic Ranking of World Universities, also known as the Shanghai rankings, Wits remains amongst the top 1%. This is a significant accomplishment, given that there are more than +/- 25 000 universities in the world. Wits has also been ranked as the top university in South Africa for the third year in a row in the 2016 Center for World University Rankings.

While I am skeptical about rankings and the various methodologies and instruments used to measure success, there is some correlation between the increased research output in quality journals and in our improved performance in the rankings.

But this performance in rankings should not distract us from the greater goal of producing high quality research and competing with the best in the world. Wits and other universities in the developing world should not be regarded merely as data collection hubs, or wellsprings of material waiting to be analysed, or footnotes in north-south collaboration projects. We are world-class generators and producers of new knowledge, we are successfully accessing and managing resources and relationships in the global knowledge economy and we are developing high level, scarce skills off our own bat.

There are several projects at Wits that will have a major impact on catapulting South Africa into the global knowledge economy. For example, Wits has been awarded a R60-million grant to establish a national e-science teaching and training platform, a great step forward in the big data arena. Wits scientists based at the European Organization for Nuclear Research (CERN) are making incredible headway. The rise of big data and advances in information technology has serious implications for our ability to deliver sufficient bandwidth to meet the growing demand. Our researchers have demonstrated a 100-times increase in the amount of information that can be packed into light. Africa's first Chair in Digital Business was established at Wits, which will contribute to the economy by developing essential skills to boost employment and encourage start-ups. Our base in the new Braamfontein tech hub in Johannesburg, the economic heart of Africa, places Wits in good stead to serve as a catalyst for innovation that will make the world a better place. The MRC/Wits University Rural Public Health and Health Transitions Research Unit (Agincourt) and two other health and demographic surveillance system sites will share a R99 million grant awarded over three years by the Department of Science and Technology. The grant addresses the DST's South African Research Infrastructure Roadmap, which is a strategic intervention to provide research infrastructure across the entire public research system.

These initiatives, based at Wits, will all contribute towards repositioning Africa as a powerhouse for innovative scientific and technological advancement. As a continent, we should use our collective capacity to respond and give appropriate evidence-based advice to policy makers on issues like climate change, infectious and non-communicable diseases, occupational health and safety, mining, development, governance and economic development.

Wits is a member of the recently-established African Research Universities Alliance and is well-placed to facilitate collaboration, knowledge transfer, equipment sharing, the pooling of resources and mutually beneficial partnerships across Africa.

Our collective strength is arguably only because of our talented researchers, diverse partners, donors, local and global collaborators and those who support us. I thank you for changing our world for the better.





# RESEARCH

**26**  
**A-rated**  
researchers  
at Wits

**6** } **4** HOSTED  
**2** CO-HOSTED

**DST/NRF**  
Centres of  
Excellence

 Highest of all  
SA universities



**381**  
**\*NRF-rated**  
researchers  
at Wits

\* National Research Foundation

recognised by peers  
internationally as global  
leaders in their field

**41%**  
**INCREASE**  
**RESEARCH OUTPUT**  
since 2012



**26 SARCHI**  
**CHAIRS**  
\* The South African  
Research Chairs Initiative

Wits is the largest producer  
of **medical** specialists &  
sub-specialists in South Africa



## GLOBAL UNIVERSITY RANKINGS

Benchmarking performance is important for universities striving to compete against thousands of research focused degree awarding institutions worldwide. Wits monitors its position on the ARWU, CWUR and the scales. Their criteria and methodologies differ so Wits' ranking varies – but it is continually improving.



**Est.** : 2003, Shanghai, China (aka the Shanghai Rankings)  
**Ranks** : Originally Chinese institutions, now top 1 200 universities worldwide  
**Criteria** : Numbers of Nobel Prize/Field Medal-winning staff/alumni, highly cited researchers, articles in *Nature* and *Science*, articles indexed in Science Citation Index, and per capita performance  
**Wits** : ±460 in 2003 moved up 260 places to cusp of top 200 in 2016



**Est.** : 2012, Saudi Arabia  
**Ranks** : Originally top 100 globally and expanded to top 1 000 in 2014  
**Criteria** : Quality of education, alumni employment, quality of faculty, publications, influence, citations, broad impact, patents  
**Wits** : **#176 in 2016 (top 18% of ranking) and #1 in South Africa**



**Est.** : 2004 as an annual publication of the THE news agency in the UK  
**Ranks** : A definitive list of the world's best universities  
**Criteria** : Teaching (learning environment), research (volume, income and reputation), citations (research influence), international outlook (staff, students and research), industry income (knowledge transfer)  
**Wits** : **#182 out of 980 and #6 out of 200 in BRICS & Emerging Economies in 2016/2017**



**Supporting Research  
for a Better Future**

**Prof. Zeblon Vilakazi**  
*Deputy Vice-Chancellor:  
Research and Postgraduate Affairs*



Wits strives to be a research intensive university that is locally relevant and internationally competitive. This report confirms significant progress in this regard and also demonstrates the impact of Wits' research in multiple ways.

Wits' research has profoundly influenced various fields. For example, Wits and the Council for Scientific and Industrial Research demonstrated 100 patterns of light used in an optimal communication link, potentially increasing the bandwidth of communication systems by 100 times.

The research produced by entities such as the Wits Reproductive Health and HIV Institute under the directorship of Prof. Helen Rees, the Wits Research Institute for Malaria led by Prof. Maureen Coetzee, the Wits Institute for Social and Economic Research led by Prof. Sarah Nuttall, and the Respiratory and Meningeal Pathogens Research Unit led by Prof. Shabir Madhi improves people's quality of life.

The work of Prof. Lesley Scott has significantly impacted society and saved lives. Tuberculosis (TB) is one of South Africa's leading infectious disease killers. Prof. Scott and her team invented the SmartSpot TBcheck. This technology verifies the accuracy of machines using molecular diagnostic devices to test for TB. Scott won the 2015 Innovation Prize for Africa and the Special Prize for Social Impact for this technology, which saved some 37 million lives between 2000 and 2013.

The discovery of over 1 500 *Homo naledi* fossils by Prof. Lee Berger and his Rising Star team challenges our thinking about our common ancestry.

In the Faculty of Humanities in the department of Political Studies, research that shapes our thinking on governance has been recognised. The British International Studies Association awarded its Best Article Prize to Prof. Joel Quirk and Dr André Broome (University of Warwick) for their paper, *Governing the world at a distance: the practice of global benchmarking*.

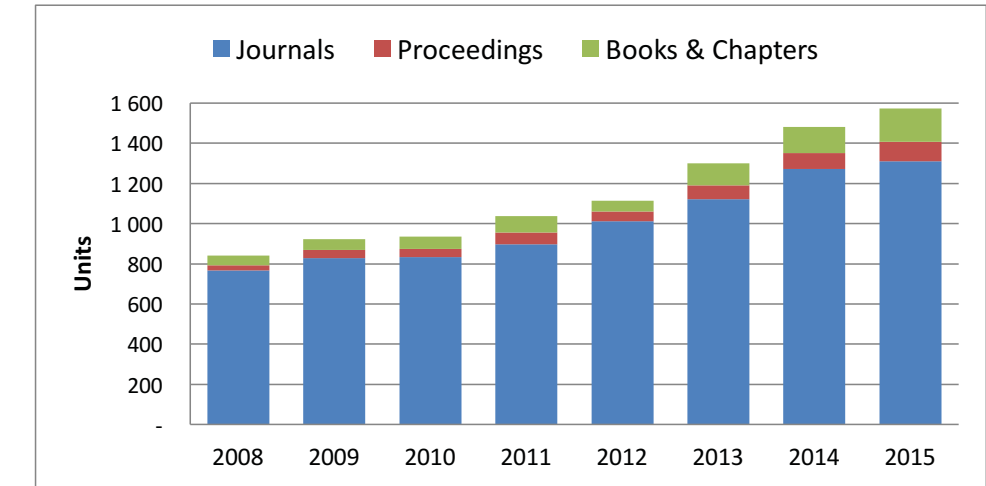
These stories show that Wits' research matters and is worth celebrating. I am grateful to all who contribute to the research effort, even if they are not named in this brief report.



### Research Units

Using the counting methodology adopted by the Department of Higher Education and Training, Wits submitted 1 572 units of research in 2015. This figure continues a seven-year growth trajectory and a 71% overall increase since 2008.

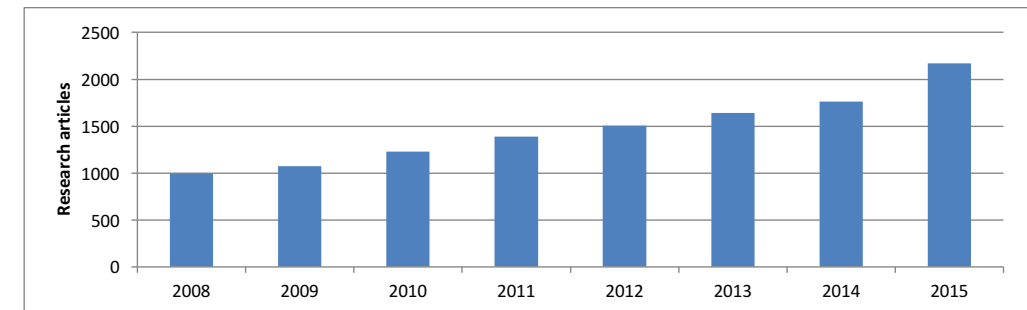
The productivity of individual researchers also reflects research intensity. Weighted research output units, which include graduate student completion, indicate a productivity rate of more than 2.6 units of research per permanently employed academic at Wits.



Growth in number of research units over time using the Department of Higher Education and Training counting methodology

### Web of Science Publications

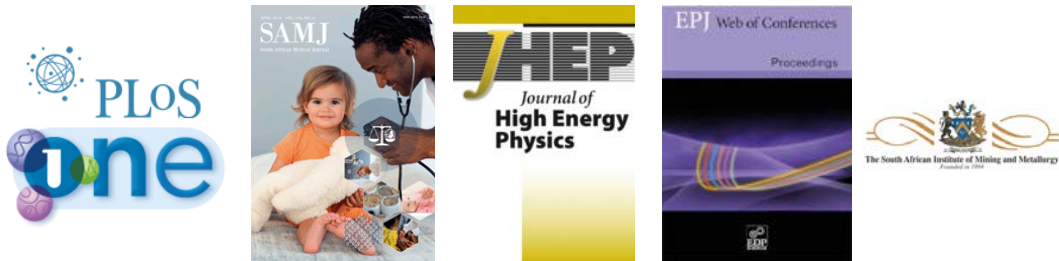
In 2015 Wits-affiliated authors published 2 169 peer-reviewed journal articles in Web of Science indexed journals, a 64% increase over the past seven years. Web of Science is an online scientific citation indexing service, which provides a comprehensive citation search.



Growth in the number of Web of Science documents over time

### ISI Journals

The International Scientific Indexing (ISI) journals that Web of Science features are renowned for quality and impact. Wits has over 85% of its publications in quality, global journals.



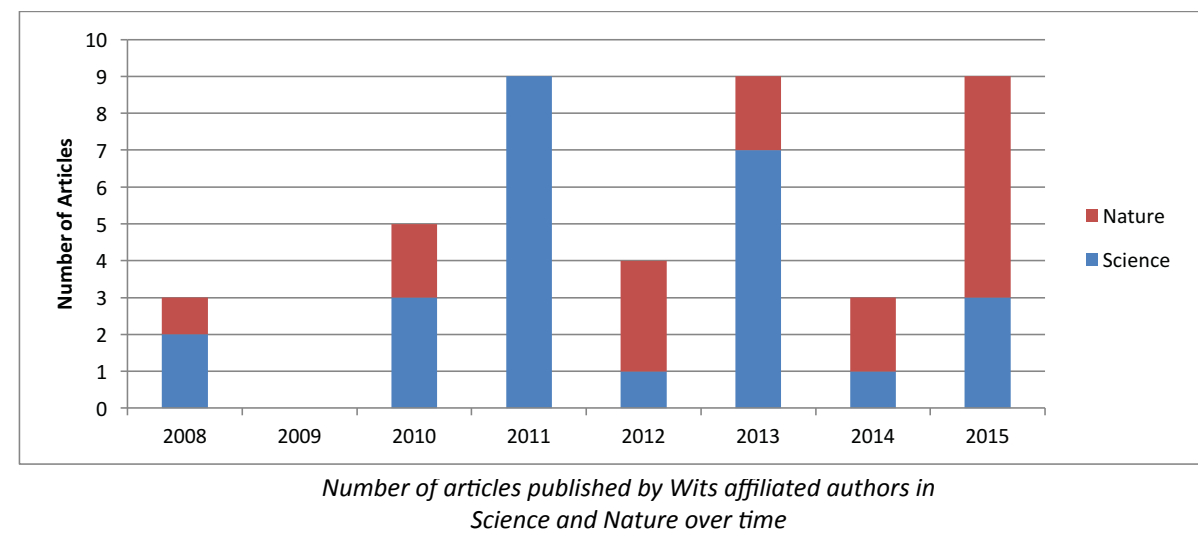


Of the 2 169 articles published by Wits affiliated authors in 2015:

- 114 were published in *PLoS One* (Impact Factor = 3.057)
  - 63 were published in *SA Medical Journal* (Impact Factor = 1.500)
  - 48 were published in *Journal of High Energy Physics* (Impact Factor = 6.023)
  - 6 were published in *Nature* (Impact Factor = 38.138)
  - 4 were published in *New England Journal of Medicine* (Impact Factor = 59.558)
  - 3 were published in *Science* (Impact Factor = 34.661)
- Most publications in a journal

Publications in the highest impact journals

Besides the research articles, Wits affiliated authors published 170 reviews, 22 clinical trials, eight books and various other scholarly works totalling 2 591 items. Of these, 78% were in the Science, Technology, Engineering and Mathematics fields and 22% in the Social Sciences, Arts and Humanities.



The acid test for a research intensive university is the impact of its research. Web of Science has an analytical tool called *InCites*, which measures the quality and impact of research benchmarked against global performance. The Category Normalised Citation Impact score for Wits research since 2008 was 1.36 on average – this is 36% above the global average. In this period these articles have been cited more than 102 514 times.

Highly Cited Researchers

In 2015/2016 four Wits authors were named Highly Cited Researchers by the Essential Science Indicators<sup>SM</sup> (ESI). These are authors with the most papers designated as Highly Cited Papers by ESI. Highly Cited Papers rank among the top 1% most cited for subject field and year of publication.



Prof. Christopher Henshilwood, Evolutionary Studies Institute



Prof. Francesco D'Errico, Faculty of Humanities



Prof. Chris Mathew, Faculty of Health Sciences



Prof. Lynn Morris, Faculty of Health Sciences

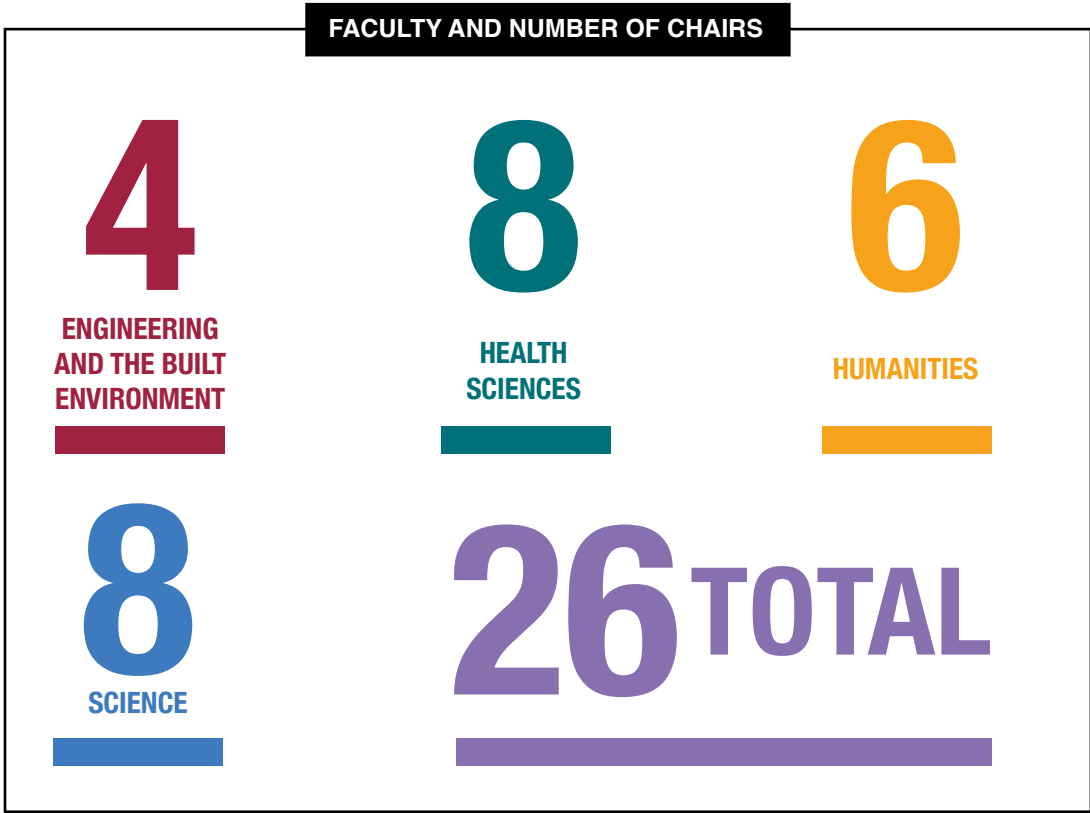
Most Cited Authors

Since 1980, on average, 84% of journal articles published by Wits-affiliated authors were cited. The following Wits-affiliated authors were frequently cited in 2015:

Name	Faculty	Times cited	Web of Science documents
Prof. Xifeng Ruan	Science	324	107
Prof. Bruce Mellado	Science	309	97
Prof. Frederick Raal	Health Sciences	235	13
Prof. Peter Kamerman	Health Sciences	43	6
Prof. Shane Norris	Health Sciences	34	16
Prof. Shabir Madhi	Health Sciences	30	28
Prof. Michele Ramsay	Health Sciences	30	6
Prof. Max Petzold	Health Sciences	30	8
Dr Ananyo Choudhury	Health Sciences	26	1
Prof. Zebulon Vilakazi	Science	24	18
Dr Nishi Prabdhial-Sing	Health Sciences	22	3
Dr Adam Mahomed	Health Sciences	22	3
Prof. Lee Berger	Evolutionary Studies Institute	22	15
Dr Matthew Skinner	Evolutionary Studies Institute	21	4
Prof. Ebrahim Variava	Health Sciences	21	7
Prof. Sergio Colafrancesco	Science	21	12

South African Research Chairs Initiative

The Department of Science and Technology and the National Research Foundation established the South African Research Chairs Initiative (SARChI) in 2006. The aim is to improve the research capacity of public universities through producing postgraduate students and research. Wits holds 26 SARChI Chairs.



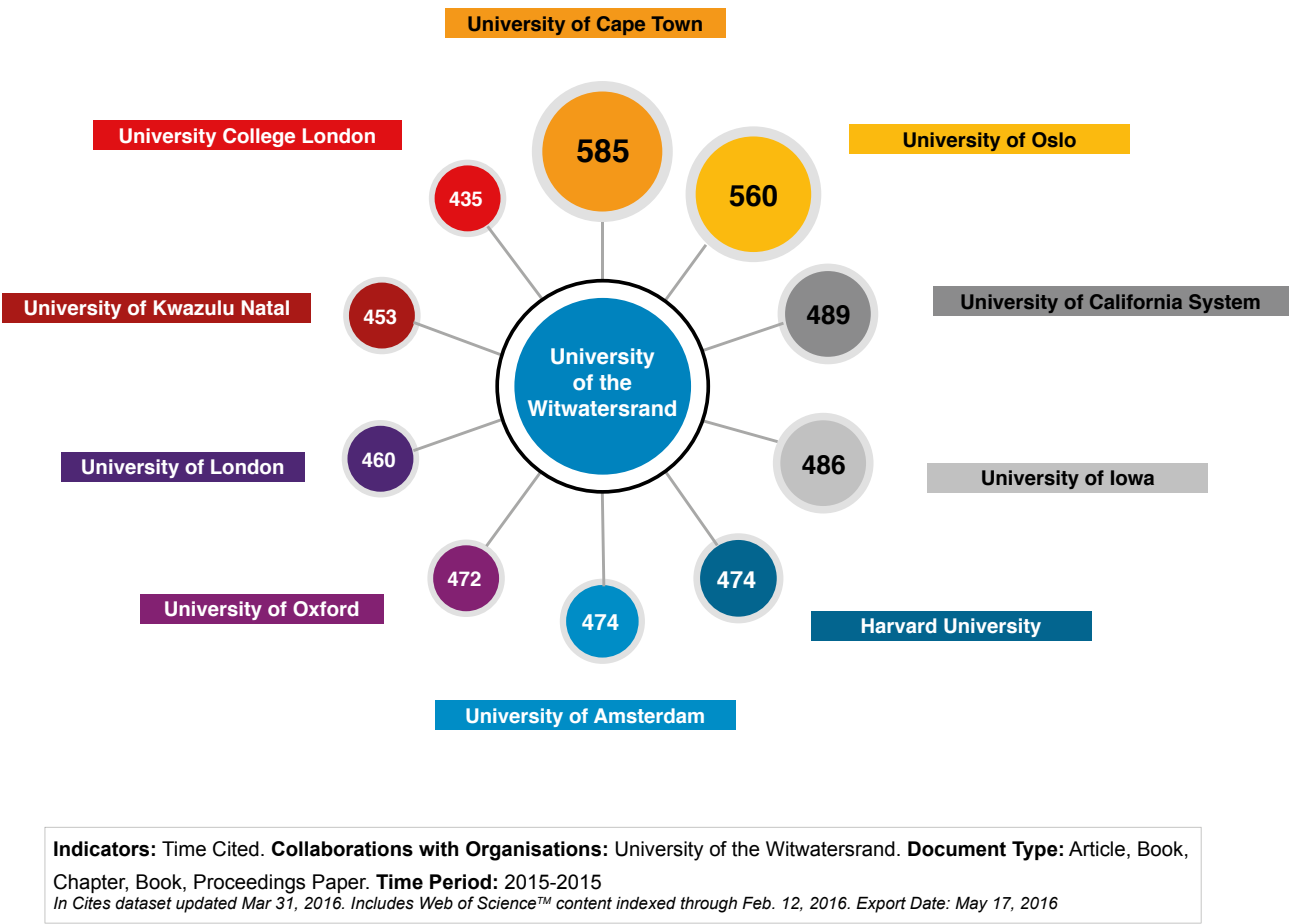
National Research Foundation-rated Researchers

The National Research Foundation (NRF) rating system is a key driver in the NRF’s aim to build a globally competitive science system in South Africa. It is a valuable tool for benchmarking the quality of our researchers against the best in the world. NRF ratings are allocated based on a researcher’s recent research output and impact as perceived by international peer reviewers.

- A-rated: Leading international researcher
- B-rated: Internationally acclaimed researcher
- C-rated: Established researcher
- P-rated: Prestigious awards recipient
- Y-rated: Promising young researcher

NRF rating	Institutes	Commerce, Law and Management	Engineering and the Built Environment	Health Sciences	Humanities	Science	Total
A	5	-	1	8	4	8	26
B	6	9	6	30	20	41	112
C	5	21	22	35	40	52	175
P	1	-	-	-	-	-	1
Y	1	9	8	10	14	25	67
Total	18	39	37	83	78	126	381

Wits University Collaborative Partners with Publications





## Research Leadership and Support

The Wits Research Office (illustrated by the diagram on the opposite page) strives to create an environment that will elevate the standard and impact of research so that the University can excel as a research and knowledge leader. Dr Robin Drennan, Director of Research Development at Wits says research is increasingly enabled through partnerships across disciplines, institutions and countries.

“The Strategic Partnerships Unit focuses on creating mutually beneficial strategic partnerships that promote research and enhance the postgraduate experience,” he says.

Other units that Dr Drennan oversees that drive research at Wits include Research Development, which focuses on managing processes to enhance research productivity and quality. “These services generally operate within the funding cycle,” he says. The diagram opposite describes these services.

The Postgraduate Affairs unit supports recruitment, registration, proposal development, research supervision, examination and graduation. The Inbound Study Abroad unit encourages international scholars and postgraduate students to conduct short-term research at the Wits Knowledge Hub for Rural Development in Mpumalanga, which is a natural laboratory.



Dr Robin Drennan, Director: Research Development

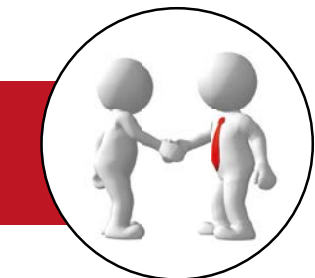
## ADMINISTRATION

- Secretariat to Deputy Vice-Chancellor and the University's Research Council/Committee
- Book-keeping
- Research output measurement
- Bibliometric services
- Data services



## BROKERING

- Internal and external partnership development
- Internal and external research funding
- Project development



## COMPLIANCE

- Research integrity including ethical research approvals
- Contracting and legal services
- Monitoring and evaluation
- Reporting
- Auditing



## COORDINATION

- Postgraduate Affairs
- Enrolment and financial experience
- Postdoctoral fellows
- Registration and funding
- Productivity



## DEVELOPMENT

- Advice (budgeting and other)
- Support
- Knowledge sharing
- Postgraduate students
- Postdoctoral fellows
- Early career academics
- Established academics



## LEADERSHIP AND MANAGEMENT

- Strategy development
- Facilities management (of five central research facilities)
- Monitoring and evaluation
- Policy development





## Research Talent

The diversity of people, disciplines and ideas is celebrated at Wits and is one of our strengths. The University initiated two key programmes recently to attract distinguished scholars and to diversify the academy. The significant increase in quality research output is attributable to our talented researchers and diversified academy, several of whom are featured here.

## Distinguished Scholars

Wits has attracted 20 scholars to its Distinguished Scholars Programme in the last three years. The following scholars most recently joined the programme.

- Prof. Michael Askew (Education, Faculty of Humanities)
- Prof. Patrick Bond (Governance, Faculty of Commerce, Law and Management)
- Prof. Andrew Forbes (Physics, Faculty of Science)
- Prof. Christopher Henshilwood (Institute for Human Evolution, Faculty of Science)
- Prof. Richard Langlois (Economic and Business Sciences, Faculty of Commerce, Law and Management)
- Prof. Florian Luca (Mathematics, Faculty of Science)
- Prof. Lenore Manderson (Public Health, Faculty of Health Sciences)
- Prof. Chris Mathew (Sydney Brenner Institute for Molecular Biosciences, Faculty of Health Sciences)
- Prof. Vishnu Padayachee (Economic and Business Sciences, Faculty of Commerce, Law and Management)
- Prof. Linda Richter (Public Health, Faculty of Health Sciences and Human and Community Development, Faculty of Humanities)
- Prof. Bob Scholes (Animal, Plant and Environmental Sciences, Faculty of Science)
- Prof. Roger Sheldon (Chemistry, Faculty of Science)
- Prof. Samantha Vice (Social Sciences, Faculty of Humanities)
- Prof. Ivan Vladislavić (Literature, Languages and Media, Faculty of Humanities)
- Prof. Coleen Vogel (Animal, Plant and Environmental Sciences, Faculty of Science)



*Distinguished Professor Linda Richter,  
Director, DST-NRF Centre of Excellence in Human Development*

# Father of Green Chemistry: a catalyst for climate change



*Distinguished Professor in the School of Chemistry, Roger Sheldon*

Prof. Roger Sheldon is a Distinguished Professor in the School of Chemistry at Wits and Professor Emeritus of Biocatalysis and Organic Chemistry at the Delft University of Technology. He is a globally recognised authority on Green Chemistry, including the development of methods for quantifying the environmental impact of chemical processes, such as E factors and atom utilisation.

“Everything we use, we borrow from future generations. We have to put it back as we have received it,” says Sheldon. “Natural resources should be used at rates that don’t unacceptably deplete supply over the long term. We are using fossil fuels much faster than the rate at which they are being generated and we are generating CO<sub>2</sub> at a rate that can’t be assimilated by the environment, and that is leading to climate change.”

In 2015, Sheldon was elected as a Fellow of the Royal Society, which is the UK Academy of Science. In 2010, the Royal Society of Chemistry conferred its Green Chemistry Award for his work on Green Catalysis and Biocatalysis research.

Catalysts promote chemical reaction due to the participation of an additional substance, called a catalyst. Biocatalysis is the use of natural substances to speed up (or catalyse) chemical reactions. By using biocatalysts to improve the production of chemicals, Sheldon and his colleagues have made several major breakthroughs in Green Chemistry, even developing magnetised enzymes, which could be recycled out of liquids (and re-used), by separating the magnetised enzymes from the liquids.

“Biocatalysis is green and sustainable, and it has made enormous progress in the last two to three decades, and the performance can be dramatically improved by biocatalysis engineering,” he says.



The Senate and Council of Wits University approved a budget of R45-million to diversify the academy. Nine appointments have been made to date and 37 enabling grants awarded to academics across the five faculties. Some of the academics pictured here have already joined the University:



*Dr Darlene Miller*  
School of Governance



*Dr Meryl du Plessis*  
School of Law



*Dr Mpho Matsipa*  
School of Architecture and Planning



*Dr Ann George*  
Centre For Health Science Education



*Dr Daphney Conco*  
School of Public Health



*Mr Luther Monareng*  
Department of Occupational Therapy



*Ms Sizakele (Siza) Khoza*  
Department of Nursing Education



*Ms Thulile Khanyile*  
HIV Pathogenesis Research Unit



*Dr Heidi Richards*  
Schools of Chemistry and Animal, Plant  
and Environmental Sciences



*Mr Nceba Mhlahlo*  
School of Physics



*Mr Nduka Mntambo*  
Film and Television



*Eight additional appointments have been made and 18 interviews are underway across faculties.*



Postdoctoral fellowships are an opportunity for people who aspire to academia to develop their skills so that they can compete successfully when they apply for academic positions. Dr Robin Drennan, Director of Research Development says many candidates from Africa and abroad prefer postdoctoral research at Wits because of its high quality research intensity and its world ranking.

“I honestly believe that Wits offers a postdoctoral experience comparable with the Ivy League universities in the US and UK. Wits’ location in South Africa and Johannesburg specifically gives our postdocs access to a diverse and complex cosmopolitan environment that would be difficult to find elsewhere,” says Dr Drennan.

The admission criteria to be accepted as a postdoctoral fellow at Wits are a doctorate, a strong CV including academic grades in undergraduate and postgraduate studies, preferably published research, and a research area that matches that of the potential mentor at Wits – this is because the postdoctoral fellow and the mentor collaborate on joint research projects. Candidates must also be within five years of completing their PhDs so they are at the right development stage to take on a postdoctoral fellowship.

Dr Drennan says, “Wits has the capacity to meet the demand from postdoctoral candidates in Africa and abroad. Were it not for funding constraints, we could easily take on another 100 postdocs each year – that’s 50% more than we have currently. With more external funding we could expand the existing programme to make a bigger impact in developing the next generation of academics for South Africa and the continent.”



*Dr Sadhna Mathura, postdoctoral fellow in the Protein Structure Function Research Unit, School of Molecular and Cell Biology*



*Dr Stacey Sommerdyk, postdoctoral fellow in the History Department, School of Social Sciences*



*Dr Buhle Moyo, postdoctoral fellow in the Antiviral Gene Therapy Research Unit, School of Pathology*



*Dr Xavier Glaudas, postdoctoral fellow in the School of Animal, Plant and Environmental Sciences*



*Prof. Mary Scholes, Director: Postgraduate Affairs*

Wits is a powerful player in the higher education sector nationally with aspirations to compete globally. Current thinking at Wits is associated with rapid change, embracing technology, new ways of seeking productivity, new market relationships and partnerships, and a change in the underlying philosophy of how we view ourselves in relation to others.

The University envisages becoming a research intensive and postgraduate-oriented institution. The growth of postgraduate student numbers since 2013 has been unprecedented with a target of 12 000 students projected for 2016 and beyond 12 000 in 2017. The number of students graduating is also increasing each year.

“Securing local and international funding has enabled an increase in postgraduate student support from R66 million to R267 million in four years,” says Prof. Mary Scholes, Director of Postgraduate Affairs.

POSTGRADUATE				
	2012	2013	2014	2015
Student enrolment	9 897	10 067	10 996	11 821
Student graduation	2 965	3 139	3 550	3 648
Postgraduate funding	R66 million	R115 million	R203 million	R267 million

The Postgraduate Office offers 56 workshops a year for postgraduate students, which cover research proposal writing, ethics, citation, building an argument, and developing a professional identity. The office also offers ten writing retreats to support students in completing their theses and writing manuscripts for publication.

“We constantly streamline our processes in all offices that manage postgraduate students and these efforts create an intellectually stimulating environment for staff and students,” says Prof. Scholes.



**Prof. Imraan Valodia**

*Dean of the Faculty of Commerce, Law and Management*

## ECONOMICS FOR GOVERNANCE AND DEVELOPMENT

Situated in the heart of the economic hub of the African continent and connected to the most powerful and influential industrial, commercial and social agents in the country, the Faculty of Commerce, Law and Management pursues a vibrant research agenda that grapples with the economic and social challenges facing our country and the global South.

Our five Schools of Accountancy, Business Administration, Governance, Economic and Business Sciences, and Law are leaders in their academic disciplines with research agendas that change the way we do business, practice law and economics, and build the public sector.

The research productivity, publication output and postgraduate throughput in our Faculty continues to improve. Building research capacity and productivity at the school level is imperative, and all schools in our Faculty have established research committees. Research plans supported by workload models are bearing fruit.

### *Publications and Postgraduate Throughput*

Research from our Faculty remains internationally visible with over 63% of our journal article output published in internationally accredited Institute for Scientific Information (ISI) and International Bibliography of the Social Sciences (IBSS) journals.

In 2015, the Faculty contributed 202.63 publication units with a research footprint across 106 academic journals, 28 scholarly books, and numerous conference proceedings. We achieved a 27% increase over 2014 publication units and well above our target of one unit per member of academic staff. Our Faculty has grown its share of total University units from 10.5% in 2014 to 12.9%.

Our schools have made significant strides individually:

- The School of Law remains the leading research producer in the Faculty with 75.09 publication units, an increase of 45%,
- The School of Governance saw a 124% increase in publication units,
- The Wits Business School, a 40% increase; and
- The School of Economic and Business Sciences improved by 16% to record 52.25 units.

Research is a priority for our Faculty as it enables us to transfer new knowledge to our curricula and ensure that our students are foremost in their professions. We are developing the future CEOs, auditors, accountants and lawyers who will build South Africa and make an impact locally and globally. In 2015, 352 Master's and 26 PhD students graduated.

### *Awards and Appointments*

The Faculty now has 38 National Research Foundation-rated researchers, including distinguished professors and chairs. These appointments reflect our success in attracting and retaining quality staff, and include the:

- Derek Schrier and Cecily Cameron Chair in Development Economics
- Helen Suzman Chair in Political Economy
- Johannesburg City Chair in Economic Development
- Wits Business School Chair in African Philanthropy
- Telkom Chair in Digital Business.

Three of these chairs are in the School of Economic and Business Sciences and focus on development economics. These projects are discussed here.



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



*Prof. Vishnu Padayachee, Derek Schrier and Cecily Cameron Chair in Development Economics*

The Chair in Development Economics fosters research into sustainable development and democracy, macro-economic policy and corporate transformation within the framework of South Africa's transition to democracy. In his research, Prof. 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, his 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. Prof. 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 and 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.

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

# Economic constraints of why few African women marry



*Prof. Dorrit (Dori) Posel, Helen Suzman Chair in Political Economics*

Prof. Dorrit (Dori) 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 cohabitation, 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 multigenerational 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 among 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. Furthermore, 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.

# Studying the making of smart cities



Prof. Ronald Wall, Johannesburg City Chair in Economic Development

Prof. Ronald Wall is an economic geographer and urban planner who was appointed as the Johannesburg City Chair in Economic Development in the School of Economics and Business Sciences 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 Prof. 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.



GIS map of top investments between thousands of world cities (2003 - 2014)



Prof. Ian Jandrell  
Dean of the Faculty of Engineering and the Built Environment



## ENGINEERING A NEW REALITY

Quality research is for all seven schools, nine externally funded centres and two 21<sup>st</sup> Century institutes housed in the Faculty of Engineering and the Built Environment. The faculty has diverse research areas which are closely aligned with the needs of industry, government, communities and the professions.

### Publications and Postgraduate Throughput

The number of research publication submissions to the Department of Higher Education and Training increased from 128.24 in 2014 to 162.69 in 2015. Faculty staff authored or edited two books in 2015: *The scholarship of teaching and learning in higher education: On its constitution and transformative potential* (Lorenzo Woollacott) and *Cross-cultural management and quality performance: Chinese construction firms in Nigeria* (Oluwayomi Babatunde). We have continued to develop strategies to increase research output. Postgraduate numbers in the Faculty are increasing and 42 Master's and 29 PhD students graduated in 2015.

### Awards and Appointments



Prof. Sehliselo Ndlovu, Research Chair in Hydrometallurgy and Sustainable Development

The National Research Institute of Finland (Tekes) and the Academy of Finland appointed Prof. Rauf Eric in the School of Chemical and Metallurgical Engineering as a Finland Distinguished Professor, and Prof. Sehliselo Ndlovu was awarded a South African Research Chair in Hydrometallurgy and Sustainable Development. The South African Institute of Tribology awarded the Louw Alberts Award to Prof. Natasha Sacks from the Centre of Excellence in Strong Materials for her contribution to the field of tribology locally and internationally. Prof. Craig Sheridan received a Technology and Human Resources for Industry Programme grant of more than R1-million per year over three years.

In the School of Construction Economics and Management, honours students Amy McGregor, Wardah Ploker and Thabo Mathuthu, supervised by Prof. Dave Roodt, came third in the Greenovate Awards administered by Growthpoint Properties and the Green Building Council of SA.

Our postgraduate students have also excelled internationally. In the Flow Research Unit in the

School of Mechanical, Industrial and Aeronautical Engineering, Lara Nel, Russell Hall, Shalan Hooseria and Bright Ndebele won presentation awards at the 30<sup>th</sup> International Symposium on Shock Waves.

The ExtraGreen team comprising Prof. Luke Chimuka (Chemistry), Dr David Ming (Chemical and Metallurgical Engineering), Mr Tondani Rampfumedzi (Agricultural Research Council) and Dr Yvonne Saini (Wits Business School) won first prize in the Biosciences category of the Gauteng Accelerator Programme competition.

### Partnerships and Proceedings

The School of Architecture and Planning secured funding for three projects from the National Research Foundation and the Economic and Social Research Council (UK), in which Wits collaborates with the University of Sheffield and University College London:

- Prof. Alison Todes is the principal investigator in South Africa for *Living the urban periphery: investment, infrastructure and economic change in African city-regions*.
- *Developing research capacity for inclusive urban governance: a Sheffield-Witwatersrand PhD training partnership* is led by Prof. Claire Benit-Gbaffou.
- Prof. Philip Harrison leads: *Governing the future city: a comparative analysis of governance innovations in large scale urban developments in Shanghai, London, Johannesburg*, in South Africa in collaboration with University College London.

In August 2015, the School's Centre for Urban and Built Environment Studies (CUBES) hosted a panel discussion with all major university-based urban research centres in South Africa on the relationship between research and policy.

The School of Chemical and Metallurgical Engineering hosted four international speakers at its 21<sup>st</sup> anniversary. The speakers discussed globally relevant topics including carbon capture and storage, sustainable process design, extractive metallurgy and mineral processing, and corrosion and damage mechanisms in nuclear materials.

Prof. Beric Skews, Director of the Flow Research Unit in the School of Mechanical, Industrial and Aeronautical Engineering delivered the Paul Vieille Memorial Lecture at the 30<sup>th</sup> International Symposium on Shock Waves.

As the host University of the National Aerospace Centre (NAC) in South Africa, Wits partners with a global network, including Airbus, in cutting edge global aerospace design and development. The associated joint Airbus/NAC postgraduate scholarship programme, comprising six academic partners, enters its tenth year. The programme has now been extended to include additional topics relevant to Airbus and the NAC, such as hydrogen fuel cell technology as an innovative technique to generate power.

Wits has also developed a Human Capital Development programme with Boeing that is similar to the Airbus/NAC initiative. The aim of the Boeing programme is to support eight postgraduate students in two different universities over three years, extendable to another two universities and for a further two years. Like the Airbus programme, the Boeing programme uses a human capital management model. The focus is titanium beneficiation, as titanium is significant for a number of key stakeholders in the country.

The Centre for Mechanised Mining Systems in the School of Mining Engineering continues to develop innovative solutions to mining problems. It has developed novel methods to address the degradation of coal during handling, amongst others. Mining process simulation research tools developed by the Centre were applied to address an issue on an Australian mine. The Centre's tools enabled this mine to optimise the design of a new ore transport system. In 2015, the Industrial Development Corporation also contracted the Centre to develop a strategy for the Department of Trade and Industry that supports resource-based capital goods development. The resultant report has influenced government policy.

# #Tshimologong

## Jozi's new digital playground



*The Wits Tshimologong Digital Innovation Precinct*



*The IBM Research Lab at Tshimologong*

Wits is transforming Braamfontein into a young, vibrant precinct for a tech-savvy and innovative community. The University and its partners in government, business and industry launched the Wits Tshimologong Digital Innovation Precinct in Braamfontein on 1 September 2016. Setswana for “new beginnings”, Tshimologong is Johannesburg’s newest high-tech address in vibrant Braamfontein, where the incubation of start-ups, the commercialisation of research and the development of high-level digital skills for students, working professionals and unemployed youth will take place.

Tshimologong has been three years in the making through Wits’ Joburg Centre for Software Engineering (JCSE), and is a dynamic development that encourages tech innovation and collaboration between the University’s researchers and students and private, public and civil society sectors in Johannesburg.

“We hope that transforming Braamfontein into Africa’s premier technology hub will inspire new talent, create jobs and lead to an economic renaissance,” says Barry Dwolatzky, Professor of Software Engineering in the Wits School of Electrical and Information Engineering and Director of the JCSE. He has been driving the Tshimologong initiative and envisions 24/7 activity in the new precinct where ideas are hatched and creativity flourishes.

“Tshimologong will be a start-up incubator, business accelerator and a source of skills. The focus is on digital hardware, software and content. We are creating a hub space where people can get together, brainstorm and work on creative projects,” he says.

An important element of the Tshimologong Precinct is the IBM Research Lab, the first such facility anywhere in the world that is tightly integrated into an innovation hub. An addition to the Tshimologong development is the establishment by Wits of the DIZ (Digital Innovation Zone), a fantastic space in Smit Street where creatives, innovators and programmers can come together and collaborate.

Read more about Tshimologong at [www.jcse.org.za/hub](http://www.jcse.org.za/hub)



**Prof. Martin Veller**  
*Dean of the Faculty of Health Sciences*



## CURBING CHRONIC DISEASE

The Faculty of Health Sciences has strengthened its research environment through the creation of sustainable, robust initiatives for increased research output and postgraduate throughput. The quality and relevance of the Faculty's research has been acknowledged locally and internationally by the impact of journals in which we publish and the citation rates of our researchers. Local policy and the lives of thousands worldwide have been positively affected by this. As the global focus of research shifts from infectious to non-communicable [chronic] diseases, our academics have aligned accordingly.

### *Publications and Postgraduate Throughput*

Postgraduate student throughput increased significantly and 52 PhD students graduated in 2015. The production of PhD Clinician Scientists through the Carnegie Academic Medicine Programme adds to the pool of highly trained clinical staff conducting research.

### *Awards and Appointments*

Two Department of Science and Technology/National Research Foundation South African Research Chairs were awarded to the Faculty in 2015. Prof. Penny Moore at the Centre for HIV and STI at the National Institute for Communicable Diseases and the Wits School of Pathology was awarded the Chair in Virus-Host Dynamics for Public Health and Prof. Laetitia Rispel, Head of the School of Public Health was awarded the Chair in Research on the Health Workforce for Equity and Quality.

In the 2015 South African Women in Science Awards, Prof. Maureen Coetzee was named Distinguished Woman Scientist in the Life Sciences category. She is Co-Director of the Wits Research Institute for Malaria and the Department of Science and Technology/National Research Foundation South African Research Chair in Medical Entomology and Vector Control. Prof. Lynn Morris of the National Institute for Communicable Diseases and Wits School of Pathology was awarded the 2015 Medical Research Council Gold Scientific Achievement Award. Prof. Frederick Raal, Director of the Carbohydrate and Lipid Metabolism Research Unit was joint winner of the Vice-Chancellor's Research Award. Prof. Helen Rees, Director of the Wits Reproductive Health and HIV Institute was awarded the Harry Oppenheimer Fellowship Award and the National Science and Technology Forum Lifetime Achievement award. Prof. Beverley Kramer was the joint winner of the Department of Science and Technology/Southern African Research and Innovation Management Association Excellence in Research and Innovation Management Award for strengthened research and postgraduate management in the Faculty.

The University Research Committee confirmed the establishment of the HIV Pathogenesis Research Unit under Prof. Maria Papathanasopoulos, and the Empilweni Services and Research Unit under Prof. Ashraf Coovadia. These two units bring to 21 the number of Faculty research entities in 2015.

### *Partnerships and Proceedings*

The Carnegie-Wits Alumni Diaspora Programme continues to bring alumni 'home' for short periods and has resulted in important and sustained collaborations.

The Medical Research Council awarded extramural unit status to the Antiviral Gene Therapy Research Unit led by Prof. Patrick Arbuthnot, and awarded a Common Epithelial Cancer Research Centre to Prof. Paul Ruff, Head of the Division of Medical Oncology, to research breast, colorectal and pancreatic cancer. Prof. Frederick Raal will lead the Evan Stein Centre for Familial Hypercholesterolaemia (FH), established to identify people with inherited high cholesterol and promote awareness of FH.

The Faculty maintains strong partnerships with the National and Provincial Departments of Health and the National Health Laboratory Services whose contribution to research in the Faculty we acknowledge.

## Analysing data to inform public health



*Prof. Tobias Chirwa received funding for the sub-Saharan Africa Advanced Training Programme for Leadership and Excellence in Biostatistics*

Prof. Tobias Chirwa is one of seven leading African researchers to receive a portion of a R70 million (£3.337-million) funding injection from the Wellcome Trust and the Department for International Development in the UK. Funding to the amount of £46 million over five years was awarded through the DELTAS Africa scheme. DELTAS is the Developing Excellence in Leadership, Training and Science Initiative, which aims to establish world class research environments at African universities and training opportunities for the next generation of researchers.

Chirwa is a biostatistician in the School of Public Health at Wits and Head of the Division of Epidemiology and Biostatistics. This is the branch of statistics concerned with the analysis and interpretation of scientific data generated in the biological and health sciences to inform clinical or health policy and practice.

"In many African countries, there is a shortage of well-trained biostatisticians. The few people that are trained are often overwhelmed. To ensure that data is used to inform public health policy and practice for the benefit of the people in Africa, we need to prioritise training of African postgraduate biostatisticians who can provide the required analysis to a high standard," says Chirwa.

Wits leads the sub-Saharan African Consortium for Advanced Biostatistical Training. This group of African and northern institutions will use the funding to develop a network of biostatisticians who will deliver statistical courses for biomedical researchers, develop and implement statistical theory to analyse health data, and create the framework for improved biostatistical skills among health researchers and academics in nine African countries.

# CARTA: Building research leaders for Africa

The Consortium for Advanced Research Training in Africa (CARTA) is a partnership jointly led by Wits in South Africa and the African Population and Health Research Centre (APHRC) in Kenya. CARTA was formed in 2008 out of the realisation that individual African universities lack the human and financial resources and infrastructural capacity to tackle the challenges of doctoral training on the continent.

CARTA aims to develop a vibrant African academy that can lead world class multi disciplinary research and impact positively on public and population health. CARTA does this by building institutional capacity at the universities who are members of the consortium, and through a doctoral training programme which recruits fellows from the staff of nine institutions across Africa. CARTA’s mandate is to empower self-sustainability in African member universities and their fellows.

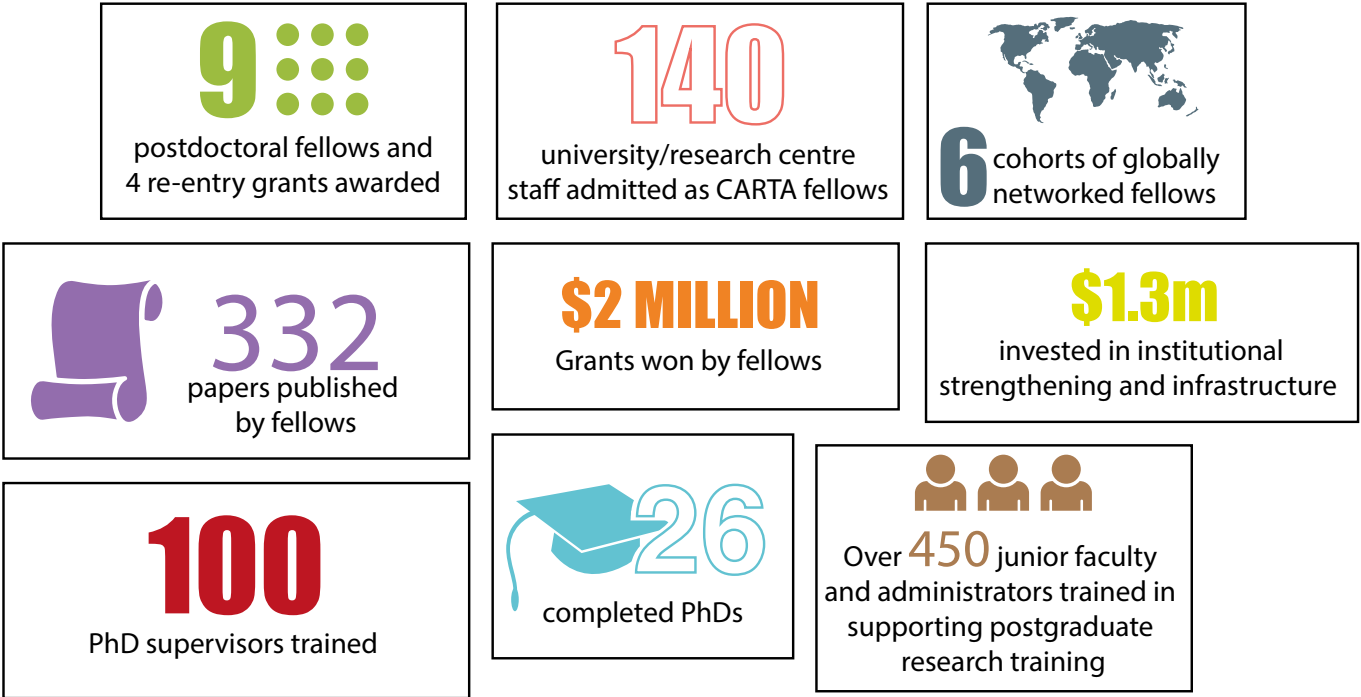
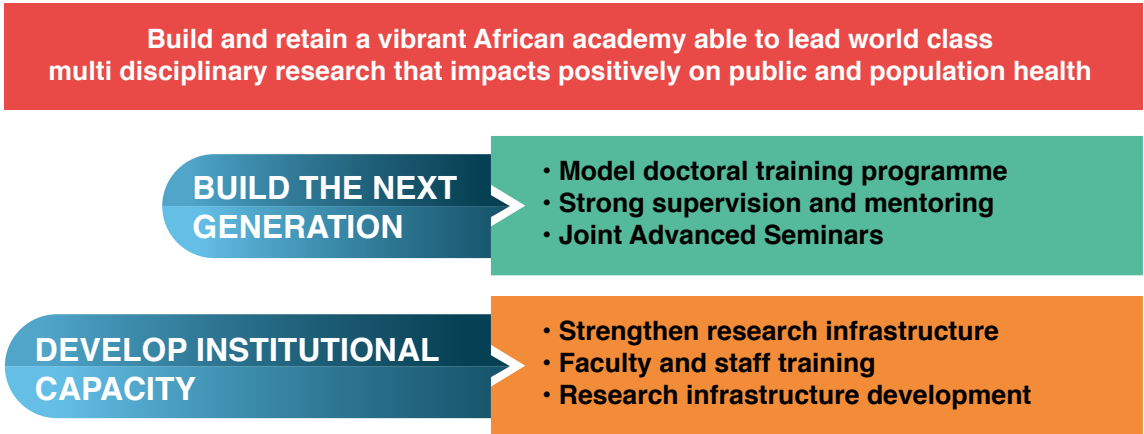
CARTA comprises nine African universities, four African research centres and selected northern partners. To date, CARTA has a total 140 PhD fellows, 24 of whom have graduated. Most of these graduates are either enrolled in postdoctoral fellowships or have received re-entry grants to enable them to undertake research when they return to their jobs at universities. Nineteen Wits staff members have won CARTA fellowships and many more of the CARTA fellows are enrolled as PhD students at Wits across all faculties.

In April 2016, the Wellcome Trust in the UK awarded CARTA a continuation grant of R108,15 million (£5.25million). It is the second grant that CARTA has received from the Wellcome Trust, but the first through the DELTAS Africa programme. DELTAS is the Wellcome Trust’s Developing Excellence in Leadership, Training and Science initiative.



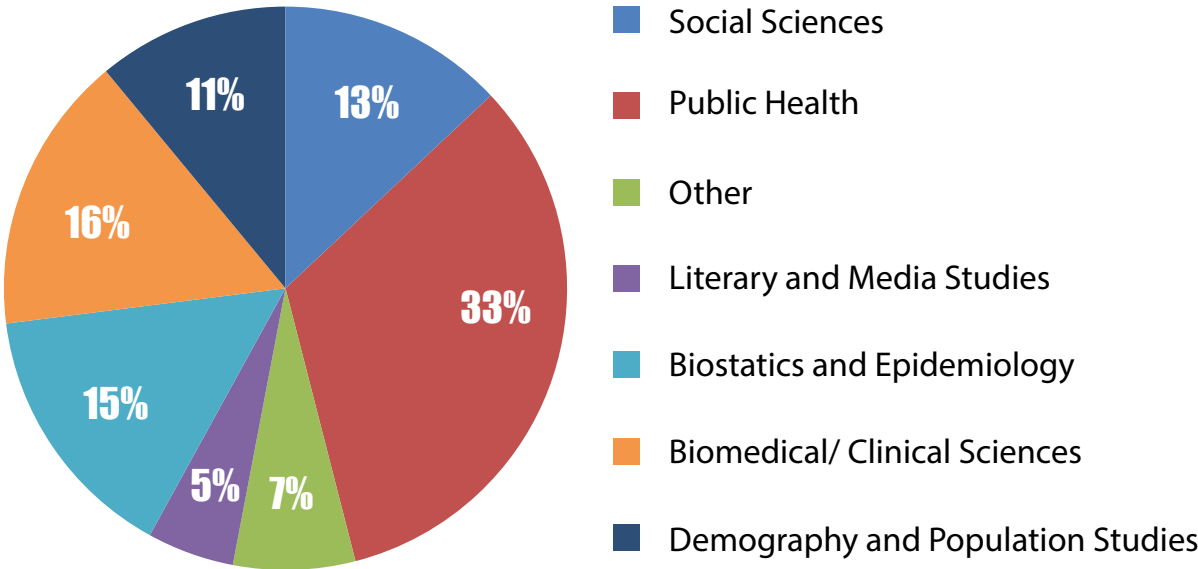
Prof. Sharon Fonn in the School of Public Health at Wits co-founded CARTA in 2008 with Prof. Alex Ezeh of the African Population Health Research Centre in Kenya

## KEY ELEMENTS OF CARTA



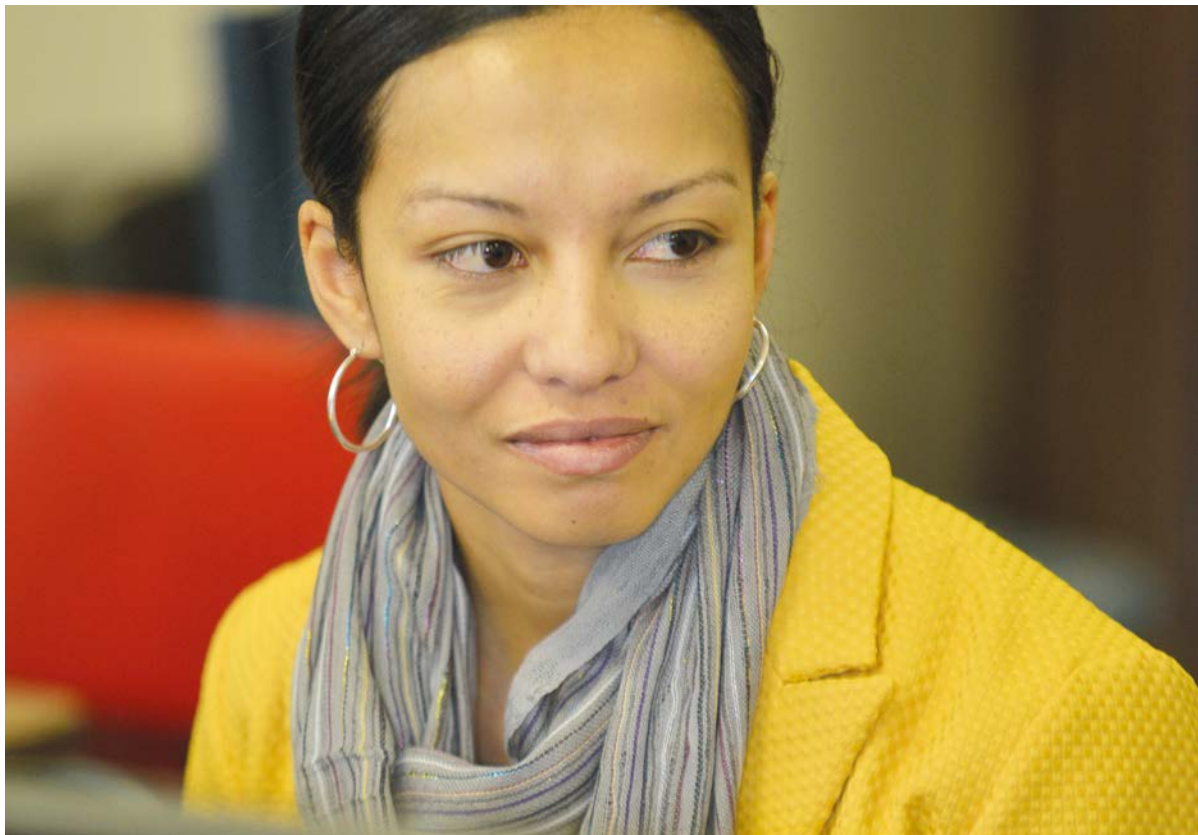
## CARTA FELLOWS' DISCIPLINARY BACKGROUNDS

CARTA’s success is due in part to the transdisciplinary approach of its fellows whose research in public and population health is located in disciplines as diverse as urban planning, mathematical modelling, and even literature and language studies.





## Researching threats to adolescent survival



*Dr Nicole De Wet, CARTA Fellow and 2015 Woman in Science runner-up*

Dr Nicole De Wet is a lecturer in demography and population studies at Wits University and a Wits alumna. Her research is on adolescent health outcomes in South Africa. There is a dearth of research in South Africa on 10-19 year olds specifically. This age group is fragmented and incorporated into adult or child health studies. However, the needs of this age group are specific and distinct from that of children and adults.

“My doctoral research found that females are at higher risk of disease-related mortality, while males are at a higher risk of non-disease (accidents, homicides) mortality,” says De Wet. Further, a differential exists by place of residence and 15-19 years old adolescents are at a higher risk of premature mortality than 10-14-year olds.

De Wet’s postdoctoral studies examine adolescent health behaviours that either promote or prohibit successful transition to adulthood. This research aligns with the Policy Guidelines for Youth and Adolescent Health in South Africa, which aim to promote safe and supportive environments for adolescents. These include relationships with families, social norms and cultural practices.

“Through identifying key behaviours - risky sexual behaviours and illicit drug use – that place adolescents at risk of adverse health outcomes, my research aligns with the South African National Youth Policy 2014-2019. This policy aims to ‘strengthen the capacity of young people to enable them to take charge of their own well-being through building their assets and ultimately realising their potential to the fullest,’” she concludes.



**Prof. Ruksana Osman**  
*Dean of the Faculty of Humanities*



## TRANSFORMING THE HUMANITIES

The Faculty is the intellectual home of five schools, several prestigious research chairs (mathematics, numeracy, local histories, political theory, diversity studies and migration), highly regarded research institutes (Wits Institute for Social and Economic Research and the Society, Work and Development Institute), as well as a range of globally recognised research entities and partnerships (Public Affairs Research Institute). Collectively it contributes and shapes civil society through various public engagements on topical issues confronting our country and the rest of the world. It is through this collective engagement that the Faculty's intellectual and public-intellectual stature has been greatly enhanced with cutting edge research into local and global priorities.

The Faculty has embarked on a robust initiative to transform the humanities through a more inclusive and diversified professoriate programme, and through investment in doctoral students in 2015. The National Institute for the Humanities and Social Sciences and the Andrew W. Mellon Foundation funded 50 PhD students and enabled the development of a model for doctoral training. The Transforming the Humanities through Interdisciplinary Knowledge Doctoral Fellowship Programme was implemented to develop a new generation of humanities scholars. The research of some of our Distinguished Professors in the Humanities is included in this programme.

### *Publications and Postgraduate Throughput*

In 2015 the Faculty continued its outstanding performance and upward trajectory in terms of research productivity, the attainment of doctoral degrees, and the creation of a vibrant intellectual culture characterised through hosting global conferences and distinguished scholars, amongst other activities. The number of rated researchers in the Faculty has increased continually with over 25% of staff now being ranked by the National Research Foundation.

The School of Human and Community Development progressed significantly on its strategic path towards research output, access, and career advancement. External bursaries increased student growth and diversity, particularly amongst postgraduate students. Research outputs increased for the third consecutive year and the School now has 15 rated researchers.

In the School of Literature, Language and Media, 13 books were published along with articles and chapters. The Wits Justice Project, the Wits Radio Academy and the Africa-China Reporting Project all produced research for public intellectual impact, and secured opportunities for international collaboration and advanced studies.

### *Awards and Appointments*

Dr Brett Pyper, Head of the School of Arts, was selected as the 2016 recipient of Emory University's Sheth Distinguished International Alumni Award.

In the Wits School of Education several members of staff were recognised for mathematics and numeracy, system-wide instructional reform research, and the Wits Abafunde-ba-hlalefe Multilingual Literacies Programme. The International Commission on Mathematical Instruction elected Wits Professor Jill Adler as President in July 2016, and awarded her the Hans Freudenthal Medal for outstanding achievement in mathematics education.

In the School of Literature, Language and Media, Dr Maxwell Kadenge in Linguistics received the African Language Association of Southern Africa award for the most outstanding article in linguistics for 2015.

In the School of Social Sciences, Professor Jacklyn Cock in Sociology received a lifetime achievement award from the World Association of Political Economy, and the African Centre for Migration and Society won the prestigious Wellcome Trust Award for research into health and mobility.

### *Partnerships and Proceedings*

Colleagues and students in the Wits School of Arts continued to make notable contributions to artistic excellence, innovative pedagogy, transformative public engagement and advancement of the Arts. Nationally, the School has contributed to debates and policies on Arts, Culture and Heritage, has had several staff appointed to leadership positions in the Arts, has had a strong presence in the 2015 National Arts Festival, and also saw the production of several films, musical scores, exhibitions and theatre performances. The School's international recognition at least rivals its national impact, with significant footprints at the Fak'ugesi Digital Africa Festival, the Stuttgart Festival for Animated Films, the Toronto Animation Arts Festival International, the New York Film Festival, Kinematifest, and the Durango Film Festival. Furthermore, international collaborations and participation at events in Mozambique, Finland, Ghana, Italy, Sweden, Serbia, Brazil, Russia, the UK, Ethiopia, Germany and Australia all marked a highly productive year for the School.

The School of Education hosted the 10<sup>th</sup> Regional Conference of the Higher Education Research and Policy Network themed *Sustainable Transformation and Higher Education*, while the Centre for Deaf Studies and the Marang Centre for Mathematics and Science Education celebrated 15 and 10 year anniversaries respectively. Both these centres are active in their communities and contribute to research in their fields.

The School of Human and Community Development secured funding for research into violence, fatherhood, narrative inquiry, health communication, and racism, amongst other areas.



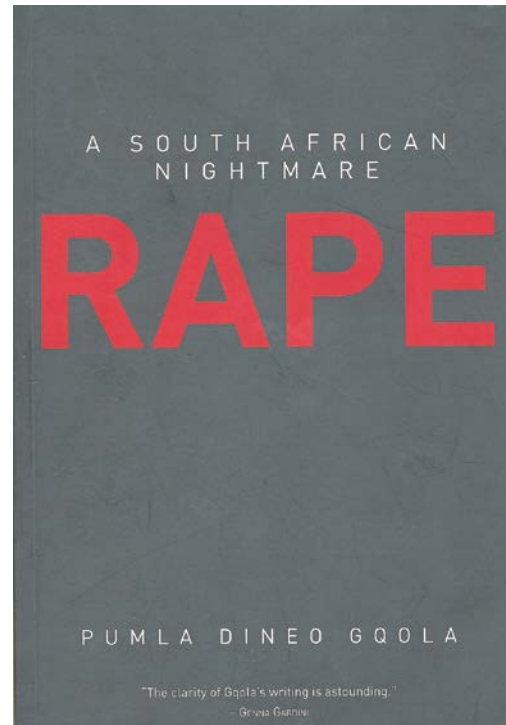
*Prof. Jill Adler, President of the International Commission on Mathematical Instruction*

The School of Social Sciences continued to host a range of stimulating intellectual activities that contributed to its reputation as one of the leading centres of work in humanities and social sciences in Africa. Highlights in 2015 were the conferences *African Philosophy: Past, Present and Future* and the *Joint Development Studies and Economies of Regions Learning Network* conference. The School maintained and leveraged international collaborations such as the Global Labour University with scholars at institutions in Morocco, Egypt, Cote d'Ivoire, Nigeria, Ghana, Tanzania and Madagascar. The Anthropology Department exhibited work by renowned anthropologist and linguist Nereida Pirero-Muniz and photojournalist Salym Fayed. The Carnegie Foundation funded the Demography and Populations Studies Programme.

I extend my appreciation to all academic and professional staff and students in the Faculty for their commitment to the academic, intellectual and research project of our Faculty and University.



## Where the power to dominate resides



*Prof. Pumla Dineo Gqola, Department of African Literature*

An Associate Professor in the Department of African Literature, Pumla Dineo Gqola's research focus areas include slave memory, post-apartheid public culture, rape culture, African feminisms, African feminist imagination and masculinities, and femininities in Black Consciousness literature. She is interested in how power works in contemporary societies. Her research explores how ideas about groups of marginal people travel across time, contexts and spaces. How do some ideas come to be taken for granted as "common sense" and how can the project of imagining freer ways of being be amplified?

Essentially, this research interrogates how the power to dominate is entrenched through violent systems of knowledge-making, through the histories of ideas, as well as counter-hegemonic discourses. Gqola's work on slavery, race and rape (separately and intersectionally) has implications for how power works in contemporary society, whether in South Africa or comparative contexts globally. As feminist research and movements point to a pervasive rape culture globally, understanding how to interrupt such narratives is important. Through her work Gqola challenges assumptions that abstraction only comes from those spaces explicitly marked as "theory". She remains convinced that sometimes counterintuitive readings are epistemically productive. Gqola is the winner of the prestigious 2016 *Sunday Times* Alan Paton Award for her book entitled *Rape: A South African Nightmare*.

## Languages and literacies in the 21<sup>st</sup> Century



*Prof. Leketi Makalela, Division of Languages, Literacies and Literatures*

Prof. Leketi Makalela is the Head of the Division of Languages, Literacies and Literatures in the Wits School of Education. He chairs a research programme on complex multilingual encounters, a field that is growing exponentially through a number of PhD students whose research projects focus on this theme.

Makalela's research explores the interface between languages and literacies in the 21<sup>st</sup> Century. He is intrigued by the prospect of alternating languages of input and output to enhance identity construction and epistemic access for multilingual students. His research challenges the validity of boundaries between languages and literacies and it "disrupts" monolingual bias in classroom interactions and language policies. His research highlights the fact that monolingual bias is the root cause of high failure rates among multilingual learners and that it reproduces social inequalities.

In the light of these theoretical limitations, he has developed a multilingual literacies framework that is based on the African value system of interdependence – *Ubuntu* – to define complex multilingual encounters. Using *Ubuntu* 'translanguaging' to explain cultural competence that is embedded in the logic of incompleteness (i.e., one language is incomplete without the other) and interdependence, he argues that all global multilingual encounters are characterised by the constant disruption of language and literacy boundaries and the simultaneous recreation of new discursive ones.

This research shifts epistemological lenses from the north to the south and proposes practical methodologies that are anchored in the cultural competence of multilingual speakers for increased access to knowledge, ways of knowing and identity formation/affirmation.

"I believe this is the most effective way to bring about transformed school practices in South Africa and other comparable contexts worldwide," he says.



## The urgency of transformation in the global south



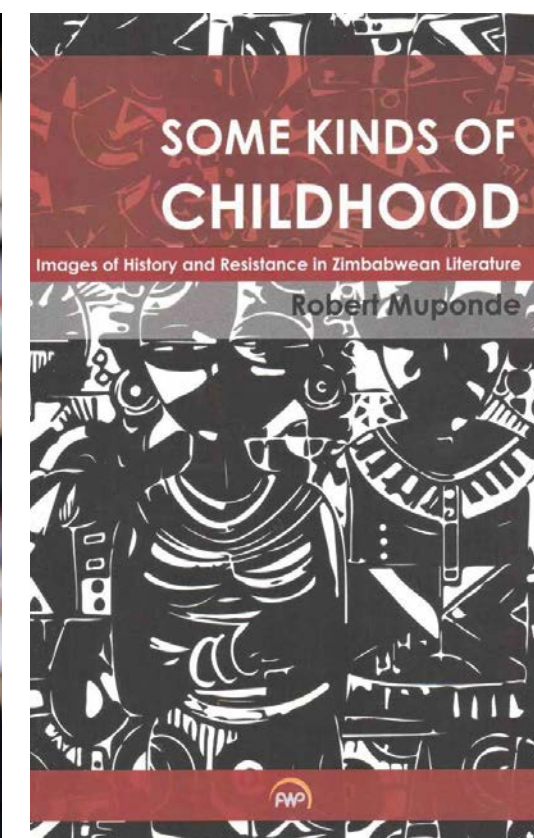
Prof. Felix Maringe, Educational Leadership and Policy Studies

Prof. Felix Maringe has been researching higher education markets in the context of international and global developments since 2004. He holds a doctorate from the University of Southampton. While global north academics are preoccupied with attracting students and staff to increase these academics' intellectual stock, global south institutions tend to focus their internationalisation efforts on developing curricula that reflect strong international dimensions. In addition, global north universities have a stronger focus on research, while those in the south tend to be more teaching-led. This creates divergent rather than convergent narratives of internationalisation and confounds the potential for coherent partnerships. Contextualised within the transformation narrative, Maringe proposes an epistemological ecology for engaging partners in the processes of decolonising higher education and sees this as a key springboard for an envisaged higher education programme of teaching and research into international markets and curricula. The programme is designed to include Master's level courses and doctoral research programmes in the field. Maringe has over 80 publications in refereed journals, which include four books on markets in higher education, globalisation and internationalisation in the sector and transformation in education.

## Some kinds of childhood



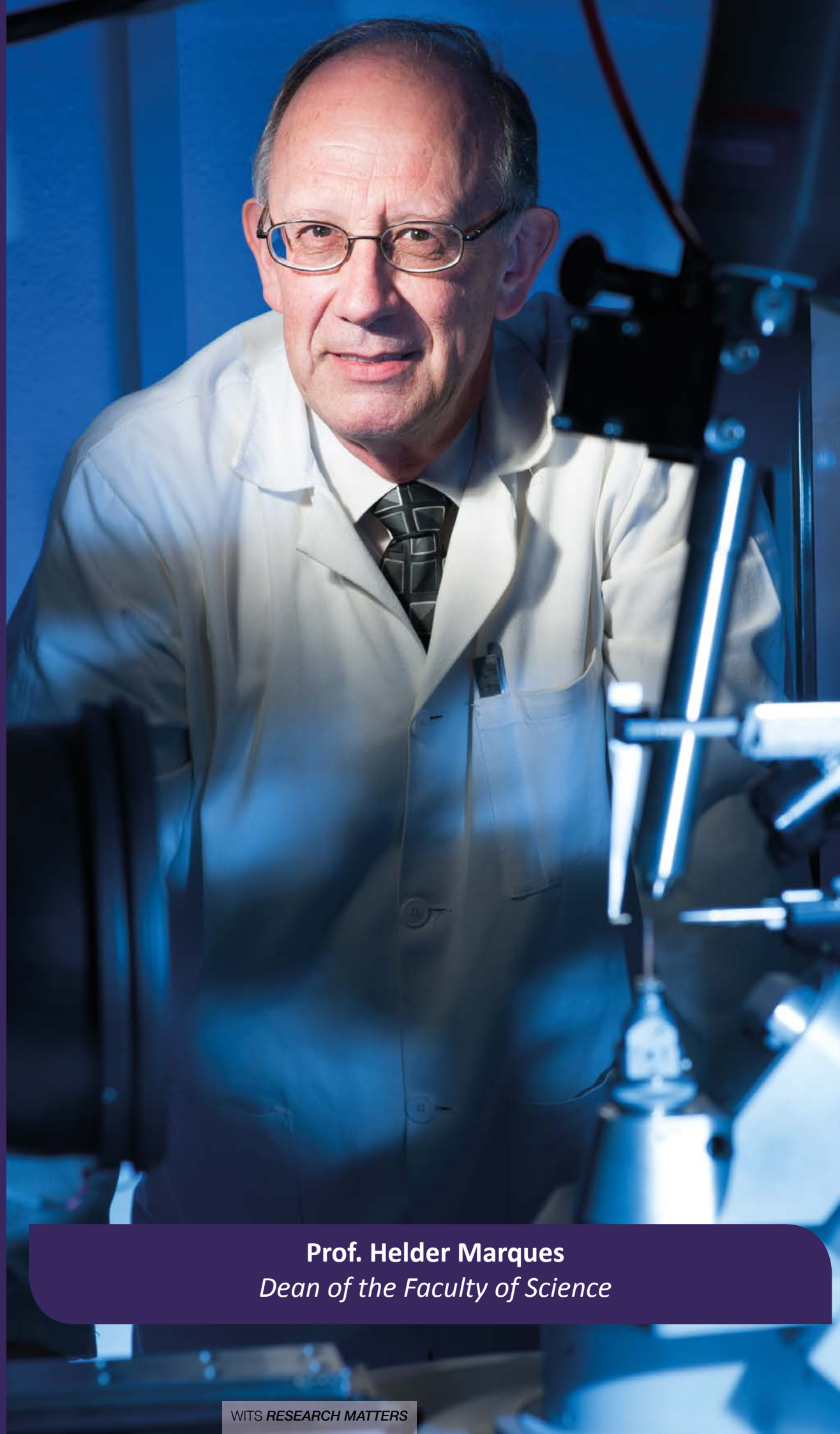
Prof. Robert Muponde, Department of English



Prof. Robert Muponde is an intellectual and writer whose books illustrate how critical redress in cultures of representation can yield cross-disciplinary innovation in global humanities. 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 and *Manning the Nation: Father Figures in Zimbabwean Literature and Society* are on the reading lists for gender studies in South Africa, 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. Prof. Muponde's subsequent study on the configurations of childhoods takes the form of creative non-fiction entitled *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.





**Prof. Helder Marques**  
*Dean of the Faculty of Science*

## BIG DATA FOR THE 4<sup>TH</sup> INDUSTRIAL REVOLUTION

The fourth industrial revolution, in which technology fundamentally alters how we live, work and relate, is driven by data science. This refers to the study of where information comes from, what it represents and how we can use it. Digital data are continually being generated and mining and analysing it has profound implications for economies and societies. Understanding big data – ginormous datasets – thus represents the next frontier in research and innovation.

Over the past three years the Faculty of Science has grown its teaching and research activities in the data sciences. We have embarked on several strategic initiatives to lead research and postgraduate study in this field. An environment that supports data science is now in place in the Mathematical Sciences disciplines, which include Computer Science and Applied Mathematics, Mathematics, Statistics and Actuarial Science. We feature our developments in the data sciences here.

Through our six other schools in the Physical, Earth and Biological Sciences, the Faculty continues its mission to create, disseminate and apply scientific knowledge towards advancement and development. Publications and postgraduate throughput in these schools, as well as prestigious appointments and awards and global collaborations, reinforce the Faculty's position as one of the leaders in science in South Africa.

### *Publications and Postgraduate Throughput*

Eminent journal *Science* accepted for publication a paper entitled *A continent-wide assessment of the form and intensity of large mammal herbivory in Africa*, by Gareth Hempson, a postdoctoral fellow in the Global Change and Sustainability Research Institute (GCSRI). The journal *Nature* has published *Pool Knowledge to stem losses from disasters*, co-authored by Prof. Coleen Vogel, a climatologist in the School of Animal, Plant and Environmental Sciences (AP&ES).

Funding of R1.1 million has enabled the provision of bursaries for the Big Data Analytics class of 2016 honours students. This initiative was boosted by a R60 million grant from government to expand the training programme to data scientists across the country.

### *Awards and Appointments*

The School of Computer Science and Applied Mathematics supported students' entry into the annual Centre for High Performance Computing (CHPC) Student Cluster Competition. Wits students won the 2015 competition and advanced, with students from other universities, to the International Supercomputing Conference in Germany to represent South Africa. The CHPC team beat 11 other international teams to clinch the ultimate award.

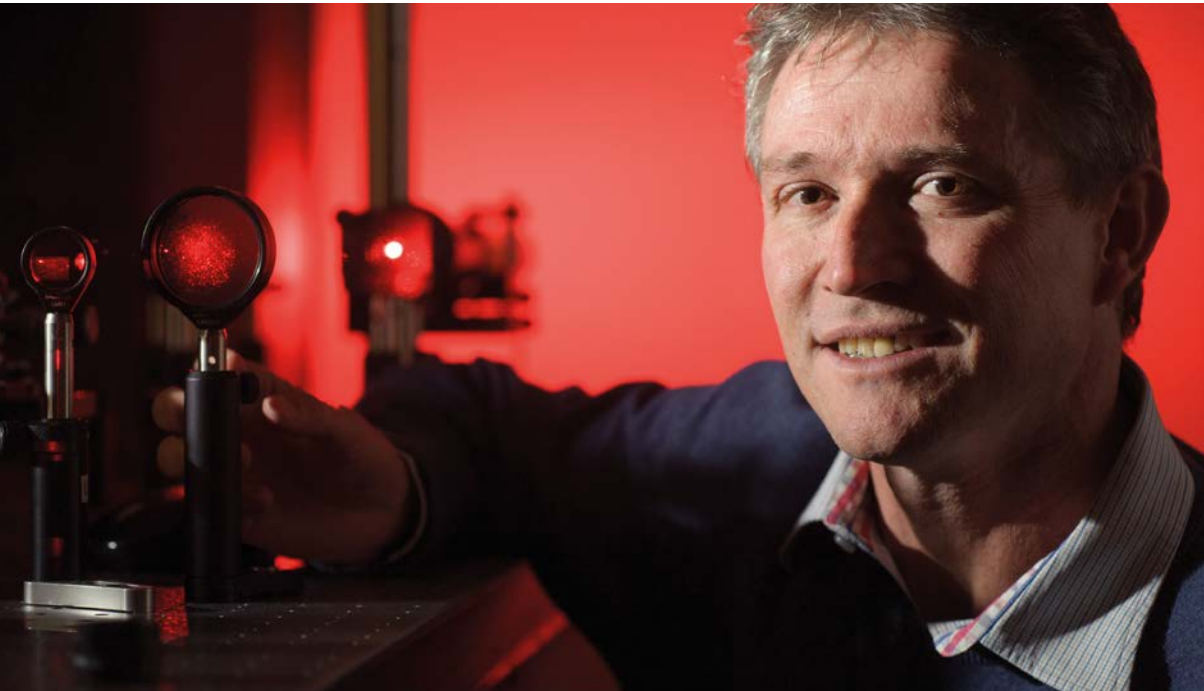
Professors Sally Archibald (AP&ES), Charis Harley (School of Computer Science and Applied Mathematics) and Vishnu Jejjala (Physics) won the prestigious Friedel Sellschop Award for research in 2015.

At the 2015 Convention of the Actuarial Society of South Africa, Prof. Roseanne da Silva was inducted as President of the Society.

Physical Sciences at Wits include the Schools of Chemistry and Physics. In 2015, Distinguished Professor in Chemistry, Roger Sheldon was inducted as a Fellow of the Royal Society, while the South African Chemical Institute awarded Prof. Helder Marques its Gold Medal for outstanding scientific contributions in the field of chemistry.



Distinguished Professor of Physics, Andrew Forbes received the individual Special Photonics Award in UNESCO's International Year of Light and Light-based Technologies, and Prof. Deena Naidoo was elected as a council member of the South African Institute of Physics. He continues to serve on the International Union of Pure and Applied Physics as a member of the Commission on Physics Education. He is also a member of the Scientific Advisory Committee of the International Conference on Physics until 2018.



*Distinguished Professor of Physics, Andrew Forbes*

Our researchers in the Earth Sciences, which include the School of Geography, Archaeology and Environmental Studies (GAES) and the School of Geosciences, have earned prestigious acclaim. The South African Presidency honoured archaeologist Prof. James David Lewis-Williams (in GAES) with the Order of the Baobab in Gold for his research on the rock art of ancient people. In the Geosciences, the South African Geophysical Association awarded Prof. Ray Durrheim the Rudolf Krahmann Memorial Medal, while Dr Musa Manzi won the Africa Award for Research Excellence in Earth and Ocean Science, awarded by the American Geophysical Union Honors Program. Prof. Susan Webb continues to serve on the Board of Directors of the American Geophysical Union.

The Biological Sciences incorporates the School of AP&ES, the Global Change and Sustainability Research Institute (GCSRI), and the School of Molecular and Cell Biology. Prof. Bob Scholes (AP&ES and GCSRI) was inducted as a Foreign Associate into the National Academy of Sciences of the USA and received a lifetime achievement award from the National Science and Technology Forum. Prof. Coleen Vogel (GCSRI) was elected as Vice-Chair of the African Future Earth Committee and as a member of the WOTRO Science for Global Development, a division of the Netherlands Organisation for Scientific Research.

Prof. Marcus Byrne (AP&ES) received a National Research Foundation award for excellence in science engagement. In October 2015, the Academy of Science of South Africa elected Prof. Stefan Weiss in the School of Molecular and Cell Biology as a member.

*Partnerships and Proceedings*

Physics at Wits continues its significant role in two major experiments at the Large Hadron Collider (LHC). This is the world's most powerful particle accelerator. Professor of Physics and Deputy Vice-Chancellor: Research at Wits, Zeblon Vilakazi, leads Wits' efforts at the ALICE experiment, which explores the state of matter that existed a millionth of a second after the Big Bang. Prof. Bruce Mellado, an expert on the

Higgs boson, leads Wits' participation in the ATLAS project at the European Organisation for Nuclear Research (CERN). ATLAS is a particle physics experiment to research the fundamental nature of matter. Prof. Mellado is also a member of the Large Hadron Electron Collider (LHeC) Coordination Group, which will construct a R12-billion facility. He was appointed as Co-Convenor in the Higgs Cross-section Group, which will collate the work of hundreds of researchers and establish how to study data provided by the LHC and the Higgs boson properties.

Our staff continue to be involved in significant research collaborations such as the High Energy Stereoscopic System (H.E.S.S) telescope in Namibia. An international collaboration of scientists operate the H.E.S.S and South African universities are strongly represented. Wits physicists are specifically involved in data analysis techniques and the development of theoretical interpretation tools of extragalactic and galactic sources.

The project entitled *Plasmonics for better efficiency of solar cells*, by Prof. Alex Quandt (Physics) and Prof. Giancarlo Righini (Centro Fermi, Rome) is one of five projects selected for the Executive Programme of Scientific and Technological Cooperation between Italy and South Africa (2015-2017). This collaboration with Italian researchers entails improving the efficiency of conventional solar cells.

In the Earth Sciences, Shell SA has invested R5 million over five years towards creating a Seismology Reflection Centre at Wits. The Centre aims to develop innovative technologies to discover what lies beneath the earth. Housed in the School of Geosciences, the Centre will provide world class geophysical training to students across Africa to equip them with the knowledge and skills that the oil, gas and mineral industries demand. Dr Musa Manzi will direct the Centre.

Shell SA's investment coincides with the 111<sup>th</sup> birthday of the School of Geosciences. Alumni and friends gathered to celebrate the occasion at the Wits Club in March 2015. Prof. Roger Gibson, Head of Geosciences, said at the event that the School is the largest geosciences postgraduate training facility in Africa and attracts many international students, mostly from Africa.



*Dr Musa Manzi, Director of the Seismology Reflection Centre*



Financial markets are among the biggest processors of information on the planet. In the financial services sector, the advent of electronic trading platforms in the last decade has altered the trading landscape. Sophisticated data analysis and integration with live data feeds results in global markets being dominated by algorithmic and high frequency trading. Subsequently, code, data and trade errors create new risks.

The High-Energy Physics group is collaborating via the South African National Grid (SAGrid) to develop and deploy the Collider Computing Grid. The SAGrid is a federation of institutes and virtual organisations that serve as a platform to provide resources and support for researchers.

## A portrait of a middle-aged man with dark hair, a beard, and a mustache. He is wearing a light blue button-down shirt and has his arms crossed. He is standing in front of a white wall with vertical grey stripes. A pen is visible in his shirt pocket, and he is wearing a metal watch on his left wrist.

GCSRI researchers published 31 peer reviewed papers, two book chapters and four articles in 2015. The Interdisciplinary Studies in Global Change Master's programme, developed with funding from the Africa Climate Change Adaptation Institute, is fully operational and increasingly popular.

The GCSRI is working to bridge the science/policy divide by strengthening its collaborations and knowledge-sharing. To this end, Prof. Bob Scholes, a systems ecologist, co-leads the Strategic Environmental Assessment of Shale Gas Development with the Council for Scientific and Industrial Research on behalf of the National Department of Environmental Affairs. Similarly, Prof. Coleen Vogel, a climatologist, heads a research project on adaptation for the City of Johannesburg. Senior researchers have also been appointed to the Intergovernmental Panel on Climate Change. “We want to empower stakeholders to make better decisions for a sustainable future,” concludes Erasmus.

"We have made progress in the research arena. However, global change concerns in the public domain require us to align our research agenda to address a changing African environment. Building capacity amongst African researchers, expanding networks and pursuing transdisciplinary research remain priorities," says Prof. Barend Erasmus, Director of the GCSRI.

In 2015 donations from Exxaro, the Open Society Foundation and the Carnegie Corporation of New York funded 33 students and postdoctoral researchers for research in: Vulnerability: adaptation and mitigation; Coupling ecosystem and human health; People, practice and policies; and Building resilient cities.



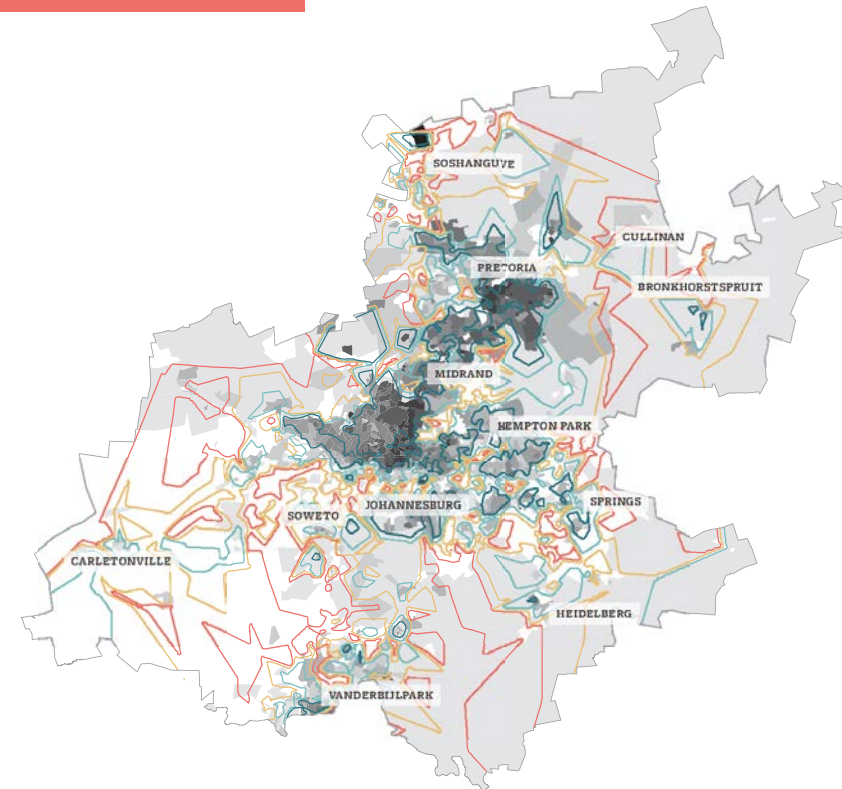
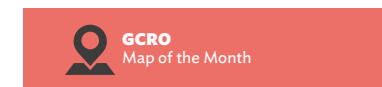
Prof. Rob Moore, Executive Director, GCRO

The Gauteng City-Region Observatory (GCRO) is a partnership between Wits, the University of Johannesburg and the Gauteng Provincial Government, with local government in Gauteng also represented on the GCRO Board. The mandate of the GCRO is to help build the knowledge base that government, business, civil society and residents need to make the Gauteng City-Region competitive, spatially integrated, environmentally sustainable and socially inclusive.

In addition to its range of policy-oriented outputs and making its research publicly accessible, the academic output at the GCRO has been significant. Peer-reviewed academic publications increased three-fold in 2015 and GCRO staff presented at local and international conferences. Concurrently, the GCRO supervised Master's and doctoral candidates and co-hosted seminars with university partners. Among these in 2015 were the *Faces of the City* seminar series and the *Smart | City | Region* symposium and exhibition.

"Smart cities are an increasingly important research focus for the GCRO as Gauteng and its municipalities explore advanced technologies to streamline service delivery, enhance revenue collection, and better manage urban environments. This provides the opportunity for the GCRO to launch its new online and interactive products," says Prof. Rob Moore, Executive Director of the GCRO..

The updated GCRO website was launched in August 2015. The website makes data available through innovative applications such as the *GIS Interactive Website (2<sup>nd</sup> generation)*, the *Urban Observatory Website* and the *Ward-profile Viewer*. The popular Maps of the Month, Vignettes and Interactive Visualisations also bring data to life.



## Tertiary qualifications and median income

### Annual median household income percentile

- 20<sup>th</sup> (R16 447.68)
- 40<sup>th</sup> (R28 649.21)
- 60<sup>th</sup> (R55 040.35)
- 80<sup>th</sup> (R134 426.06)

### Proportion with tertiary qualification

- 0.0 - 1.4
- 1.4 - 3.6
- 3.6 - 6.5
- 6.5 - 10.1
- 10.1 - 14.3
- 14.3 - 19.5
- 19.5 - 24.9
- 24.9 - 31.2
- 31.2 - 52.1
- 52.1 - 100.0

Authors  
Christian Hamann  
Data Source  
Statistics South Africa, 2011



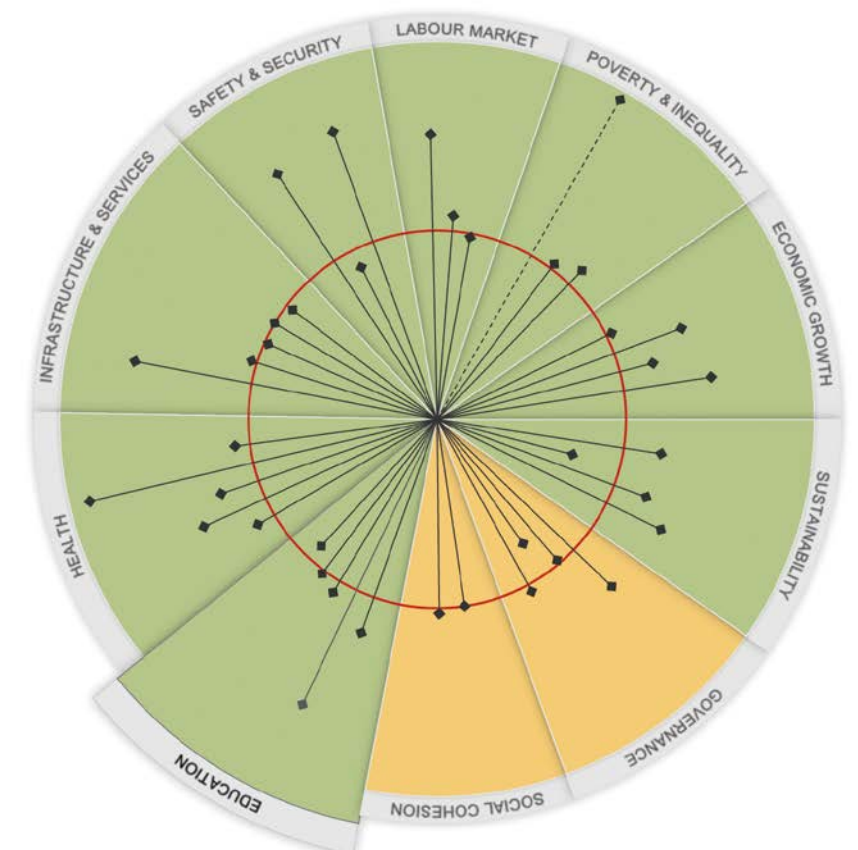
## THE GCRO BAROMETER 2014

Change since ...  
(Choose baseline year)

2002 2007 2011

The GCRO Barometer depicts developmental progress in the Gauteng City-Region in a single interactive graphic, using 38 indicators across 10 key sectors. It serves as a tracking and diagnostic tool to inform policy makers and the public on where development progress is being made, and areas of concern. The Barometer shows progress against three base years (2002, 2007 and 2011) in the last year for which data could be collected across all indicators, 2012. The base year is represented by the red circle, and the length of the line reflects the extent of progress on a standardised index.

Viewing Instructions

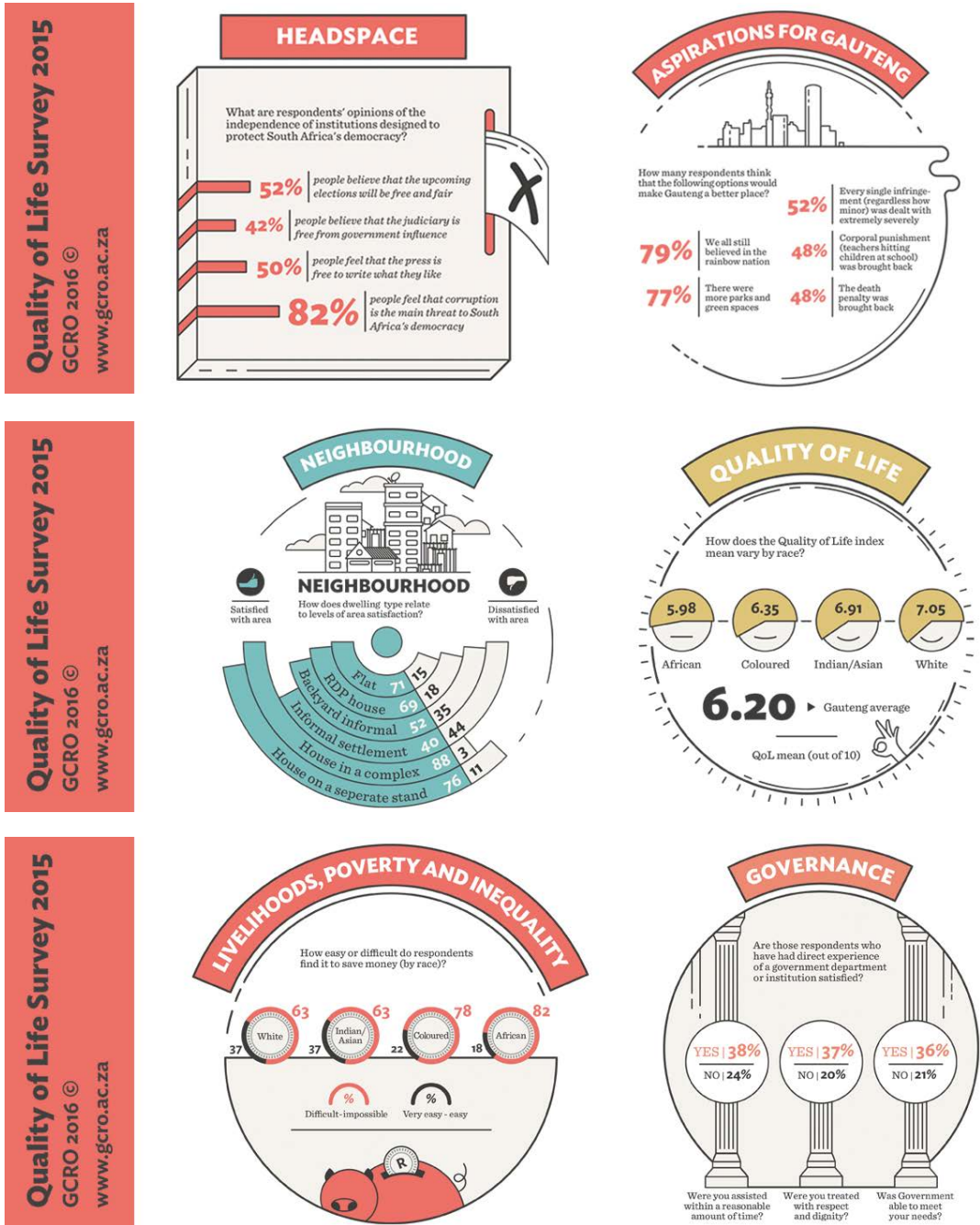


<http://barometer.legacy.gcro.unomena.net/>

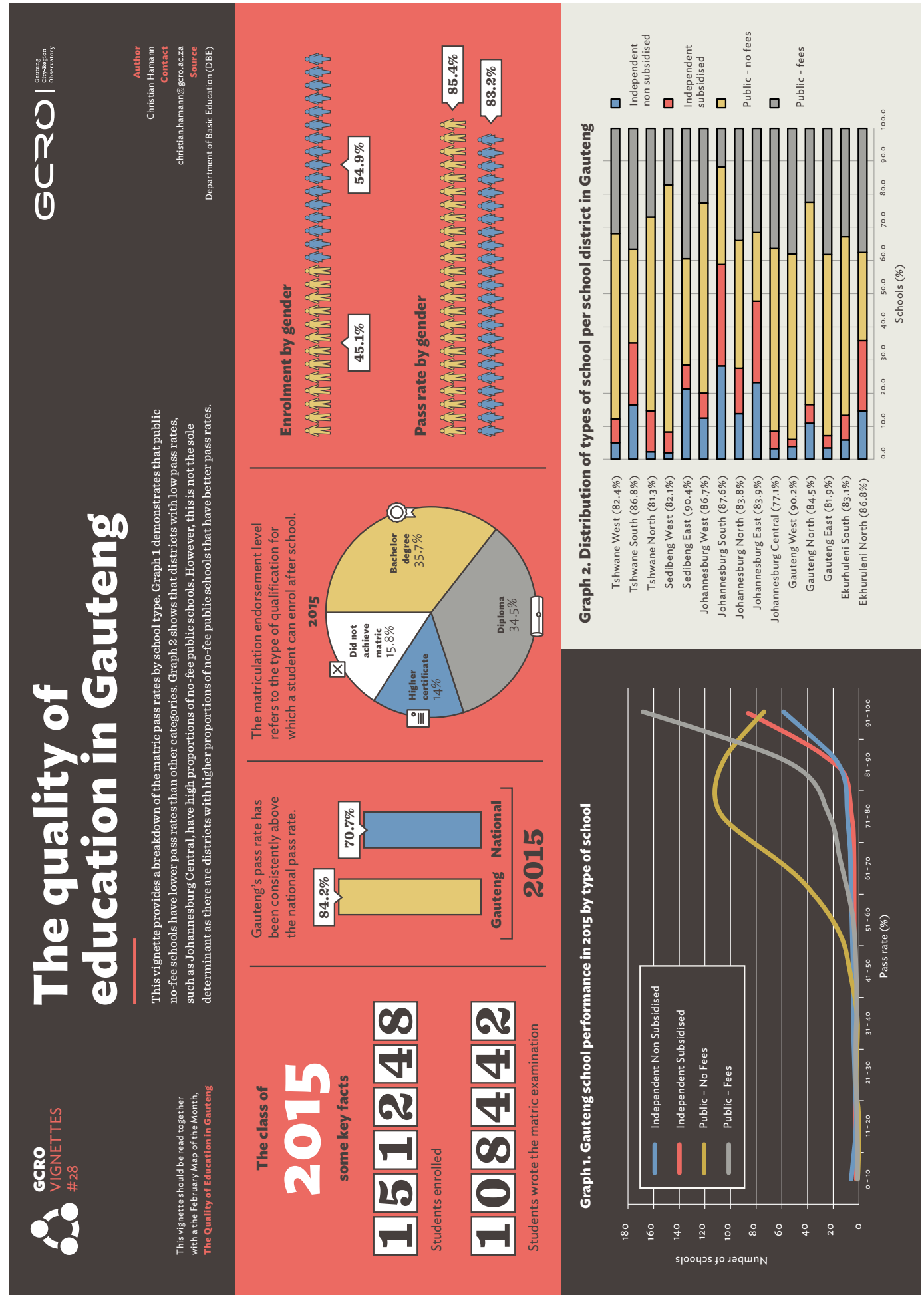


# The quality of life in post-apartheid Gauteng

In 2015 the GCRO produced its fourth, largest and most ambitious iteration of the Quality of Life (QoL) Survey. This study includes 30 000 in-depth interviews across all quarters of the City-Region and probes both the material conditions and the less tangible dimensions of what it means to live in Gauteng in the post-apartheid era. The survey explores issues of the economy, employment, transport, crime, health and perceptions of government. It probes perceptions of race relations, community cohesion and the degree to which inhabitants feel included in societal processes. This latest QoL survey saw unprecedented buy-in from the three metropolitan municipalities with requests to further deepen the granularity of data generated. Some of the findings are illustrated here.



Read more about the Gauteng City-Region Observatory and its projects at [www.gcro.ac.za](http://www.gcro.ac.za)





*Duncan Raftesath, Chief Executive Officer, Wits Enterprise*

Wits Commercial Enterprise (Pty) Ltd is a wholly owned subsidiary of Wits, which undertakes technology transfer, short courses and research support activities on behalf of the University. The research support unit provides proposal development, fund raising, contractual negotiation and financial administration services, and is involved in a multitude of projects with Wits researchers every year.

In 2015, Wits Enterprise managed 172 research related projects led by 77 Wits researchers across 30 Schools, amounting to over R48 million in revenue. This included about R8.22 million secured from the Technology for Human Resource for Industry Programme, which is a Department of Trade and Industry initiative managed by the National Research Foundation that supports the development of students in industry relevant research projects. Other funders ranged from large industry players like AngloGold Ashanti through government agencies such as the Technology Innovation Agency and Industrial Development Corporation, to international organisations like the European Union and the Southern African Development Community.

Furthermore, the technology transfer unit assists Wits with registration of promising intellectual property, as well as the commercialisation of technologies developed by its researchers, though, inter alia, raising funds for product development and market testing, and spinning out companies. These support services create a supportive space for researchers to secure research, technology development and commercialisation funding, and to enable the translation of their research into products and services that positively impact the South African economy and the lives of its citizens.

## Improving the accuracy of TB testing



*Prof. Baves Kana, Director of the DST/NRF Centre of Excellence for Biomedical TB Research*

Tuberculosis (TB) affects some 35-million people globally. The introduction of technology in 2009 that tests for TB using molecular diagnostics was a game-changer for national TB programmes. The technology increased access to TB testing, which then improved diagnosis and treatment and ultimately inhibited further infection. However, when the World Health Organization endorsed this molecular diagnostic test, there was no quality assurance in place for checking the accuracy of the testing machine.

A team of scientists from Wits, led by Prof. Wendy Stevens and Prof. Lesley Scott in the Department of Molecular Medicine and Haematology, in collaboration with Prof. Baves Kana from the Department of Science and Technology/National Research Foundation Centre of Excellence for Biomedical TB Research, developed the SmartSpot technology. SmartSpot guarantees the quality of the molecular diagnostic tests.

In South Africa, SmartSpot has been used on all 289 GeneXpert testing instruments in the national TB programme since 2011. Over a year, SmartSpot showed that 2.6% of the TB tests were inaccurate and that test modules needed replacing. In the absence of SmartSpot verification, 78 000 test results out of the three million tests performed at the time would have been inaccurate. This would have led to an incorrect diagnosis. As a result, some patients would have remained undiagnosed and either died or infected others, while others would have been subjected to unnecessary, costly drugs with unpleasant side effects.

The Global Laboratory Initiative, an advisor to the WHO, has endorsed TBCheck for verification. The technology was developed in collaboration with the Centres for Disease Control, which provided significant funding, the National Health Laboratory Services, which was responsible for the rollout of the new diagnostic programme in South Africa, and the AIDS Clinical Trial Group in the USA, which provided funding for testing in particular countries.

TBCheck was so successfully rolled out to local and international TB testing programmes at scale that Wits Enterprise “spun out” a new company, SmartSpot Quality (Pty) Ltd in 2015. TBCheck has since been exported to 22 countries, with more in the pipeline.





# Extracting maximum value from the Moringa plant



Prof. Luke Chimuka, School of Chemistry

Prof. Luke Chimuka in the School of Chemistry developed a method to produce an extract from the Moringa plant through pressurised hot water extraction. The extract, which is more environmentally friendly and less potentially hazardous to human beings, may be used as an additive in foods, beverages, cosmetic products and as a dietary supplement. The pressurised hot water extraction technology alleviates the issues associated with conventional extraction techniques. These methods require high solvent concentrations using organic solvents, which are pollutants and may threaten human health. Prof. Chimuka's technology produces an extract that is environmentally friendly and safe for human consumption. The Moringa project is a partnership between the Phedisanang community, which produces Moringa powder and the Department of Science and Technology, which funded the community, and Wits to develop the extraction technology.

Funding from the Technology Innovation Agency to the Wits Seed Fund enabled Prof. Chimuka to produce samples of Moringa yoghurt and mineral water and undertake preliminary consumer acceptance research. This provided momentum to enter the 2015 Gauteng Accelerator Programme BioScience Business Plan competition. The Moringa extract business, dubbed *Extra Green*, won first prize.

The research team is now embarking on further market testing with the intention to establish a joint-venture and a company between Wits and the Phedisanang community.

Two funders have invited proposals to explore the commercialisation potential of the technology by designing and constructing a pilot plant. Here extraction can be tested at higher volumes and the commercial viability of the product assessed. Should these efforts succeed, the impact will be evident in the production of sophisticated food and supplement products for consumers that contain the nutritional properties of Moringa but not the unpleasant taste, and are made using environmentally sound processes. Furthermore, communities producing Moringa leaf powder will benefit from increased sales volumes through expanded uses of Moringa.



Alf Farrell, Chief Executive Officer, Wits Health Consortium

The Wits Health Consortium (WHC) (Pty) Ltd is a private, wholly owned company of Wits University, registered in the Faculty of Health Sciences since 1998. The WHC leverages opportunities that are ancillary and complementary to those of the Faculty, to generate additional resources to strengthen the Faculty. This was undertaken by creating academic entrepreneurial business units (divisions), most of which focus on research.

The WHC Shared Services Centre supports these divisions by providing services relating to financial administration and reporting, grants, risk and compliance management, internal and external auditing, human

resources and payroll management, training and IT support. These services are provided in accordance with approved WHC policies, procedures and practices.

A Board of Directors and six sub-committees oversee WHC operations. These sub-committees include: Academic Oversight, Audit, Directors Affairs, Remuneration and Transformation, Strategy and Investment, and Sustainability.

Academics in the Faculty of Health Sciences have driven growth by establishing some 60 divisions within the WHC legal umbrella, to support their clinical and research activities predominantly within the therapeutic areas of HIV/AIDS, TB, pulmonology, vaccines, malaria, non-communicable diseases, and public health. The number of articles published by WHC joint-appointed staff has exceeded 300 over the past three years.

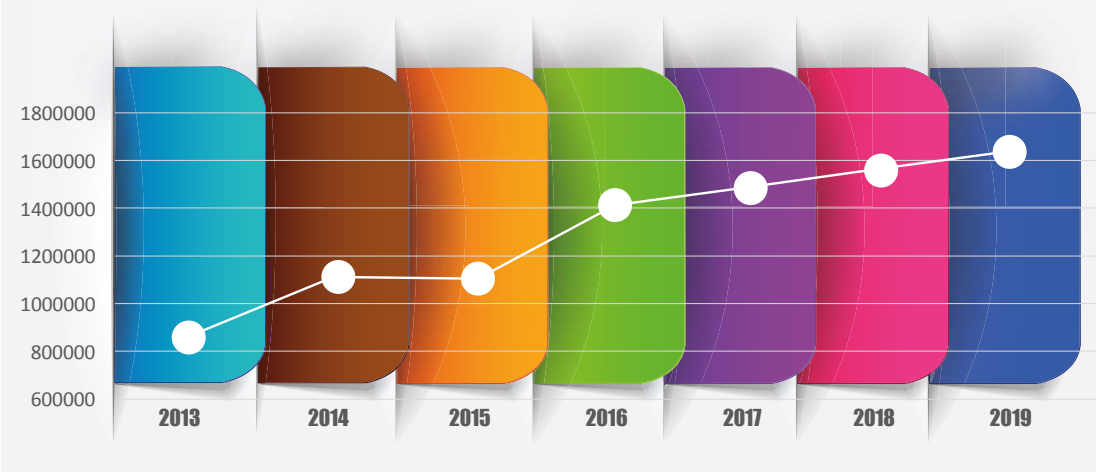
The WHC continues to be the vehicle for significant and increasing contributions to the Faculty's research and training agenda and through which its applied research initiatives directly benefit South African and African patients. For example, the WHC Ebola initiative in response to the outbreak in West Africa demonstrated how the WHC facilitated scientific community engagement with significant African impact, in this instance on behalf of the South African government.

The initiative brought together the technical skills of the Wits Reproductive Health and HIV Institute and the non-governmental organisation Right To Care, with administrative and operational support from the WHC that helped government quickly respond to this challenge and, in so doing, save lives.

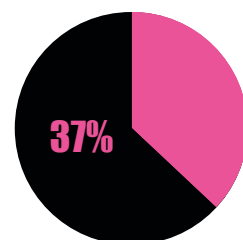
Furthermore, two WHC divisions – the Wits Reproductive Health and HIV Institute, and the Respiratory and Meningeal Pathogens Research Unit – supported by the WHC and the University are spearheading an ambitious African vaccine initiative that has as its objective a significant reduction in Vaccine Preventable Diseases. The WHC is therefore a key vehicle through which Wits achieves its objectives in the health sector.



## INCOME PROJECTIONS (R x 1000)



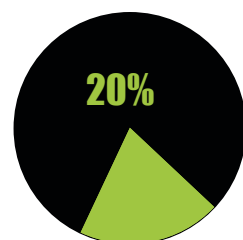
## INCOME PER DONOR DETAILS 2015



**USAID**

US Agency for International development

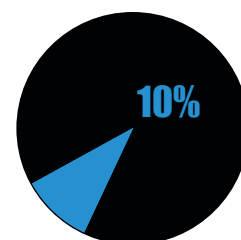
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**NIH**

National Institutes of Health

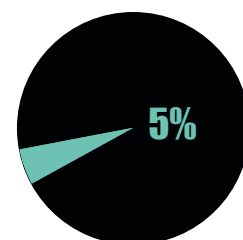
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**BMGF**

Bill and Melinda Gates Foundation

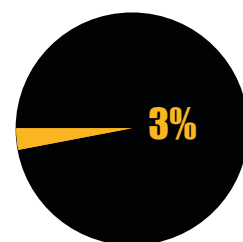
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**CLS**

Clinical Laboratory Services

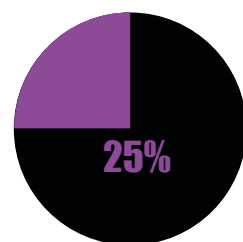
R56 004 933.33



**COMMERCIAL**

Wits Clinical Research

R31 531 386.23



**OTHER**

Various other smaller donors

R273 674 438.91



Wits Clinical Research

**R1 104 986 398**

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