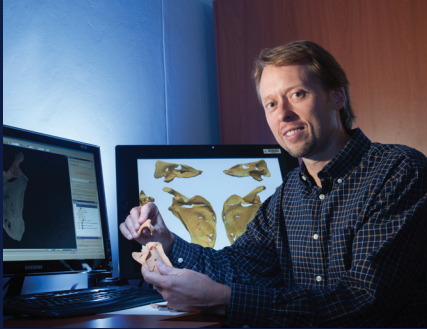


WITS 2012 Research Report



WITS



Appreciation is expressed to the following people for their valuable assistance:

Deborah Minors
Dr Bavesh Kana
Iain Burns
Ferna Clarkson
Shirona Patel
Data capturers in the departments

Editor in Chief: Shirona Patel
Head: Communications
+27 11 717 1019
shirona.patel@wits.ac.za

Research related enquiries:
Iain Burns
+27 11 717 1231
iain.burns@wits.ac.za

Editor:
Kanina Foss

Photographs:
Mariki Uitenweerde

Design, cover and layout:
Helen Philippou

University of the Witwatersrand,
Johannesburg
Private Bag 3
Wits, 2050
South Africa

1 Jorissen Street
Braamfontein, 2001
Johannesburg
Gauteng
South Africa

+27 11 717 1000
www.wits.ac.za



Copyright © University of the Witwatersrand

This report comprises two volumes. Volume 1 is the print edition of the report (ISBN NUMBER: 978-0-620-58397-8). Volume 1 and Volume 2 (the publications list) are available electronically on CD (ISBN NUMBER: 978-0-620-58398-5) or at www.wits.ac.za/research



University of the Witwatersrand, Johannesburg

Research Report

A selection of
Groundbreaking Achievements
from 2012



CONTENTS

Message from the Vice-Chancellor and Principal: Professor Loyiso Nongxa	4
Message from the Deputy Vice-Chancellor: Research: Professor Helen Laburn	6
Message from the Director of Research and Development: Dr Rob Drennan	9
Research Overview	12
Ethics Committees	23
• Human Research Ethics Committee (Medical): Professor Peter Cleaton-Jones	24
• Human Research Ethics Committee (Non-Medical): Professor Tommaso Milani.....	24
• Institutional Biosafety Committee: Professor Caroline Tiemessen	25
• Animal Ethics Screening Committee: Professor Graham Alexander	26
Emerging Researchers	27
Faculty Reports	38
Commerce, Law and Management	
• Message from the Dean: Professor Nqosa Mahao	39
• Law, Justice and Development in Africa	42
• The Core of Political and Socio-economic Change.....	45
• Driving a Strategic Goal.....	48
Engineering and the Built Environment	
• Message from the Dean: Professor Beatrys Lacquet	51
• Energy Efficiency and Greening of the Skies.....	54
• Partnering with Eskom to solve Key Combustion Engineering Issues.....	57
• Towards Sustainable, Resilient South African Cities.....	60

CONTENTS

Health Sciences

- Message from the Dean: Professor Ahmed Wadee 63
- The Triumph of 10 Years 67
- A Weighty Issue 70
- Game Changing Research..... 73

Humanities

- Message from the Acting Dean: Professor Ruksana Osman..... 75
- The Arts as Research 79
- A People's History 82
- iPods for Literacy and Education..... 85

Science

- Message from the Dean: Professor Andrew Crouch 88
- Giant Breakthrough after a Decades-long Search..... 91
- Scanning Through Stone 94
- Transforming ARV Treatment in sub-Saharan Africa..... 97

Report from the CEO of Wits Enterprise: Duncan Raffesath..... 100

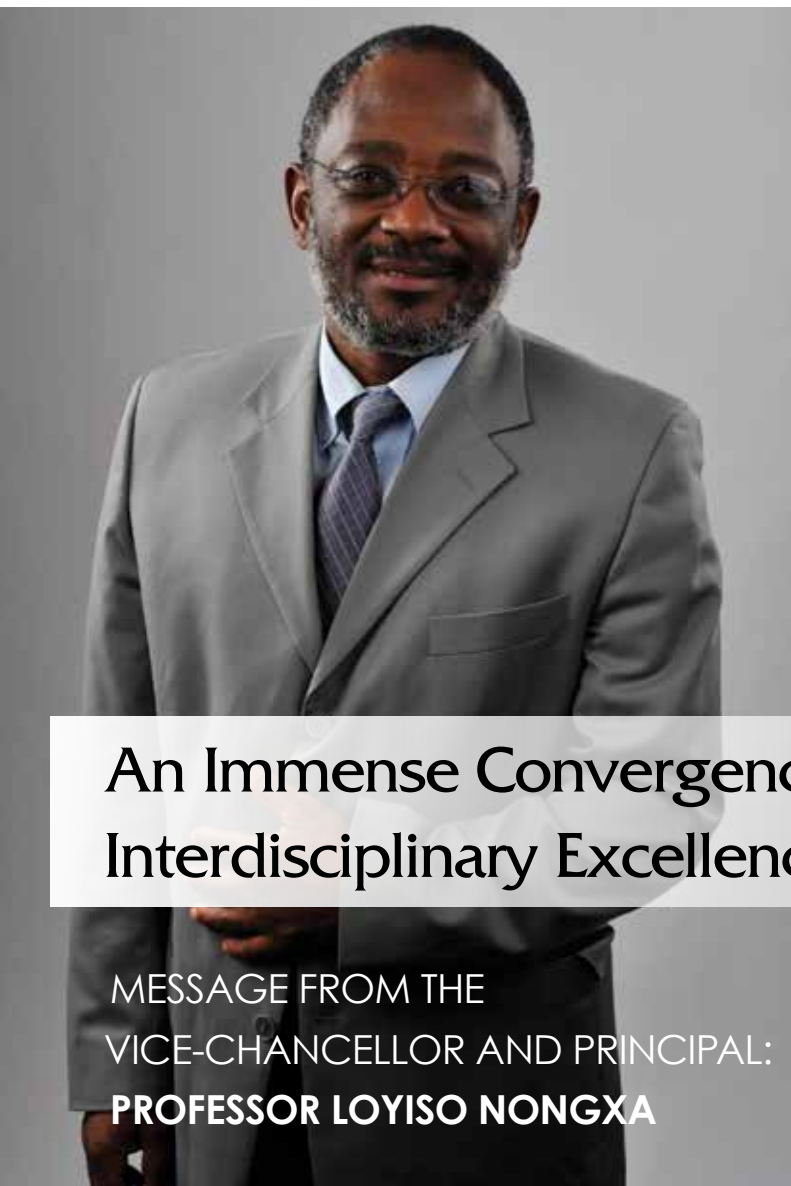
Report from the CEO of the Wits Health Consortium: Alf Farrell 103

News and Events..... 109

Books 111

In Memoriam: Professor Phillip Tobias 112





An Immense Convergence of Interdisciplinary Excellence

MESSAGE FROM THE
VICE-CHANCELLOR AND PRINCIPAL:
PROFESSOR LOYISO NONGXA

My career at Wits started when I was appointed as the Deputy Vice-Chancellor: Research over 10 years ago. At that stage I did not fathom that such a diverse and creative range of research ideas, programmes, groups, centres, institutes and thrusts would emerge at Wits in such a short period of time.

Built on a strong foundation of excellent research, we have seen an immense convergence of disciplines, schools, faculties, institutions and research communities – local and global working together to solve complex problems facing our society.

The six Wits 21st Century Research Institutes, built on the principles of intellectual excellence, international competitiveness and measurable impact, are probably the most visible demonstration of this cross-boundary research.



The six institutes were approved by Council in 2012, and five have already been approved by the University's Research Committee. Four of these prestigious institutes have already been launched: the Global Change and Sustainability Research Institute, the Sydney Brenner Institute for Molecular Bioscience, the Wits Mining Research Institute and the Evolutionary Studies Institute. The City Institute and the Institute for Wellbeing and Development are established and progressing well.

I have overseen the opening of three Department of Science and Technology/National Research Foundation (NRF) centres of excellence – in biomedical TB research, strong materials and – most recently, palaeosciences. According to the NRF, these centres 'concentrate existing capacity and resources to enable researchers to collaborate across disciplines and institutions on long term projects that are locally relevant and internationally competitive in order to enhance the pursuit of research excellence and capacity development'.

In addition, the Department of Trade and Industry's National Aerospace Centre was opened in 2006 and in 2011 the African Network for Drugs and Diagnostics Innovation announced two new centres of excellence in advanced drug delivery technology and viral gene therapy.

In the last decade, Wits has hosted 22 prestigious NRF South African Research Chairs. The University has over 230 NRF rated researchers, of whom 16 are A-rated, identifying them as international leaders in their fields. It remains one of only two South African universities that continue to publish extensively in high impact journals accredited by the Institute for Scientific Information, and is acknowledged as the South African institution which produced the most scientific research publications pertaining to HIV/Aids between 1996 and 2006 (Pouris & Pouris).

There are nine traditional research institutes at Wits – the newest to be described as such are the Wits Reproductive Health and HIV Research Institute, and the Wits Malaria Institute – evidence that Wits is engaged in combating the most important diseases confronting Africa.

Wits hosts about 20 research units and 10 research groups – all centres of excellence in their own right, not only because of the innovative research being undertaken, but because of the dedicated, passionate researchers who are devoted to making a difference to the world through their pursuit of knowledge.

Numerous academic and research centres were opened in the last decade with a variety of partners from the public, private and higher education sectors. Among others, these include the Joburg Centre for Software Engineering, the Palaeosciences Centre, the Marang Centre for Mathematics and Science Education, the Origins Centre, the Steve Biko Centre for Bioethics, the Wits Centre for Ethics, the Centre for Indian Studies in Africa, the Centre for the Creative Arts in Africa, the FIFA Medical Centre of Excellence, the Centre for Learning on Evaluation and Results for Africa and the Gauteng City-Region Observatory.

It is through our committed researchers, working in world-class facilities, with adequate resources, equipment, systems and support from the University and its external partners, that we are able to confront and fight our current challenges, while continuing to predict the difficulties of the future and how they can be overcome.

It has been an incredible journey and an amazing realisation to work with some of the most talented researchers in the world.

I sincerely wish you all the best with your current and future endeavours, in the spirit of inquiry, and in your search for truth.





One of the Top 300 Universities in the World

MESSAGE FROM THE DEPUTY
VICE-CHANCELLOR: RESEARCH:
PROFESSOR HELEN LABURN

**I hope that you will enjoy reading our
Research Report for 2012.**

**Even after two years in the job, the
diversity and excellence of research
at Wits continues to surprise and
inspire me.**

**This being so, no single publication of
this sort can hope to cover
all that goes on.**

In this 2012 Report, we decided in part to highlight some of the records which our researchers had broken during the year, not the least of which was the total publication count – we expect to receive approval from the Department of Higher Education and Training for over 1 080 units.

We again also focus on some of our emerging researchers and make no apology for this – they are the future of the institution. As in previous reports, this latest version draws attention to some specific success stories. The rest of the report is intended to be indicative of the sort of research done at Wits in 2012, to demonstrate to the reader the breadth and depth of our research and to suggest sources of further information.

In 2012, the University was home to 16 National Research Foundation (NRF) A-rated scientists, six Medical Research Council (MRC) Units or Groups, two Department of Science and Technology (DST)/NRF Centres of Excellence (one jointly with the Universities of Stellenbosch and Cape Town), and one Department of Trade and Industry Centre of Excellence. Next year we will be able to report on a third DST/NRF Centre of Excellence. We were awarded two new Centres of Excellence by the African Network for Drugs and Diagnostics Innovation. We also hosted 22 South African Research Chairs, not all of which had yet been filled as the year drew to a close.

No new equipment grants were awarded to any university by the NRF under the National Equipment Programme and the National Nanotechnology Equipment Programme in 2012 although there was a call in progress as the year ended and we had six submissions under review. On 24 April 2012, the Minister for Science and Technology, Naledi Pandor, formally opened our new R10 million Micro CT Scanner, co-funded by the NRF under the 2011 Strategic Research Infrastructure Grants programme. This instrument has already demonstrated some truly amazing results, particularly after we were able to connect it to a 3D printer.

The creation of what has become known as the six Wits 21st Century Research Institutes proceeded apace. By the end of the year, formal recognition had been accorded to the following:

- Evolutionary Studies Institute
- Sydney Brenner Institute for Molecular Bioscience
- Wits Mining Research Institute
- City Institute
- Global Change and Sustainability Research Institute

I reported last year on the refurbishment of a building for the new Wits Art Museum. It was formally opened on 9 May 2012 and has already hosted some spectacular exhibitions. It is well on its way to realising the hopes and aspirations of not just the University community, but the wider artistic community of Johannesburg, Gauteng

and beyond. The Andrew W. Mellon Chair in the Centre for Creative Arts of Africa is hosted in the Museum and will lead its research focus. It has already proved to be a magnet for art lovers and students alike.

The University was the beneficiary of a number of major grants from overseas funders, including the Andrew W. Mellon and Andrew Carnegie foundations, the Howard Hughes Medical Institute, the British MRC, the Wellcome Trust, the University of North Carolina and the European Union.

Domestically, the University was the recipient of major funding under the NRF's South African Research Chair Initiative, the Centre of Excellence, Indigenous Knowledge, Nano Flagship and Global Change programmes, and the Technology Innovation Agency. These grants varied in value between R1 and R3 million. In total, the University received R236 million in new external research funds in 2012. The Wits Health Consortium raised a further R520 million for clinical research.

Thirteen projects ran in 2012 under the NRF's Technology and Human Resources Programme, bringing in R7.15 million from the NRF and R13.84 million from industrial partners. Collaboration with industrial partners will continue to be indispensable to our research endeavours.

Internally, the University Research Committee was given a budget of R89.9 million, of which R21.25 million was for equipment.

We continue to support both emerging and established researchers in their quest for recognition, funding and awards. We are proud to say that we had 234 NRF-rated researchers at the end of 2012 and the number continues to grow. The year 2012 saw Professors Lyn Wadley and Fazal Mahomed awarded first time A-ratings by the NRF, and Professor Darrell Comins was re-affirmed as an A-rated scientist. Professor Jill Adler, another A-rated researcher, was awarded the Science for Society Gold Medal by the Academy of Science of South Africa. There are definitions of the various NRF ratings later in this Report.



Each year the University selects a winner of the Vice-Chancellor's Research Award and in 2012 the Award went to Professor Helen Rees, Director of the Wits Reproductive Health and HIV Research Institute. The Friedel Sellschop Award, which recognises excellence and exceptional potential in emerging researchers, was awarded to Drs Shireen Ally, Lois Harden, Marie Jorritsma and Andreas Lemmerer in 2012.



Professor Helen Rees

As always, we had a number of distinguished international visitors. These included Emeritus Professor of the University of Toronto, Tony Naldred, Professor Debbie Elmegreen, President of the American Astronomical Society, and her husband, Dr Bruce Elmegreen, a researcher at the IBM Research Division in New York, Professor

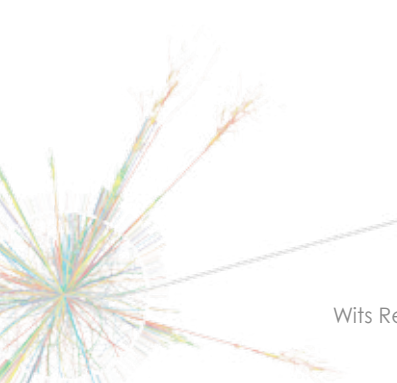
Timothy Haas of the University of Wisconsin-Milwaukee, Professor Jonathan Hellmann of the University of Toronto, Professor Dunbar Moodie from New York, Professor Rogers Ragaven, Professor Javed Majeed of the University of London, Professor Peter Agre of Johns Hopkins University and Professor Hiroshi Ishiguro of the ATR Intelligent Robotics and Communication Laboratories. Ishiguro has been described as one of the top 100 geniuses alive in the world today.

This Report includes mention of two specialist units within the University – Wits Enterprise and the Wits Health Consortium. Both are wholly-owned University companies. Wits Enterprise provides specialist assistance to researchers in contract negotiations and pricing, patent registration, technology transfer and project management. Wits Health Consortium runs a range of clinical trials, many of them multi-centre international trials, and funds independent medical research.

Wits was one of only two South African universities to feature in the top 300 universities worldwide, as defined by the Shanghai and Times Higher annual ranking surveys. It is the University's avowed aim to continue to climb the ladder. These rankings are based on several criteria, of which research is an important one.

As in any year, there were low points. Included in this category would be the passing away of some notable researchers, including Professor Phillip Tobias, one of the University's most distinguished researchers over the course of a long career. Details are listed later in this Report.

I hope that you enjoy reading this Report and that you will find much to interest you.





Incubating the Next Generation of Groundbreakers

MESSAGE FROM THE DIRECTOR OF RESEARCH DEVELOPMENT:
DR ROB DRENNAN

Postdoctoral fellows (postdocs) are a key cog in the renewal and development cycle of the academy. The training of thinkers in the form of academic researchers is a lengthy process. It begins with undergraduate learning (three years), moves on to postgraduate training (one-year honours, two-year masters and three-year doctorate) and culminates in the postdoc experience (two years). Assuming all goes according to plan, the development cycle is at least 11 years long.

This gestation period has many exit points and thus only a minimum number of people actually move through it successively. Some 54% of Wits academics, for example, hold PhD degrees; even fewer would have had the privilege and benefit of a postdoc fellowship.

The year 2012 was strongly characterised by the re-organisation of the University's Research Office to include the postdoctoral fellow support function in the Research Development division. The intensity of the recruitment, induction and administration of postdoctoral affairs meant that the balance of emphasis was very different to the previous year.



The consequence of this long gestation period is that much effort needs to be invested into the pipeline so as to minimise the dropout rate. Even more important is to ensure that the candidates operate at maximum efficiency so as to be as productive as possible. This applies especially at the PhD and postdoc levels as they are engaged in the production of original research. Besides the development and training aspects, which are of importance to the candidates, this productivity enhances the reputation of the University.

Hence the University's Research Office has a division for graduate student support and another for postdoc support. Postdoc support includes a distance induction including the use of a newly prepared handbook giving new recruits, especially those from other countries, plenty of information about South Africa, Johannesburg and Wits.

On arrival this induction is reinforced by a discussion session about many pertinent issues.

It is hoped that this investment into the induction of postdocs and the follow-up on their welfare through various faculty postdoc fora will add to their productivity. It is worth noting that, on average, the postdocs produce 1.5 peer-reviewed (accredited) publications over a two-year period. Wits hosts a total of 93 postdocs with 37 in the Faculty of Science, 24 in Health Sciences, 16 in Humanities, eight in Engineering and the Built Environment, seven in cross-faculty institutes and one in Commerce, Law and Management. Of these, 80% were funded by external sources.

Besides the focus on postdocs, normal research development activities took place as described overleaf.



Left to right: PhD student Michael Day, masters student Sifelani Jirah and PhD student Natasha Nicoletti undertaking research in the Bernard Price Institute for Palaeontological Research



Enhancement of skills

To ensure that Wits researchers are fully skilled for the task at hand, they are provided with a concerted and structured skills development programme, focussed on the peripheral skills necessary to be an effective researcher. Peripheral skills refer to non-technical skills related to the 'art and craft' of research. Technical skills, on the other hand, are those skills that relate to the disciplinary focus of the research.

The delivery of the skills development programme is achieved in partnership with the Wits Centre for Learning, Training and Development. The programme consists of the following:

- EndNote
- Fitting in writing
- Planning your academic career
- Planning your sabbatical
- Postgraduate supervision
- Project management
- Project planning in research
- Qualitative research
- Research writing
- Writing retreats
- Writing winning proposals

Transfer of knowledge from existing to emerging research talent

It is important to maximise the transfer of knowledge from the existing research talent to the cohort of emerging researchers. The intervention supporting this objective is the funding and coordinating of a long term (10 years plus) mentoring programme that touches all five Faculties. The Mellon Retiree Mentorship Programme, focussed on the Humanities, currently has 32 mentees and six mentors.

An environment conducive to research

The objective is to develop an environment that is conducive to research across all five Faculties.

It is acknowledged that this environment may differ from Faculty to Faculty, and that small aspects often disrupt the culture.

The single major event in terms of recognition was the celebration of National Research Foundation (NRF) rated researchers at Wits that took place in November 2012. The function was held at the Wits Art Museum and was addressed by Professor Glenda Gray and attended by the Deputy Vice-Chancellor for Research and some 100 rated researchers.

Increased funding for research

Funding proposals are attempts to convince grant funders, who are held responsible for the funds that they manage, to take a risk and invest in a particular research proposal. The decision is mostly based on research merit (as adjudicated through peer review) and strategic fit with the stated objectives of the grant funder. Assuming that research merit is never questionable at Wits, alignment between the proposed research and the strategic intent of the funder is the key deciding issue.

Mixed success was achieved in increasing the success rate of funding applications. Two specific interventions were run in 2012 including the following (figures in brackets show the corresponding success in 2011):

- NRF Thuthuka proposals: 45 (32) submitted, 27 (20) awards
- NRF: 45 (40) submitted, results outstanding

Reducing unnecessary barriers

The major success of 2012 in terms of reducing unnecessary barriers or hindrances, internal or external to Wits, which hinder research was the completion of the 'project statement'. When emailed on a monthly basis, it gives simple but accurate financial information about researcher project accounts that normally contain external funds.



Research Overview

THE UNIVERSITY RESEARCH COMMITTEE

Membership of the University Research Committee

The membership of the University Research Committee (URC) in 2012 is shown below. Members are appointed jointly by Senate and Council and serve a term of office of three years, which may be renewed.

Chairperson	Professor HP Laburn
Vice-Chancellor	Professor LG Nongxa
Deputy Vice-Chancellors	Professors Y Ballim and R Moore
University Librarian	F Ubogu
Council appointed	Professors G Eagle, B Lacquet, S Madhi and G Marcelle, and Dr B Kana
Faculty appointed	Professors S Fonn, R Gibson and M Pieterse and Drs K Khoza-Shangase, and M Shuma-Iwisi
Deans' nominee	Professor AM Crouch
Chairs of the Faculty Research Committees	Professors LA Cornish, B Kramer, M Leon, H Marques and A McLennan
By invitation	Dr G von Gruenewaldt and D Gozo

Some of the major issues addressed in 2012

- Review of the research performances of all five Faculties during 2011
- The quantum of the Council budget for research, which was generally considered to be too small
- Development of the six 21st Century Research Institutes
- Strategic Research Plan 2012-17
- Open Access publishing

Research thrusts

The research thrusts approved by Senate and Council to date and still active in 2012 are set out below:

1. Biodiversity - Champion: Professor ETF Witkowski
2. Evolution of the Species and Natural Heritage - Champion: Professor BS Rubridge
3. Cities - Champion: Professor AS Mabin
4. Materials Science and Engineering - Champion: Professor LA Cornish
5. Mineral Resources, Exploration and Mining - Champion: Professor R Gibson
6. South Africa/India - Champion: Professor CI Hofmeyr
7. Diseases of Lifestyle: An Emerging African Problem - Champion: Professor NJ Crowther
8. Molecular Biosciences - Champions: Professors M Ramsay and MEC Rey
9. Global Change and Sustainability - Champion: Professor AM Crouch

DETAILS OF URC RECOGNISED RESEARCH ENTITIES

Institutes

1	Wits Reproductive Health and HIV Institute	Professor H Rees
2	Wits Research Institute for Malaria	Professor M Coetzee
3	Wits Institute for Social and Economic Research	Professor S Nuttall
4	Society, Work and Development Institute	Professor K von Holdt
5	Economic Geology Research Institute	Professor J Kinnaird
6	Materials Physics Research Institute	Professor E Sideras-Haddad
7	Molecular Sciences Institute	Professor D Brady
8	Rock Art Research Institute	Professor BW Smith
9	Evolutionary Studies Institute ¹	Professor BS Rubidge
10	Global Change and Sustainability Research Institute ¹	Professor H-P Plag
11	Sydney Brenner Institute for Molecular Bioscience ¹	Professor M Ramsay (Acting)
12	Wits Mining Research Institute ¹	Professor N van der Merwe (Acting)
13	City Institute ¹	Professor AS Mabin
¹ 21st Century Research Institutes		

Research Units

1	Flow Research Unit	Professor BW Skews
2	Rural Public Health and Health Transitions Research Unit ¹	Professor SP Tollman
3	Bone Research Laboratory ¹	Professor U Ripamonti
4	Carbohydrate and Lipid Metabolism Research Unit	Professor F Raal
5	Cardiovascular Pathophysiology and Genomics Research Unit	Professor G Norton
6	Clinical HIV Research Unit	Professor I Sanne
7	Developmental Pathways for Health Research Unit ¹	Professor SA Norris
8	Effective Care Research Unit	Professor GJ Hofmeyr
9	Antiviral Gene Therapy Research Unit	Professor PB Arbutnot
10	Pulmonary Infections Research Unit	Professor C Feldman
11	Perinatal HIV Research Unit	Professor G Gray
12	Respiratory and Meningeal Pathogens Research Unit ¹	Professor K Klugman/Dr S Madhi
13	Health Communication Research Unit	Professor C Penn
14	Protein Structure-Function Research Unit	Professor HW Dirr
15	John Knopfmacher Centre for Applicable Analysis and Number Theory	Professor A Knopfmacher
16	Centre for Theoretical Physics	Professor JAP Rodrigues
17	Soweto Cardiovascular Research Unit	Professor K Sliwa
¹ Joint Wits/Medical Research Centre entities		

Research Groups

1	Brain Function Research Group	Professor A Fuller
2	Centre for Health Policy ¹	Dr J Goudge
3	African Ecology and Conservation Biology Research Group	Professor BFN Erasmus
4	Water in the Environment Research Group	Professor KH Rogers

¹ Joint Wits/Medical Research Council entities

CENTRES OF EXCELLENCE

The University hosted two Department of Science and Technology (DST)/National Research Foundation (NRF) centres of excellence.

- Strong materials (Director: Professor Lesley Cornish)
- Biomedical tuberculosis research, jointly with the Universities of Stellenbosch and Cape Town (Director: Dr Bavesh Kana)

Furthermore, Wits staff members participated in the Centre of Excellence in Catalysis, based at the University of Cape Town.

A third centre of excellence, in aerospace, operates at Wits under the auspices of the Department of Trade and Industry (Director: Rudolph Louw).

Fourth and fifth centres of excellence were recognised at Wits in 2012, by the African Network for Drugs and Diagnostics Innovation. They are in antiviral gene therapy (Director: Professor Patrick Arbutnot) and advanced drug delivery technology (Director: Professor Viness Pillay).

AWARDS

Vice-Chancellor's Research Award

The Vice-Chancellor's Research Award was made to Professor Helen Rees. She is the founding director of the Wits Reproductive Health and HIV Institute. Her research on HIV transmission has been groundbreaking, overturned existing myths about treatment, and directly influenced both government and World Health Organization Policy. She has affected and saved thousands of people's lives.

The purpose of the award is to stimulate research and research related scholarly activities by acknowledging and rewarding a quite exceptional worker who has been engaged in research and more general scholarly activity at the University. The award is open to all full-time academic staff between the ages of 38 and 65.

Friedel Sellschop Award

This award recognises exceptional researchers who are under 35 years of age at the date of application. The award takes the form of a substantial grant and may be annually renewed for up to three years in total. The award is open to applicants in all five Faculties.

The current awardees are:

Dr C Thurman	English
Dr T Vickey	Physics
Dr K Gillespie	Social Anthropology
Dr Y Choonara	Pharmacy
Dr Y Zelenyuk	Mathematics
Dr J Watermeyer	Speech Pathology
Dr S Ally	Sociology
Dr L Harden	Physiology
Dr M Jorritsma	Music
Dr A Lemmerer	Chemistry
Dr JN Quirk	Political Studies
Dr R Hetem	Physiology
Dr S Laryea	Construction Economics
Dr JN Choiniere	Evolutionary Studies Institute

The Andrew W. Mellon Postgraduate Mentoring Award

The University received a sixth award of R3.8 million to cover the period 2012-15 from the Andrew W. Mellon Foundation. The scheme is open to all black, female or disabled doctoral students in the Faculty of Humanities.

Mellon Postgraduate Mentoring Scheme October 1995 to December 2012

	Masters	Doctoral	Total
Number taken into scheme	65	171	236
Graduated	53	126	179
Still registered	2	21	23
Discontinued studies	10	24	34

POSTDOCTORAL FELLOWS

In 2012, the University had 96 postdoctoral fellows – a 48% increase on 2011. The largest single external funder was the NRF (38) through its various programmes. Most NRF bursaries were topped up by the University. The University supported 22 fellows solely from its own funds. Other funders included the Andrew W. Mellon and Claude Leon foundations (six each) and the Hillel Friedland Trust (two). The remaining 22 were supported by various external funders.

The majority of fellows came from outside the country. The largest contingent came from Europe (29), followed by the rest of Africa (20) and Asia (17).

The recruitment of high quality fellows remains a priority for the University. To this end, various strategies are being pursued to bring in more external and competitive funding. The Wits experience is being enhanced for the fellows by improved information sharing between fellows and regular postdoctoral forum meetings.

SOUTH AFRICAN RESEARCH CHAIRS

In 2012, the University held the following DST/NRF South African Research Chairs:

1	Professor S Madhi	Vaccine preventable diseases
2	Professor V Pillay	Pharmaceutical biomaterials and polymer-engineered drug delivery technologies
3	Professor M Coetzee	Medical entomology and vector control
4	Professor CS Henshilwood	Origins of modern human behaviour
5	Professor R de Mello Koch	Fundamental physics and string theory
6	Professor HM Marques	Bio-inorganic chemistry
7	Professor HW Dirr	Protein biochemistry and structural biology
8	Professor JB Adler	Mathematics education
9	Professor H Venkatakrisnan	Mathematical numeracy
10	Professor P Harrison	Development planning
11	Professor D Hildebrandt	Sustainable process engineering
12	Vacant	Intelligent systems
13	Professor N Nieftagodien	Local histories and present realities
14	Professor V Jejjala	Theoretical particle cosmology
15	Professor S Colafrancesco	Square kilometre array
16	Professor R Durrheim	Seismology
17	Vacant ¹	HIV vaccine translational research
18	Vacant ¹	Health policy
19	Vacant ¹	Biostatistics
20	Professor R Falcon	Clean coal technology
21	Vacant ¹	Human mobility and migration
22	Vacant ¹	Critical diversity studies

¹ Newly awarded Chair – first incumbent not yet appointed as at 31 December 2012



NATIONAL RESEARCH FOUNDATION RATINGS

The NRF is a government agency which channels funding to tertiary educational institutions for research in the fields of science, engineering and technology, the humanities and the social sciences. As part of the assessment process, the Foundation organises a peer evaluation process of individual researchers.

At the end of 2012, the University had 234 NRF-rated researchers. The figure is made up as follows:

Number of NRF Ratings		
CATEGORY	DESCRIPTION	2012
A	Researchers who are accepted by the international community as being amongst the leaders in their field	16
B	Researchers who enjoy considerable international recognition as independent researchers of high quality	69
C	Proven researchers who have maintained a constant high level of research productivity and whose work is regularly made known internationally	114
L	Members of the academic community who have demonstrated potential as researchers in the past and who can demonstrate that they were prevented from realising that potential, but who now can show promise of being able to establish themselves as researchers within a five-year period after evaluation	2
P	Researchers younger than 35 years who have shown exceptional potential as researchers, or are accepted by the international community as being amongst the leaders in their field, or enjoy international recognition as researchers of high quality	1
Y	Researchers younger than 35 who increasingly exhibit research productivity as individuals or as team members and whose work is regularly made known internationally, or researchers normally younger than 35 years who on the basis of their recent outputs show promise to become recognised specialists within a period of about four years	32



THE UNIVERSITY'S A-RATED RESEARCHERS

- Professor Jill Adler (Education)
- Professor Lewis Ashwal (Geosciences)
- Professor Darrell Comins (Physics)
- Professor Arthur Every (Physics)
- Professor Charles Feldman (Clinical Medicine)
- Professor David Glasser (Chemical Engineering and Metallurgy)
- Professor Glenda Gray (Clinical Medicine)
- Professor Isabel Hofmeyr (Literature and Language Studies)
- Professor Keith Klugman (Pathology)
- Professor David Lewis-Williams (Geography, Archaeology and Environmental Studies)
- Professor Shabir Madhi (Pathology)
- Professor Duncan Mitchell (Physiology)
- Professor Norman Owen-Smith (Animal, Plant and Environmental Sciences)
- Professor John Pettifor (Clinical Medicine)
- Professor Beric Skews (Mechanical Engineering)
- Professor Lyn Wadley (Institute for Human Evolution)



FUNDING SOURCES

University Council Funding			
	2012	2011	2010
	R '000	R '000	R '000
Direct allocation to Faculties	34 422	32 475	31 787
Individual grants centrally awarded:			
Thuthuka ¹	2 954	1 308	1 000
Sellschop Award	1 494	1 002	520
NRF rating award	820	315	30
Conference travel			150
Individual research grants			
Publication award		60	60
Vice-Chancellor's Research Award	250	250	250
Postdoctoral fellowships	4 000	3 691	3 500
Co-funding of Y, L and P rates ¹	660	520	430
Centres of Excellence ¹	1 351	1 067	1 000
Equipment - minor	3 160	3 000	2 000
Artworks	200	200	200
Research niche areas ¹	305	305	550
Electronic subscriptions ²	350	341	420
Research Report	150	140	140
Animal purchases	300	350	350
Contingencies	7 450	3 407	3 814
Audit fees			50
Miscellaneous		20	410
Equipment	19 340	18 500	12 500
Total	77 206	66 951	59 161

¹ These programmes are co-funded with the NRF.

² The Research Office and the Library jointly and equally fund access to the Web of Science.

Estimate of Available Funding Sources

	2012	2011	2010
	R '000	R '000	R '000
General funds			
URC grants ¹	48 038	42 264	44 661
URC equipment grants	22 500	18 500	15 625
Statutory councils and government departments	132 729	115 848	130 684
Other external sources (contracts, donations, grants, etc.)	103 808	86 014	75 751
Research funds held in the Wits Foundation ²	226 783	179 108	178 863
Total³	533 858	441 734	445 584

¹ The 2012 figure excludes a rollover of R8.798 million in unspent prior year funds; the cost of the Research Office and the five central services (Central Animal Unit, Microscopy and Microanalysis Unit, Art Museum, Radiation and Health Physics Unit and Central Optical Unit) are excluded throughout.

² This figure reflects the year-opening balances of funds known to be held in the Wits Foundation for research funding purposes; taking year-end balances will result in significant double-counting. It must be remembered that not all the funds reflected in the above table were available for spending in the year shown – some funds may be investment capital or funds committed to later years.

³ This figure excludes funds held in the Wits Health Consortium (see page 103).

Funds from Statutory Councils

Statutory council funding

Science councils	2012	2011	2010
	R '000	R '000	R '000
National Research Foundation	118 685	98 624	101 473
South African Medical Research Council	4 080	4 738	5 380
Other government departments and science councils	9 964	12 486	23 831
Total	132 729	115 848	130 684



OTHER EXTERNAL FUNDING

Funds Received by Research Field and held in Current (Oracle) Accounts			
Research fields	2012	2011	2010
	R '000	R '000	R '000
Built Environment	0	231	1 757
Commerce and Management	5 779	0	9 487
Earth Sciences	4 116	3 884	5 181
Palaeo Studies and Archaeology	700	1 578	1 311
Education	245	235	1 359
Engineering	8 947	10 596	16 255
Humanities and Social Sciences	7 426	10 221	3 187
Law	1 253	150	361
Biological Sciences	15 942	1 397	10 263
Health Sciences ¹	47 388	46 895	20 466
Materials Sciences	6 675	2 519	1 457
Physical Sciences and Mathematics	1 197	7 368	3 167
General	4 140	940	1 500
Total	103 808	86 014	75 751

¹ This figure excludes funds held in the Wits Health Consortium.

Funds by Research Field in the Wits Foundation, as at 1 January 2012			
Research fields	2012	2011	2010
	R '000	R '000	R '000
Built Environment	52	0	10
Commerce and Management	1 619	1 506	1 743
Earth Sciences	7 028	4 851	7 725
Education	2	168	7 204
Engineering	11 655	10 728	11 355
Humanities and Social Sciences	19 535	24 298	22 340
Law	2 684	3 785	9 131
Biological Sciences	7 867	6 722	9 058
Health Sciences ¹	74 501	54 966	60 259
Mathematical Sciences	1 254	1 623	937
Physical Sciences	7 223	5 867	7 777
Materials Sciences ²	2 213	2 221	
Palaeo Studies and Archaeology	17 594	28 286	23 278
General ³	73 556	34 087	18 046
Total	226 783	179 108	178 863

¹ This figure excludes funds held in the Wits Health Consortium.

² Previously subsumed in Physical Sciences

³ Included here are, inter alia, the NRF grant deposit (53 527) and the Gauteng City-Region Observatory (6 925).

APPLICATION OF FUNDS

Expenditure of Research Funds	2012	2011	2010
	R '000	R '000	R '000
Wages and salaries	109 959	101 116	118 351
Running costs, consumables and equipment	325 908	306 769	267 616
Total	435 867	407 885	305 967
Wage and salary expenditure as a percentage of total	25.23	24.79	30.66
Total available funds, including balances in the Wits Foundation	533 858	441 734	445 584
Unexpended research incentive funding as at 31 December 2012 ¹	13 473		
Total	547 331	441 734	445 584
Total expenditure as a percentage of total available	79.63	92.34	86.62
Totals	547 331	441 734	445 584

¹ This information was not previously available.

Research outputs in 2012

Faculty	Publication units in 2012	Doctorates completed in 2012 ¹	Masters by dissertation completed in 2012 ²	Masters by coursework completed in 2012 ³	Total research units	Number of full-time academic staff as at 31/12/2012 ⁴	Average output per Faculty in 2012 ⁵	Average output per Faculty in 2011
*CLM	93.97	21.00	9.00	122.02	245.99	250	0.98	1.30
*EBE	122.61	75.00	49.00	44.05	290.66	186	1.56	2.43
Health Sciences ⁴	291.33	99.00	54.00	40.57	484.9	280	1.73	2.87
Humanities	260.47	114.00	43.00	85.92	503.39	501	1.00	1.50
Science	353.52	150.00	83.00	6.00	592.52	258	2.30	2.16
Other	30.37				30.37			
University	1,152.27	459.00	238.00	298.56	2,147.83	1,475	1.46	1.91

* Commerce, Law and Management

* Engineering and the Built Environment

The main significance of this table is that the Department of Higher Education and Training (DHET) funding formula is based on an assumed output of 1.41 'research units' (publications plus higher degrees) per full-time member of the academic staff.

¹ Each completed doctorate scores 3 points in the DHET assessment.

² Each completed masters by dissertation scores 1 point in the DHET assessment.

³ Only the component of the final mark contributed by the Research Report is counted in the DHET assessment.

⁴ Excluding joint staff

⁵ The only reason for the perceived per capita drop in output is the reported increase in the number of staff in all Faculties.