

2010

RESEARCH REPORT

University of the Witwatersrand,
Johannesburg



RESEARCH REPORT 2010

University of the Witwatersrand, Johannesburg



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Message from the

Vice-Chancellor and Principal



The year 2010 was a remarkable year for research at Wits. One of the most important discoveries that add to the human evolution record – the 1.98-million year old *Australopethicus sediba* fossils – was presented to the world in April 2010 and made headlines in 99 countries.

Another legendary researcher, Prof. Phillip Tobias was honoured by the National Research Foundation for his lifetime contribution to the Anatomical Sciences. Both these achievements produced by these renowned researchers are indicators of the local research produced at Wits that demands global attention.

Wits is a leading research-focused, publicly engaged institution committed to advancing the public good. It is one of only two universities in South Africa ranked in two separate international rankings in the world.

The University's strong research track-record is reflected in part in the 23 fields of study where Wits ranks in the top 1% of the world. The University's publication record shows a very high level of international collaboration – a substantial percentage (44.8%) of all papers published by Wits academics in ISI accredited journals have at least one international co-author.

Wits is the natural home for talented academics, researchers and students and unashamedly values intellectual excellence. Home to 14 world-renowned NRF A-rated scientists and 16 South African Research Chairs, Wits also boasts a diverse, dynamic complement of excellent thinkers and researchers who are leaders in their respective fields.

The onus falls on us to exploit the University's competitive advantages by building aggressively on existing research niche areas and strengths and nurturing new avenues, where we can produce groundbreaking research. Research undertaken at Wits has extraordinary and unusual local and international influence and magnificent potential based on our location. We have identified our strongest strategic research areas and we have plans to build on them aggressively, with focus and ambition in the coming years. We wish to focus in particular on building nodes of excellence in the following areas: Evolutionary Sciences, Global Change and Sustainability, Mining and Minerals, Energy, Molecular Biosciences, Population, Health and Society and the Study of Cities.

Intellectual excellence, international competitiveness and local relevance is imperative in this age of innovation and Wits has to react swiftly and accurately to reach its research goals. Widening our global footprint through strategic networks to attract and retain distinguished scholars in niche and strategic fields is of utmost importance, as is our contribution to society through research, teaching and social engagement.

To achieve the objective of being a gateway for research and intellectual engagement on the African continent, Wits is developing an internationalisation strategy that will project Wits as a world-class centre and a preferred destination for global intellectual talent. We will pursue intellectual elitism as an approach which will nurture world leaders in their respective fields of engagement and graduates – through professional development and educational programmes – that compare with the best globally.

Strong collaborative links with leading academics within Africa will expedite the process of becoming globally competitive, enhance regional innovation, and position Africa as one of the centres of global knowledge production in its own right.

The next few years should see the start of a whole new era of research for Wits in which we are geared towards further inspiring successful leaders, distinguished achievers and advancing frontiers in knowledge generation.

It is up to us to produce highly specialised forms of knowledge,

combined in novel ways, to anticipate our emergent world today and to help us craft desirable futures. Through research and innovation and the production and mobilisation of highly specialised knowledge, we will be able to tackle the challenges of the 21st Century and in so doing, leave a legacy for future generations.

Prof. Loyiso Nongxa



Message from the outgoing

Deputy Vice-Chancellor: Research



I hope that you will enjoy reading our Research Report for 2010, which is the last of my seven years in office. It had some notable high points, probably none higher than the announcement of the *Australopithecus sediba* discoveries, which focused the attention of the world's media on the University on 8 April.

Given the breadth and depth of research at Wits, no single publication of this sort can hope to cover all that happens at Wits. We do profile some specific success stories. The rest of the report is intended to be indicative of the sort of research undertaken at Wits and to indicate where to look for further information.

In 2010, the University was home to 14 National Research Foundation (NRF) A-rated scientists, 16 South African Research Chairs (SARChI), five Medical Research Council (MRC) Units or Groups, two Department of Science and Technology (DST)/NRF Centres of Excellence (one joint with Stellenbosch University) and one Department of Trade and Industry (Dti) Centre of Excellence. Our publication output, at 890 Department of Higher Education and Training units, was up over 3% on the average of the three preceding years.

The year brought news of success in five National Equipment Programme (NEP) applications to the NRF and a second new South African Research Chair in Mathematics Education.

The University was the beneficiary of a number of major grants from overseas funders, including an award of nearly \$10 million (R68 million) from the Bill and Melinda Gates Foundation for a four year maternal health project – to my knowledge, the biggest single research grant ever awarded to the University.

Other substantial awards included \$2 million (R14 million) over two years from the Carnegie Corporation for the training of doctoral students in the Faculties of Science and Health Sciences and substantial awards from the AW Mellon Foundation for Chairs in South Africa-Indian Studies and African Art.

An award of just over €300 000 (R3 million) was received from the German Research Foundation for a three year project on hepatitis. All of this confirms the University's place on the world stage, a theme which is picked up elsewhere in this report.

Domestically, the University received NRF funding for six major items of equipment, five under the NEP and one under the National Palaeo-equipment Programme. In total, these six awards brought R12 million into the University.

The dti/NRF Technology and Human Resources for Industry Programme brought in R10 million in government funding and R19 million in private funding for 13 projects. A grant of more than R2 million was received from Anglo American for improving HIV treatment in rural areas.

Internally, the University Research Committee (URC) was given more than R14 million in its 2010 budget for equipment. Just over R12 million of this was earmarked for items of major equipment, some of which were funded in partnership with the NRF's NEP. The balance was invested in items of minor research equipment, costing not more than R200 000 per item.

It is the University's intention to provide similar sums in future URC budgets, to keep abreast with state-of-the-art equipment, particularly in the Science, Engineering and Health Science sectors.

The University has in place an active programme of recruiting postdoctoral fellows from around the world. In 2010, some 80 fellows were at work at the University for at least part of the year. We are grateful for the financial assistance of external donors such as the AW Mellon Foundation, the Claude Harris Leon Foundation, the NRF and the Hillel Friedland Trust in supporting this programme.

Wits has continued to feature in the top 300 universities worldwide, as defined by the Shanghai and Times Higher annual surveys, one of only two South African universities to still do so. It is the University's avowed aim to be in the Top 100 by 2022. These rankings are based on several criteria, of which research is an important one.

Another measure of research excellence is that we have 231 NRF-rated researchers, a significant increase on any prior year and one of the significant achievements of my term in office.

A number of high profile events took place at the University, as they do every year. One of the early highlights was an appearance at the South African Chemical Institute's Annual Conference by Sir David King, now of Oxford University and



"Obtaining an A-rating is a major achievement for any academic. Keeping it from one cycle to the next is at least as difficult ..."

former scientific advisor to the British government.

The public announcement of the discovery by Prof. Lee Berger and his team of scientists of the *Australopithecus sediba* fossils was unveiled in April by Kgalema Motlanthe, Deputy President of South Africa. The proceedings were televised live worldwide.

At the NRF Awards an award was made to Prof. Philip Tobias (Anatomical Sciences) for his achievements over a lifetime. Several decades his junior, Prof. Shabir Madhi (Wits/MRC Respiratory and Meningeal Pathogens Research Unit), was awarded an A-rating by the NRF towards the end of the year.

Other new A-ratings to come out of the 2010 NRF evaluation round were Professors Charles Feldman (Pulmonary Research Unit) and Lyn Wadley (Institute for Human Evolution).

Obtaining an A-rating is a major achievement for any academic. Keeping it from one cycle to the next is at least as difficult and here I wish to laud the achievements of Professors David Glasser (Centre of Materials and Process Synthesis) and John Pettifor. Pettifor was director of the Wits/Mineral Metabolism Research Unit for more than a quarter of a century. The Unit was closed in 2010.

Other awardees in the course of the year included Prof. Claire Penn, who was recognised in first place amongst the Distinguished Women in Social Sciences and Prof. Karen Sliwa, who took third place amongst the Distinguished Women in Life Sciences. Both these awards were made by the DST. In addition, Prof. Chrissie Rey was awarded the National Science and Technology Forum Award for postgraduate capacity building.

I initiated a plan to create six stellar institutes at Wits, as the vehicles of choice to take forward research in areas where the University has particular strengths. This is work in progress and my successor will no doubt comment on progress in next year's Report.

As previously, this Report includes mention of two specialist units within the University, in the form of 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. The Wits Health Consortium runs a range of clinical trials, many of them multi-centre international trials and funds independent medical research.

In conclusion, may I take this opportunity to wish my successor, Prof. Helen Laburn, former dean of the Faculty of Health Sciences, every success in the post. I believe she will find it to be one of the best jobs in the University.

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

Prof. Belinda Bozzoli



RESEARCH OVERVIEW

Membership of the University Research Committee (URC) in 2010:

The mandate of the University Research Committee (URC) is to take responsibility for the implementation of the institution's research policy and, with its various sub-committees, to offer support to all approved research and related activities and to monitor all such projects.

During 2010 the people listed in the table alongside served on the Committee. All members are jointly appointed by Senate and Council. They serve a term of office of three years, which may be renewed.

Ex Officio	
Chairperson	Prof. Belinda Bozzoli, Deputy Vice-Chancellor: Research
Vice-Chancellor	Prof. Loyiso Nongxa
Deputy Vice-Chancellors	Profs. Yunus Ballim, Derek Keats and Rob Moore
University Librarian	Felix Ubogu
Council appointed	Profs. Beatrys Lacquet, Paul Manger, Claire Penn, Akpofure Taigbenu and Dr. Sehliselo Ndlovu
Faculty appointed	Profs. Roger Gibson, Anna Kramvis, Robert Muponde and Dr Natasha Sacks
Dean's nominee	Prof. Tawana Kupe
Appointed by the Postgraduate Association	Rivendra Narain
Chairs of the Faculty Research Committees	Profs. Lesley Cornish, Beverley Kramer, Mark Leon, Helder Marques and Marius Pieterse
By invitation	Dr Gerhard von Gruenewaldt



Some of the major issues addressed by the URC during 2010 include:

- Review of the research performances of all five faculties during 2009.
- The quantum of the Council budget for research, which was generally perceived to be inadequate.
- The appointment of a new Deputy Vice-Chancellor: Research, to succeed the retiring incumbent.
- The proposal to create six new major research institutes.
- Open access to research publications.
- Two new research units were recognised and advanced preparations for the approval of a new research thrust in global change were undertaken.

Research thrusts

Eight research thrusts were prioritised in 2010. They are:

- Biodiversity (Champion: Prof. Ed Witkowski)
- Cities (Champion: Prof. Alan Mabin)
- Diseases of Lifestyle: An emerging African problem (Prof. Nigel Crowther)
- Evolution of the Species and Natural Heritage (Champion: Prof. Bruce Rubidge)
- Materials Science and Engineering (Champion: Prof. Lesley Cornish)



- Mineral Resources, Exploration and Mining (Champion: Prof. Roger Gibson)
- Molecular Biosciences (Profs. Michele Ramsay and Chrissie Rey)
- South Africa-India (Champion: Prof. Dilip Menon)

Research entities

In 2010 the University had ten research institutes, 21 research units and six research groups recognised by the URC.

The institutes are:

- Bernard Price Institute: Palaeontology (Director: Prof. Bruce Rubidge)
- Economic Geology (Director: Prof. Allan Wilson)
- Human Evolution (Director: Prof. Francis Thackeray)

- Materials Physics (Director: Prof. Elias Sideras-Haddad)
- Molecular Sciences (Director: Prof. Helder Marques)
- Rock Art (Director: Prof. Benjamin Smith)
- Social and Economic Research (Acting Director: Prof. Belinda Bozzoli)
- Society, Work and Development (Acting Director: Prof. Roger Southall)
- Sydney Brenner Molecular Biosciences (Acting Director: Prof. Michele Ramsay)
- Reproductive Health and HIV (Director: Prof. Helen Rees)
- Molecular Mycobacteriology (Director: Prof. Valerie Mizrahi)*
- Perinatal HIV (Director: Prof. Glenda Gray)
- Protein Structure-Function (Director: Prof. Heini Dirr)
- Pulmonary Infections (Director: Prof. Charles Feldman)
- Respiratory and Meningeal Pathogens (Directors: Profs. Keith Klugman and Shabir Madhi)*
- Rural Health in Transition (Director: Prof. Stephen Tollman)*
- Soweto Cardiovascular (Director: Prof. Karen Sliwa-Hahnle)
- Theoretical Physics (Director: Prof. Joao Rodrigues)

The units are:

- Antiviral Gene Therapy (Director: Prof. Patrick Arbuthnot)
- Applicable Analysis and Number Theory (Director: Prof. Arnold Knopfmacher)
- Bone Research Laboratory (Director: Prof. Ugo Ripamonti)*
- Carbohydrate and Lipid Metabolism (Director: Prof. Derick Raal)
- Cardiovascular Pathophysiology and Genomics (Director: Prof. Gavin Norton)
- Clinical HIV (Director: Prof. Ian Sanne)
- Development Pathways for Health (Prof. Shane Norris)*
- Effective Care (Director: Prof. Justus Hofmeyr)
- Flow (Director: Prof. Beric Skews)
- Health Communication (Prof. Claire Penn)
- Human Genomic Diversity and Disease (Director: Prof. Himla Soodyall)*
- Malaria Entomology (Director: Prof. Maureen Coetzee)
- Mineral Metabolism (Director: Prof. John Pettifor)*

The groups are:

- African Ecology and Conservation Biology (Leader: Prof. Norman Owen-Smith)
- Brain Function (Leader: Prof. Andrea Fuller)
- Bushveld Complex (Leader: Prof. Grant Cawthorn)
- Climatology (Leader: Prof. Stuart Piketh)
- Health Policy (Leader: Dr Jane Goudge)
- Impact Cratering (Prof. Roger Gibson)

*Denotes joint Wits/MRC recognition



The Centres of Excellence

The University hosted two National Research Foundation (NRF) Department of Science and Technology (DST) Centres of Excellence. They are:

- Strong Materials (Director: Prof. Lesley Cornish); and
- Biomedical Tuberculosis Research (jointly with the University of Stellenbosch) (Director: Prof. Valerie Mizrahi)

In addition, Wits staff members also participate in the Centres of Excellence for Catalysis based at the University of Cape Town.

Awards

Internal awards

Vice-Chancellor's Research Award

The Vice-Chancellor's Research Award was made to Prof. Shabir Madhi. He heads the NRF/DST Vaccine Preventable Disease Unit and co-directs the Medical Research Council's Respiratory and Meningeal Pathogens Research Unit. His area of specialisation is vaccine-preventable diseases – particularly amongst children. The purpose of the award is to stimulate research and

research related scholarly activities by acknowledging and rewarding an exceptional academic 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

The recipients of this award were Prof. Ebrahim Momoniat from the School of Computational and Applied Mathematics, Dr Hlanganani Tutu from the School of Chemistry, Dr Brendon Barnes from the Department of Psychology, Dr Sehliselo Ndlovu from the School of Chemical Engineering and Metallurgy, Dr Penny Moore from the National Centre for Infectious Diseases, Dr Bavesh Kana from the Molecular Mycobacteriology Research Unit and Dr Marco Weinberg from the Molecular Medicine and Haematology Unit. 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 is available by annual renewal for up to three years. The award is open to applicants in all schools.

The AW Mellon Postgraduate Mentoring Award

The University received a fifth award of R8,4 million from the AW Mellon Foundation in March 2009, continuing

funding of a postgraduate mentoring programme originally restricted to black students, but now extended to all female and disabled students.

The AW Mellon Retiree Mentorship Scheme

In 2006 the AW Mellon Foundation donated more than R3,5 million to Wits to establish a three year mentorship scheme. Selected members of the academic staff have been retained beyond normal retirement age in order to mentor junior staff members in the completion of their doctorates.

In 2010, the following staff members acted as retiree mentors:

- Dr Rosemary Crouch (Therapeutic Sciences)
- Prof. Shirley Hanrahan (Animal, Plant and Environment Sciences (APES))
- Prof. Jennifer Kromberg (Pathology)
- Prof. David Lewis-Williams (Geography, Archaeology and Environmental Sciences (GAES))
- Prof. Duncan Mitchell (Physiology)
- Prof. Richard Pienaar (APES)
- Prof. Trefor Jenkins (Pathology)

External awards

Prof. Diane Hildebrandt, Co-Director of the Centre of Materials and Process Synthesis (COMPS) based in the School of Chemical and Metallurgical Engineering, won the 2009 African Union Scientific Award. She accepted her award in Addis Ababa in February 2010. Prof. Andrew Crouch was honoured by the World Federation of Occupational Therapists.

Prof. Penn was selected as DST's Distinguished Women in Social Sciences and Prof. Sliwa-Hahnle came third in the Distinguished Women in Life Sciences. Penn is Director of the

	Masters	Doctoral	Totals
Number admitted into scheme			
Graduated	46	106	152
Still registered	5	35	40
Discontinued studies	9	25	34
Totals	60	166	226

Table 1:
The AW Mellon Postgraduate Mentoring Scheme (1995 – 2010)

Wits Health Communication Project, while Sliwa-Hahnle heads the Soweto Cardiovascular Unit. Prof. Chrissie Rey in the School of Molecular and Cell Biology, was awarded the National Science and Technology Forum Award for postgraduate capacity building.

Veteran researcher, Prof. Phillip Tobias received the President's Award for Lifetime Achievement, while Prof. Madhi received the President's Award for the Transformation of a Science Cohort.

His Co-Director, Prof. Keith Klugman, was awarded the John FW Herschel Medal by the Royal Society of South Africa, while Profs. Arnold Knopfmacher and Fidel Mohamed in the School of Mathematics were inducted into membership.

APES researcher Prof. David Mycock, was awarded a Chair in Cryobiology by the United Nations Education, Science and Cultural Organization.

Postdoctoral fellows

In 2010 the University had 78 Postdoctoral fellows. The majority of the fellows were funded by the University (32) and the NRF (28), with the AW Mellon Foundation (8), the Claude Leon Harris Foundation (5), and the Hillel Friedland Trust (2) also providing support. The University continues to recruit the overwhelming majority of its postdoctoral fellows from outside South Africa – in 2010, 63 (81%) of the University's postdoctoral fellows were foreign nationals. The University is proud of its ability to attract so many of its

postdoctoral fellows from outside the country, as this attests to the high regard that its academics are held in their respective fields. While the largest contingent of postdoctoral fellows by nationality was from South Africa (15), India (12) had the largest foreign contingent of postdoctoral fellows, followed by the UK (6) and the USA (6).

In terms of the share of postdoctoral fellows by broad knowledge field, the Faculty of Science (35) hosted the largest number of postdoctoral fellows in 2010, followed by the Humanities (17) and Health Sciences (15). Within the Science Faculty, the highest concentration of postdoctoral fellows was in the School of Physics, which hosted 10 of the 35 postdoctoral fellows in the Faculty.

In 2006, the AW Mellon Foundation provided a grant of R1,6 million to the University to establish a programme for Postdoctoral Fellowships specifically for the Humanities and Social Sciences.

In 2010, further funding was made available to support a new cohort of postdoctoral fellows for a period of two years. Six postdoctoral fellowships have since been awarded under the auspices of the AW Mellon Foundation grant.

South African Research Chairs

In 2010, the University was home to 12 DST funded South African Research Chairs. Wits has been awarded 16 chairs, of which three were still to be appointed in 2010 and the fourth taking up her post in January 2011. The three vacant chairs are in Intelligent Systems, Theoretical Particle Physics and Radio Astronomy. Two of the 16 chairs are co-funded by the First Rand Foundation.

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 2010, the University had 231 NRF-rated researchers, an increase of 194 from 2009. The figure is made up as follows:



Table 2: Number of NRF ratings

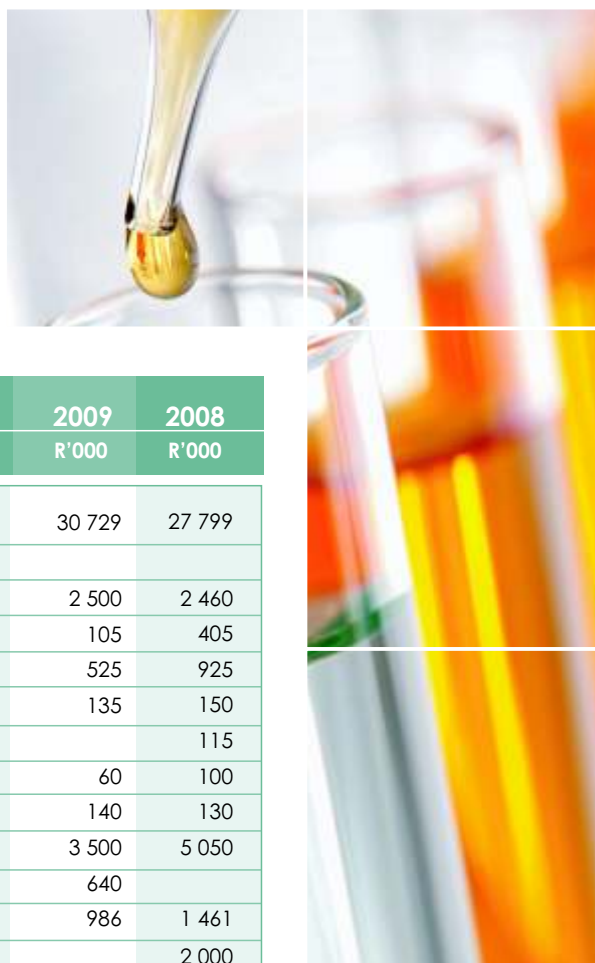
Category	Description	2010
A	Researchers who are accepted by the international community as being amongst the leaders in their field	14
B	Researchers who enjoy considerable international recognition as independent researchers of high quality	71
C	Proven researchers who have maintained a constant high level of research productivity and whose work is regularly made known internationally	110
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	3
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
	Totals	231

The University's A-rated researchers are:

- Prof. Jill Adler (Education)
- Prof. Belinda Bozzoli (Sociology)
- Prof. Darrell Comins (Physics)
- Prof. Arthur Every (Physics)
- Prof. Charles Feldman (Pulmonology)
- Prof. David Glasser (Chemical Engineering and Metallurgy (CEM))
- Prof. Isabel Hofmeyr (Literature and Language Studies)
- Prof. Keith Klugman (Pathology)
- Prof. David Lewis-Williams (Geography, Archaeology and Environmental Studies)
- Prof. Duncan Mitchell (Physiology)
- Prof. Norman Owen-Smith (Animal, Plant and Environmental Sciences)

- Prof. John Pettifor (Clinical Medicine)
- Prof. Beric Skews (Mechanical, Industrial and Aeronautical Engineering)
- Prof. Yevhen Zelenyuk (Mathematics)

Read more about Wits' A-rated researchers and their work on page 55.



Funding sources

Table 3: University Council Funding

	2010 R'000	2009 R'000	2008 R'000
Direct allocation to Faculties (70%)	31 787	30 729	27 799
Individual grants centrally awarded			
■ Thuthuka	1 000	2 500	2 460
■ Sellschop Award	520	105	405
■ NRF Ratings Award	30	525	925
■ Conference Travel	150	135	150
■ Individual Research Grants			115
■ Publication Awards	60	60	100
■ Vice-Chancellor's Research Award	250	140	130
■ Postdoctoral Fellowships	3 500	3 500	5 050
■ Co-funding of Y, L and P ratees	430	640	
Centres of Excellence	1 000	986	1 461
Minor equipment	2 000		2 000
Artworks	200	200	200
Research niche areas	550	600	513
Electronic subscriptions	420	200	200
Research report	140	125	
Animal purchases	350	275	284
Contingencies	3 814	559	300
Audit fees	50	200	180
Miscellaneous	410	600	160
Major equipment	12 500	14 500	2 000
Totals	59 161	56 579	44 432

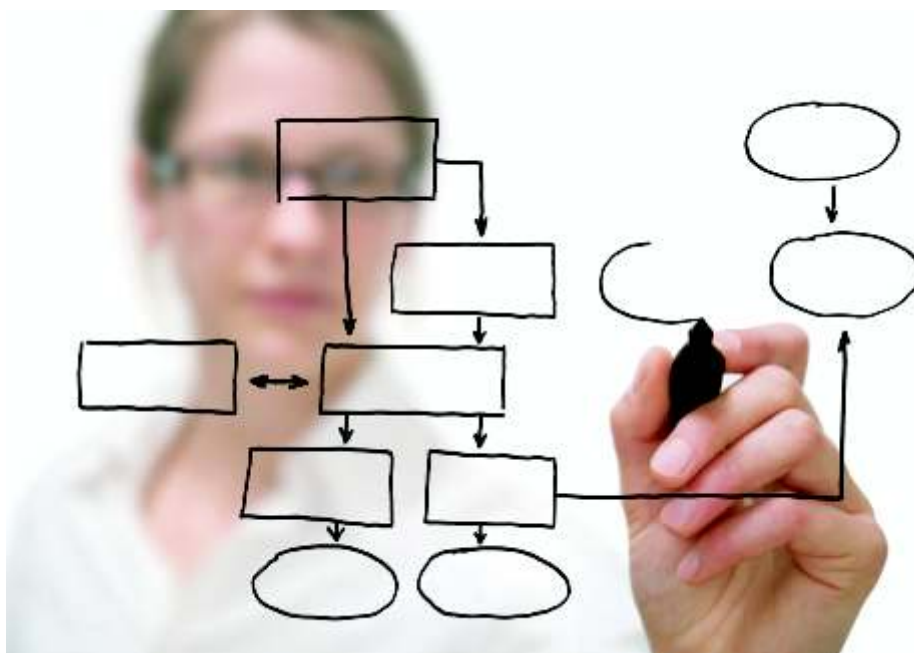


Table 4: Funding sources

Estimate of available funding sources	2010	2009	2008
General Funds	R'000	R'000	R'000
URC Grants (1)	44 661	42 079	42 432
URC Equipment Grants	14 500	14 500	2 000
Statutory Councils and Government Departments	102 591	98 085	82 107
Other External Sources (contracts, donations, grants, etc)	75 751	68 999	55 004
Research funds held in the Wits Foundation (2)	189 188	170 994	134 808
Totals	426 691	394 657	316 351

Notes

1. The 2010 figure excludes a roll-over of R 11,925-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 Gallery, Radiation and Health Physics Unit and Central Optima 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. This figure excludes funds held in the Wits Health Consortium

Table 5: Statutory Councils funding

Science councils	2010	2009	2008
	R'000	R'000	R'000
National Research Foundation (NRF)	69 824	71 640	70 643
South African Medical Research Council (MRC)	8 936	8 650	8 516
Other Government Departments and Science Councils	23 831	17 795	2 948
Totals	102 591	98 085	82 107

Table 6: Other external funding

Research fields	2010	2009	2008	
	R '000	R '000	R '000	
Built Environment	1 757	490	690	
Commerce and Management	9 487	10 268	4 813	
Earth Sciences	5 181	7 119	1 351	
Palaeo Studies (1)	1 311	1 147	1 000	
Education	1 359	613	560	
Engineering	16 255	11 412	15 728	
Humanities and Social Sciences	3 187	6 996	6 130	
Law	361	527	450	
Biological Sciences	10 263	6 424	1 961	
Health Sciences (2)	20 466	14 120	19 857	
Mathematical Sciences	1 457	100	440	
Physical Sciences	3 167	3 171	2 024	
General	1 500	1 000		
Totals	75 751	68 999	55 004	

Notes

1. Included in Earth Sciences prior to 2008
2. This figure excludes funds held in the Wits Health Consortium

Table 7: Funds by Research field in the Wits Foundation as at 31 December 2010

Research fields	2010	2009	2008	
	R '000	R '000	R '000	
Built Environment	10	48	45	
Commerce and Management	1 743	907	12 813	
Earth Sciences	7 725	5 029	6 654	
Education	7 204	604	4 171	
Engineering	11 355	17 408	17 015	
Humanities and Social Sciences	22 340	24 250	15 622	
Law	9 131	190	5 868	
Biological Sciences	9 058	6 767	4 271	
Health Sciences (1)	60 259	66 299	53 208	
Mathematical Sciences	937	577	901	
Physical Sciences	7 777	7 413	5 251	
Palaeo Studies (2)	23 278	31 720	31 369	
General	18 046	26 976	13 806	
Totals	178 863	189 188	170 994	

Notes

1. This figure excludes funds held in the Wits Health Consortium
2. Included in Earth Sciences prior to 2008

Application of funds

Table 8: Overview of expenditure of research funds

Expenditure of research funds	2010	2009	2008
	R '000	R '000	R '000
Wages and salaries	118 351	112 389	86 881
Running costs, consumables and equipment	267 616	270 742	234 473
Totals	385 967	383 131	321 354
Wage and salary expenditure as a % of total	30,66	29,33	27,04
Total available funds, including balances in the Wits Foundation	426 691	394 657	316 351
Total expenditure as a % of total available	90,46	97,08	101,58

Research output

Table 9: Research output per Faculty

Faculty	Publica- tion Units in 2000 (1)	Docto- rates com- pleted in 2010 (2)	Masters by Disser- tation com- pleted in 2010	Masters by Course- work com- pleted in 2010 (3)	Total research units	Number of full- time aca- demic staff as at 31/12/10 (4)	Average output per Faculty in 2010	Average output per Faculty in 2009
Commerce, Law and Manage- ment	73.36	15.00	5.00	80.02	173.38	190	0.91	0.76
Engineering and the Built Environment	85.24	63.00	34.00	62.79	245.03	135	1.82	1.78
Health Sciences	245.42	63.00	30.00	28.19	366.61	154	2.38	2.12
Humanities	226.84	72.00	50.00	85.1	433.94	338	1.28	1.24
Science	258.27	87.00	60.00	13.5	418.77	193	2.17	1.58
Other	20.09							
University	909.22	300.00	179.00	269.60	1 637.73	1 010	1.62	1.43

Notes

The main significance of this table is that the DHET funding formula is based on an assumed output of 1.25 'research units' (publications plus higher degrees) per full-time member of the academic staff.

1. 2009 is the latest available year for confirmed DHET publication data
2. Each doctorate scores three points in the DHET assessment
3. Only the component of the final mark contributed by the Research Report is counted
4. Excluding joint staff

Public lectures and conferences

Faculties, Schools and Departments hosted hundreds of public lectures and conferences at Wits in 2009 focusing on a variety of topics that are relevant to society. The diverse range of speakers hailed from several countries around the globe. A list of some of the key public lectures and conferences hosted by Wits are included on page 165.

FOCUS



Wits:

A player on the world stage

Wits is ranked as one of the top 300 universities in the world and is one of only two South African universities that appear in two separate international rankings as a leading institution. It is also the only university in the country that features in the top 1% in the world in seven defined fields of research. As a result of its excellent research and academic reputation, Wits is highly valued as a research partner by international collaborators. This article highlights just a few of the international research partnerships that Wits researchers were involved in during 2010.



Faculty of Commerce, Law and Management

Dr Samantha Ashman

France

United Kingdom (UK)

Staff members in the Corporate Strategy and Industrial Development (CSID) Research Unit, led by Dr Samantha Ashman, are involved in two large international collaborations; namely the Augur and the Financialisation, Economy, Society and Sustainable

Development project. Both projects are funded by the European Union's (EU) Seventh Framework Programme. The aim of the Augur project is to look at the evolving world economy in all domains – including demographic, environmental and institutional areas. The project brings together seven European research institutes including the Centre for Financial Analysis and Policy at the University of Cambridge and the Centre for Development Policy Research at the School of Oriental and African Studies, University of London, UK. The primary focus of the Financialisation, Economy, Society and Sustainable Development project, based at the University of Leeds in the UK, which brings together 15 universities – 14 of which are based in Europe – is how to change the role of the financial system so that it better serves economic, social and environmental objectives.

Natalie Cunningham

United States (US)

In the Wits Business School, Natalie Cunningham, a research fellow and Director of the Business and Executive Coaching Programme, worked on a collaborative project with the Graduate School Alliance of Executive Coaching based in the US. The aim of the project was to develop academic standards for coaching education at graduate level.

Faculty of Engineering and the Built Environment

Prof. Alan Mabin

Brazil

Prof. Alan Mabin, former head of the School of Architecture and Planning, is involved in a project with Erminia Maricato, an emeritus professor at the Universidad de São Paulo in Brazil. Maricato, author of eight books, architect and urbanist, former director of housing in the City of São Paulo (1988-92) and first director general of the Ministry of the City in Brazil (2003-2005), founded a research centre called LabHab, in the Faculdade de Arquitetura e Urbanismo at the Universidad de São Paulo in the 1980s. Mabin and Maricato have collaborated since 1991. The objective of their collaboration is to bring the two sets of cities in Brazil and South Africa into comparative research.

France

Mabin and Prof. Philippe Gervais-Lambony, Director of the Université de Paris-Ouest Nanterre-La Défense's Institut Français de l'Afrique du Sud, have been involved in a long-term project linking research on cities and crossing language boundaries, which are key objectives in many places today. Successful joint proposals were made to the Institut de Recherche pour Développement, which resulted in a joint Tata Steel in Europe (formerly known as the Corus Group) entitled *Voices of the Poor in Urban Governance* and the French National Research Agency project entitled *Spatial Justice*.

Tanzania

Mabin has also joined forces with Prof. Wilbard Kombe, Director of the Institute for Human Settlement Studies (IHSS) at the Ardhi University in Tanzania. Their collaboration started in 2006 and the IHSS has since provided a research base for a number of Wits graduate students. Their collaboration has now led to joint involvement in a major research project on 'suburbs' in Africa funded for seven years by the Canadian Social Sciences and Humanities Research Council.

Prof. Beric Skews

Russia

Prof. Beric Skews, Director of the Flow Research Unit, housed in the School of Mechanical Engineering, has been involved in two major international

collaborative projects over the past few years. He works closely with Prof. Irina Znamenskaya from the Moscow State Lumonosov University and Prof. Alexander Lutskiy of the Keldish Institute of Applied Mathematics to study the stability of gas dynamic shear layers. The aim is to study the use of multiprocessor systems with hybrid architecture applied to the evolution, interaction and stability of discontinuities in high speed flows. The presence of such discontinuities requires the use of monotonicity preserving algorithms to avoid unphysical oscillations. For an accurate calculation of such phenomena high order algorithms are required.

Australia

Skews' collaborator on the shock reflection project is Prof. Harald Kleine from the Australian Defence Force Academy at the University of New South Wales. The general aims of this project are to enhance the understanding of the fundamental physics of unsteady shock wave reflection from curved surfaces and particularly curved shocks and to combine unique experimental diagnostics and highly specialised Computational Fluid Dynamics techniques to provide previously inaccessible data on the basis of which the existing incomplete models can be improved.

Prof. David Glasser

China

Norway

Saudi Arabia

UK

US

Prof. David Glasser, Co-Director of the Centre of Material and Process Synthesis (COMPS), and his colleagues collaborate with a large cohort of international scholars and researchers on a number of projects ranging from sending all their doctoral students overseas at the end of their research period to building a small scale gasification plant in China to make liquid fuel and electricity. Because of the physical isolation of South Africa, COMPS adopted a policy of sending all their doctoral students overseas. This usually takes the form of attendance at a conference and a stay of a few months to a year with a senior internationally recognised researcher in the area of their doctoral research. According to Glasser, they have found that these visits boosts their students' confidence as they realise that the work which they are undertaking is at least as good as that being done by their international peers. The universities to which they have sent more than one student over the last few years are: Carnegie-Mellon University (US), University of Kentucky (US), Rutgers University New Jersey (US), University of Illinois, Chicago (US) and The National Technical University of Norway. COMPS is also part of Rutgers University's Integrated Graduate



Education and Research Traineeship Programme that is funded by the National Science Foundation and at least one staff member attends their annual conference. The team also presented a three day course on process synthesis, accredited by the American Institute of Chemical Engineers and the Institution of Chemical Engineers of the UK, to students in the US, UK and Saudi Arabia. COMPS is also working with the Agricultural University of Hebei in China where they have built a small scale gasification plant attached to a Fischer-Tropsch reactor of our design to make liquid fuel and electricity funded mainly by the Chinese government, but with NRF support.

Faculty of Health Sciences

Prof. Patrick Arbuthnot France

The research of Prof. Patrick Arbuthnot, Director of the Antiviral Gene Therapy Research Unit (AGTRU), has the broad aim of developing gene therapy as an approach to countering hepatitis B virus (HBV) and HIV-1 infection. These viruses cause serious public health problems in South Africa and there is a pressing need to improve on available antiviral treatments. The field of gene therapy is complex, which means that progress requires input from investigators with specialised know-how in a variety of fields. Despite the AGTRU having expertise in a range of molecular biology procedures and gene transfer techniques, additional

skills are required to advance a competitive gene therapy research programme. The establishing of research partnerships is critically important to achieving the research objectives of the AGTRU. The group has therefore vigorously pursued a strategy of nurturing research partnerships that provide synergy and mutual benefit to the partners. In addition to strengthening the research base, collaborations contribute to an improved environment for student training. Currently, research collaboration has been aimed at strengthening synthetic organic chemistry resources, improving the technology for engineering of recombinant viral vectors (carriers) and progress in knowledge of specialised areas of applied molecular biology. The team works closely with Dr Nicolas Ferry from the Laboratoire de Thérapie Génique in France. Ferry is an expert in the field of engineering and propagating viruses that carry gene therapy activators. This is particularly important for delivery of anti HBV agents to the liver.

US

Kevin Morris, a professor at Scripps Institute in the US, is an expert in the field of using nucleic acids to silence gene expression at the level of transcribing RNA from the DNA template. This is potentially an extremely powerful anti-HIV technique as a more effective sustained inhibition of virus proliferation can theoretically be achieved by preventing initiation of gene expression.

Belgium

Germany

Prof. Joachim Engels from the Institut für Organische Chemie und Chemische Biologie based at the Johann-Wolfgang-Goethe-Universität in Germany, and Prof. Piet Herdewijn from the Laboratory of Medicinal Chemistry at the Rega Institute for Medical Research, Katholieke Universiteit Leuven in Belgium, are organic chemists with expertise in the field of synthesis of nucleic acids. They have generated several anti-HBV gene silencing sequences that the AGTRU has been testing against the virus. Together with the AGTRU team, the laboratories of Engels and Herdewijn were part of the RNA Interference technology as a Human Therapeutic Consortium of the EU Framework Sixth Programme. This group of researchers had the broad aim of developing gene silencing as a method of treating human disease. Dr Dirk Grimm from Heidelberg University in Germany is an expert in HBV and HIV molecular biology and is contributing to research in the AGTRU that involves understanding the role of regulatory RNAs in the progression of HIV-related diseases.

Prof. Charles Feldman

US

In the School of Clinical Medicine, Prof. Charles Feldman, Head of the Division of Pulmonology, and his team work closely with the Community-acquired Pneumonia Organisation (CAPO) led by Dr Julio Ramirez from the US. Their research includes an ongoing international study of

community-acquired pneumonia (CAP), which is a web-based repository of cases with community-acquired pneumonia. The subsequent studies that are done are on a number of differing aspects of CAP. Cases are being recruited onto a web-based case report form. Feldman also has close ties with the International Pneumococcal Research Collaboration under the directorship of Dr Victor Yu. In addition, he is also a member of the research team that is involved in an International Study of Pneumococcal Bacteraemia, a collaborative study of pneumococcal bacteraemia, which has been ongoing for almost nine years. The sentinel study undertaken was that of a prospective observational study of patients with pneumococcal bacteraemia. Feldman has also joined forces with Prof. Keith Klugman, the William H. Foege Professor of Global Health at Emory University's Rollins School of Public Health and Co-Director of the Respiratory and Meningeal Pathogens Research Unit at Wits, to undertake the National Surveillance Study, an ongoing surveillance of sterile site isolates of *Streptococcus pneumoniae* and the cases associated with them.

Argentina

Australia

Spain

US

Feldman is also collaborating with Dr Grant Waterer from the University of Western Australia, Drs Richard Wunderink from the US and Carlos

Luna from Argentina and Jordi Rello from Spain. The focus of their research is the genetic study in CAP. This is a multicentre study investigating genetic factors that may predispose patients to community-acquired pneumonia and/or be associated with severity and outcome of this infection. Data collection for the South Africa component is almost completed and the laboratory work and subsequent analysis of the results will be undertaken shortly.

Prof. Andrea Fuller

Australia

Director of the Brain Function Research Group, Prof. Andrea Fuller, focuses on researching the physiological capacity of large African mammals to cope with the predicted effects of climate change. In order to investigate the physiological responses of the animals, Fuller and her colleagues, Prof. Duncan Mitchell and Drs Robyn Hetem and Leith Meyer, use remote measurement techniques to measure physiological and behavioural variables of free-living animals in their natural habitats. During 2010 they collaborated with a number of international researchers including Prof. Shane Maloney from the University of Western Australia, who was involved in several projects investigating the physiology of free-living mammals.

Canada

The team also worked closely with Professors Peter Henzi and Louise Barrett from the University of



Lethbridge in Canada. They started a long-term project based at the Samara Game Reserve in the Eastern Cape, aimed at investigating how vervet monkeys alter their physiology and behaviour to survive environmental changes.

Norway

Their research partner at the University of Tromsø in Norway is Prof. James Mercer. Fuller and Mercer are joint-supervisors of masters student, Nadine Torrao, who is investigating how elephants thermoregulate by altering their skin temperature. The research was featured on National Geographic and Channel 4 in the UK.

Germany

Together with Prof. Niels Rattenborg and Dr John Lesku from the Max Planck Institute for Ornithology in Germany, the team carried out a project investigating the sleep patterns of free-living ostriches. The research, to be published in the journal *PLoS One* in 2011, showed that ostriches have similar sleep patterns to platypuses and yielded important new information on the evolution of sleep.

The Netherlands

Professors Steven de Bie and Sip van Wieren from the Wageningen University in The Netherlands, have joined forces to supervise the doctoral studies of Anil Shrestha. Shrestha's studies are aimed at investigating how antelope respond physiologically to environmental change at the Asante Sana Game Reserve, in the

Eastern Cape, and the Mapungubwe National Park in Limpopo.

Prof. Anna Kramvis

Belgium

Japan

The impetus of the research of the Hepatitis Virus Diversity Research Programme, led by Prof. Anna Kramvis, has been to characterise the genome of the African strains of hepatitis B virus (HBV) and to determine whether there are variations in the isolates from Africans with and without disease, which may contribute to disease progression. Comparative analyses with hepatitis virus strains from various geographic regions of the world have been carried out, in order to shed light on the viral origin and transmission as well as pathogenesis of viral-induced disease. This is important in diagnostics and in custom designing molecular antiviral and antitumour therapies. To facilitate these comparative studies, extensive international collaborative networks have been established. The team's longest collaborative linkage, initiated in 2001, has been with Professor Masashi Mizokami of the Research Center for Hepatitis and Immunology and the Yasuhito Tanaka of Nagoya City University Graduate School of Medical Sciences in Japan. The Unit has collaborated on a number of studies characterising subgenotype A1, the strain

discovered in South Africa. With them, the Wits team are continuing with the functional characterisation of various genotypes in transgenic mice models together with their Flemish collaborators at the University of Ghent in Belgium, Professors Geert Leroux-Roels and Philip Meuleman.

Australia

As part of their longstanding collaboration with Professors Stephen Locarnini and Peter Revill at the Victoria Infectious Diseases Research Laboratory in Australia, the team is studying innate immunity to HBV and the development of drug resistance.

Prof. John Pettifor **UK**

Prof. John Pettifor, Head of the Department of Paediatrics, works closely with Dr Ann Prentice, Head of the UK Medical Research Council Human Nutrition Research based in Cambridge at the Elsie Widdowson Laboratories. She also directs the Medical Research Council bone research activities in The Gambia. The Mineral Metabolism Research Unit has been collaborating with her on the pathogenesis of rickets in developing countries and together they have published a number of book chapters and journal articles. Their research concentrates on the role of low dietary calcium intakes in the pathogenesis of rickets in children.

US

In the US, Pettifor collaborates with Tom Thatcher, an associate professor in the Department of Family Practice at the Mayo Clinic. They have had a longstanding collaboration over the past 10 years studying the pathogenesis of rickets in subtropical regions of the world. The collaboration has centred on studies conducted in Jos in central Nigeria which has resulted in a number of publications including one in the *New England Journal of Medicine*. Their current research focuses on investigating the metabolism of the various forms of vitamin D given as daily or monthly doses.

Prof. Steven Tollman **Sweden** **US**

Prof. Steven Tollman, Director of the Medical Research Council/Wits Rural Public Health and Health Transitions Research Unit (Agincourt) has been involved in a number of international collaborative projects over the past few years. These include the Agincourt Health and Demographic Surveillance Site (HDSS), which has attracted a rich network of international collaborators including the study on adult health and aging, which was conducted in collaboration with researchers from Umeå University (Sweden), Harvard University (US) and the World Health Organization (WHO).

Bangladesh

China

Ghana

Indonesia

India

Kenya

Tanzania

Vietnam

US

The study on migration and urbanisation was conducted in conjunction with Brown University (US). The study on adult health, which was conducted at sites in Tanzania, Kenya, Ghana, Bangladesh, Indonesia, Vietnam and India was lead by Agincourt. They have applied a short version of the WHO-SAGE instrument, in adults 50 years and older, to assess baseline measures of physical and cognitive function, thereby establishing cohorts of older adults in both Asian and African settings.

A study on migration was conducted by Dr Mark Collinson, the Field Research Manager at Agincourt. He continues to lead INDEPTH multi-site work, involving several demographic surveillance sites in Africa and Asia. Datasets are being harmonised for a second multi-country study on migration, poverty and health. The Wits-Brown-Colorado-African Population and Health Research Centre has an extensive portfolio of research and academic partnerships. Other partnerships include productive collaboration with Prof. Sam Clark from the University of Washington (US) and Dr Sangeetha Madhavan from



the University of Maryland (US).

Agincourt enjoyed strong support from the Mellon and the Hewlett Foundations which made sister grants to all the participating institutions. Selected examples of collaborative projects are the:

- HIV/NCD prevalence study, to measure HIV prevalence and biomarkers for non-communicable chronic disease (mainly cardiovascular and diabetes) using dried blood spots.
- Social Connection, Vulnerability and Resilience study. Qualitative studies are triangulated with surveillance-based analyses to investigate changing household structure and composition.
- Migration, Livelihoods and Health study. Outcomes for children's health and household poverty are key research areas. Grants awarded in 2010 will support work on migration, HIV and socioeconomic change in South Africa, as well as assessing the impact of internal labour migration on patterns of intergenerational support and the health and well-being of children and older people in China and South Africa.

Sweden

UK

US

Collaborations around child and adolescent health where influential collaborations involve Oxford University (*Kulani and Ntshembo*), Cambridge and Umeå Universities (*Ntshembo*), and the University of

North Carolina (US) (*Conditional Cash Transfer*).

Kulani Child Health and Resilience Project is a school-based trial to evaluate an established school-based intervention by Soul City, a non-governmental organisation, which provides emotional and social support to pupils between the ages of 10 and 12 years old to enhance their ability to cope and learn in an environment of chronic adversity.

Ntshembo (Hope) is a wide ranging collaboration between Wits' Birth-to-Twenty Programme, the Universities of Cambridge, Oxford, Umeå and North Carolina and the INDEPTH Network. *Ntshembo* aims to promote adolescent health as a critical pathway to improve intrauterine and infant growth and thereby interrupt the intergenerational transfer of metabolic disease and HIV/AIDS.

Conditional Cash Transfer seeks to determine the effects of a multi-level HIV prevention intervention addressing structural and social factors contributing to young women's increased vulnerability to HIV. Cash transfers are provided to the families of young girls conditional on school attendance.

Faculty of Humanities

Professors Peliwe Lolwana and Jill Adler

US

Professors Peliwe Lolwana and Jill Adler in the School of Education, the

Corporate Strategy and Industrial Development (CSID) unit and the Graduate School of Public and Development Management, have embarked on a longterm project with Applied Development Research Solutions in the US, to forecast the demand and supply for skills. The major objective of this project is to support strategic thinking and policymaking at the Department of Higher Education and Training and to build the Department's capacity as well as that of the Sectoral Education and Training Authorities to anticipate trends in the demand for and supply of skills from the education and training sector.

Prof. Claire Penn

US

Italy

In the School of Human and Community Development, Prof. Claire Penn and her team of researchers are collaborating with the Department of Paediatrics at Duke University and the National Institute for Migration and Poverty in Italy. Their partners in the project entitled *Disease, poverty and diversity: Communication solutions for intercultural healthcare settings*, are Dr Neil Prose and Dr Aldo Morrone. The aim of the project is to apply a cultural brokerage model of healthcare interaction in intercultural healthcare settings. This project will assist with an understanding of intercultural communication and barriers to care which are imposed in a context of poverty, migration and

disease and assist in developing capacity and effectiveness in underserved healthcare contexts.

Sweden

The team is also involved in a number of projects that focus on living with aphasia (language impairment) in a multicultural context. Their partner in this venture is Prof. Elizabeth Ahlsen from the Department of Linguistics at the University of Goteborg. The projects focus on understanding the impairment experience in a multicultural context, the role of culture in the social reintegration of patients and group therapy participation across cultural groups.

The Netherlands

Their partner in this study entitled *Moving towards cultural safety: Developing cultural and linguistic partnerships in the clinic*, is Dr Tom Koole from the Department of Linguistics at the University of Utrecht. This project examines the role of the third party (interpreter, mediator, counsellor) in clinical interactions and will involve six sites over three years (including paediatrics HIV/AIDS, child psychiatry and maternal diabetes).

Wales

Transcending cross-cultural and cross-linguistic barriers: The challenges of communication practices in genetic counselling in South Africa, is the name of yet another project in which the team in the School of Human and Community Development is involved. Their partner in this venture, which focuses on genetic counselling, is Dr

Angus Clarke from the Health Communication Research Centre based at Cardiff University. The project examines the interactions between South African genetic counsellors and patients, looking specifically at verbal and non-verbal communicative processes and the role of culture in the genetic counselling interaction.

Prof. James Ogude

Kenya

Uganda

US

In 2007 James Ogude, a professor of African literature, initiated two exchange programmes between the Division of African Literature at Wits and a selected number of Universities from East Africa and Indiana University in the US. Ogude's collaborators in the project that focuses on black intellectual traditions in the East African region are the University of Makerere in Uganda, Moi University and Nairobi University in Kenya. The project investigates the rise of literary patronages and leading intellectual traditions that have shaped the production and consumption of modern literature in East Africa since independence. Ogude's main interest is those intellectual traditions that emerged within the academy, changes that have occurred in the English School Syllabus (an important colonial cultural institution within the British Empire), and other institutional frameworks such as publishing industries that also determine what is published and what passes as good



literature. His US partner is Prof. Eileen Julien in the Department of Comparative Literature at Indiana University. The title of this project is *Locations, Epistemologies, and Pedagogies in African and Black Diaspora Literatures*. The project, which was initiated in 2009, examines the relationship of place to the interpretation, criticism and teaching of texts. Their point of departure is that readers and scholars formulate questions and perspectives on literary and other cultural texts, based on their particular histories and experiences. The aim of the project is therefore two-fold: to develop an understanding of how location structures one's grasp of issues and their importance, how context – regional, national and institutional – is critical in the formulation of debates and the production of knowledge; to assure that the teaching and study of African literary and cultural production in both institutions are informed by local experiences and perspectives.

Prof. Robert Thornton

Canada

Czech Republic

Mozambique

Scotland

Slovenia

Sweden

The Netherlands

UK

US

Prof. Robert Thornton, a researcher in the Department of Anthropology,

collaborates in different capacities with people, departments and institutes in The Netherlands, Sweden, the Czech Republic, Slovenia, Canada, Scotland, and the US.

He is currently supervising two doctoral students from the University of Edinburgh in Scotland who are conducting research on the medical anthropology of tuberculosis in Barberton. He also co-supervised a doctoral student from Mozambique who is working on HIV/AIDS.

He recently joined forces with Prof. Don Ray from the University of Calgary in Canada to co-author books and book chapters. He worked closely with Profs. Peter Skalnik and Radim Tobolka from the Hradec Kralova University in the Czech Republic and with Professors Rijk van Dijk and Marlene Dekker at the African Studies Institute based in The Netherlands. He also collaborated with Prof. Trevor Marchand from the School of Oriental and African Studies, University of London (UK), and Prof. Kai Kresse from the University of Edinburgh on a special issue of the journal *Africa*. The issue focused on 'transmission of knowledge' in traditional African societies. He continues to work with Dr Elisabeth Hsu, a medical anthropologist at the Anthropology Institute and Templeton-Green College, Oxford University (UK), on medical anthropology and HIV/AIDS. He is also collaborating with Prof. Jonathan Thornton from Buffalo State University of New York (US), focusing on material culture, archaeology and the history of traditional healing

(sangomas), and metal smelting, smithing and fabrication for ritual use in southern African societies.

Prof. Karl von Holdt **US**

Prof. Karl von Holdt, Director of the Society, Work and Development Institute (SWOP), and his team have developed an extensive international network in recent years through their active participation in the Research Committee on Labour Movements of the International Sociological Association (ISA) and the Global Labour University, an international labour organisation initiative initially located in the Institute. SWOP managed to strengthen its ties with Michael Burawoy, President of the ISA and a professor in the department of sociology at the University of California (US). Burawoy spent the first semester of 2010 as the Mellon Distinguished Visiting Professor and presented eight lectures. As a result of the lively response to the lectures, Burawoy and Von Holdt are co-authoring a book, entitled *Conversations with Pierre Bourdieu: The Johannesburg moment*. This is to be published by Wits University Press.

Brazil

Germany

India

Kenya

Mexico

Pakistan

SWOP also collaborated with the International Center for Development and Decent Work (ICDD) based at

the University of Kassel in Germany. The ICDD is a global research institute connecting eight universities in Germany, Brazil, Mexico, Kenya, India, Pakistan and Wits. Through the ICDD, SWOP is involved in four activities. These include academic exchanges, started in 2009 when Prof. Eddie Webster, founder of SWOP, was appointed as the first Ela Bhatt professor in Development and Decent Work at Kassel University, organising joint international conferences, joint-supervision of doctoral students and leading a South-South interdisciplinary research project entitled *Work, Livelihoods and Economic Security in the 21st Century: Comparing India, Brazil and South Africa*. The research project examines how the governments of these three countries are responding to economic security through innovative social protection and public work programmes, and the role of civil society and trade unions in formulating and implementing these policies.

Faculty of Science

Prof. Neil Coville

Wales

In the School of Chemistry, Prof. Neil Coville and his partners have been working on a number of major international research projects, focusing on catalyst supports and carbons in solar cells.

For the past two decades Coville and his colleague at Cardiff University in Wales, Prof. Graham Hutchings have been studying the Fischer-Tropsch (FT)

reaction. The FT reaction entails a catalyst (typically Fe or Co) that is used to convert CO and H₂ (derived from coal, gas, biomass, etc.) into fuels and chemicals. This process underpins the South African chemical industry.

Brazil

Coville's partner in the carbons in solar cells research project is Dr Ana Flavia from the State University of Campinas in Brazil. The Brazil groups' expertise is in solar cell devices. This has led to Coville and his team's own studies using their functionalised carbon nanotubes synthesis in solar cell device construction. Student exchange has taken place (to and from Brazil) and publications from the collaboration will start appearing in 2011. Their research has resulted in plans to establish a solar cell testing laboratory in the School of Physics.

Prof. Eric Dabbs

Germany

Italy

Japan

Sweden

Prof. Eric Dabbs and his team in the School of Molecular and Cell Biology, collaborates with researchers in several countries on the study of various aspects of biotechnology. Dabbs' main research interest is nocardioform bacteria and mycobacterial antibiotic resistance.

In Germany his collaborator is Prof. Andreas Stolz from Stuttgart University.



The title of their project is *The Identification and application of new oxynitrilases from the South African flora for biocatalysis and White Biotechnology*. Prof. LJ Mampuru from the University of Limpopo is also involved in the study.

Italy

Prof. Gianfranco Risuleo from Rome University is Dabbs' collaborator in Italy. Risuleo spent some time with Dabbs in his laboratory and the two have collaborated on a number of projects over the past few years and jointly published articles. The aim of Risuleo's visit was to explore potential future collaborative projects.

Japan

Dabbs and his team collaborate with two universities in Japan; namely Kobe and Chiba Universities. At the University of Kobe, the team works closely with Prof. Madoka Kitakawa on a project entitled *Mining phage genomes to discover new antimicrobial targets in Mycobacterium and other pathogens*. Dabbs has also visited the university on several occasions to work in the Kitakawa laboratory to optimise *Saccharomyces* transformation methodology.

Prof. Yuzuru Mikami is the team's collaborator at Chiba University. Here they collaborate on a project called *Characterisation of novel antibiotic resistance mechanisms in Nocardia and related bacteria*. Dabbs and some of his team members visit Chiba University at the end of last year to present a seminar

based on his work within the framework of this collaboration.

Sweden

Ribosomal RNA mutants and their effects on translation and gene expression is the name of a project that Dabbs works on with Swedish collaborator, Prof. Leif Isaksson from Stockholm University.

Prof. Arnold Knopfmacher Israel

Prof. Arnold Knopfmacher, Director of the John Knopfmacher Centre for Applicable Analysis and Number Theory, started collaborating with Prof. Toufik Mansour from the University of Haifa in 2007. Mansour is one of the most active researchers in enumerative combinatorics worldwide, and has collaborators from all over the globe. The focus of their research is combinatorial problems relating to compositions of integers and geometric random variables.

Mexico

Knopfmacher also works closely with Prof. Florian Luca, a distinguished analytic number theorist from Universidad Nacional Autónoma de México, the foremost university in Latin America. Luca is one of the most prolific researchers in his area. Knopfmacher and Luca are investigating the divisibility of binomial coefficients and the existence of prime-perfect numbers.

Prof. Fazal Mahomed **Pakistan**

In the Centre for Differential Equations, Continuum Mechanics and Applications, Prof. Fazal Mahomed is involved in an international study with Prof. Asghar Qadir, Director of the Centre for Advanced Mathematics and Physics at the National University of Sciences and Technology. Their work focuses on the idea of conditional linearisation for ordinary differential equations and they have been able to obtain several new results for higher order equations that can be linearised subject to a root equation. In their more recent work on semi-invariants of systems of linear hyperbolic equations and their adjoints, they have deduced new invariant properties using complex symmetry analysis which they have developed in a series of papers. Moreover, they are continuing their research on the inter-relationship between geometric and algebraic approaches to differential equations. They are studying how this relationship enables one to construct criteria for reducibility of such systems

Prof. Norman Owen-Smith **France**

Prof. Norman Owen-Smith, an internationally renowned natural scientist and leader of the Centre for African Ecology, worked closely with Dr Simon Benhamou from the French National Centre for Scientific

research on a project entitled *Movement ecology of large herbivores*. This is a long-term project.

Germany

In Germany he works with Dr Joseph Ogutu from Hohenheim University. The title of their project is *Population dynamics of African large herbivores*.

US

In the US he collaborates with Prof. Wayne Gets from the University of California Berkely and with Dr James Cain III from the University of New Mexico. The title of the project that he is involved in with Gets is *Inconsistencies in the foundations of population ecology*, while he and Cain III are working on a project entitled *Habitat selection of African large herbivores*. A number of manuscripts featuring the research of both these projects have been submitted for publication.

Prof. Chrissie Rey **Colombia** **Israel**

Mozambique

Switzerland

Tanzania

Uganda

US

Prof. Chrissie Rey, Head of the School of Molecular and Cell Biology, specialises in plant pathology and collaborates with several international partners who share her interest in this field. She collaborates with Dr Joe Tohme from the Center for International Tropical Agriculture

in Colombia in a satellite cassava project and the functional genomics of the plant and in Israel she works closely with Prof. Henryk Czosnek from the University of Jerusalem on a project funded by USAID. The project focuses on tomato and cassava crops. Teams from Wits and Mozambique's Agricultural Research Institution (IIAM) and the University of Eduardo Mondlane (UEM) work on a similar USAID funded project. Their collaborator at IIAM is Murbibi Cossa, while at the UEM they work with Dr Ana Monjana. Dr Herve Vandershuren, a researcher at the Federal Institute for Technology is their Swiss collaborator and they work together on cassava transformation. In Tanzania they work with Dr Joseph Ndunguru from the International Institute for Tropical Agriculture, while in Uganda they work with Dr Peter Seruwagi from the International Center for Genetic Engineering and Biotechnology.

Prof. Bruce Watson **Canada**

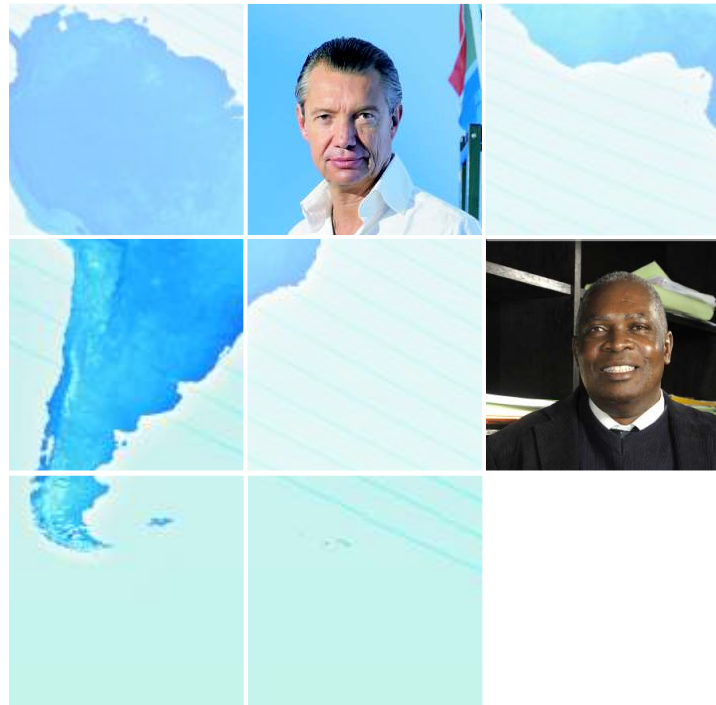
Prof. Bruce Watson, Head of the School of Mathematics, collaborates closely with Professors Paul Binding from the University of Calgary and Patrick Browne from the University of Saskatchewan. The group studies spectral theory and inverse problem for non-standard boundary value problems. In 2010 one of their publications was ranked the most downloaded article from the *Proceedings of the Royal Society of Edinburgh*.

Wits' global village



During 2010, a number of international researchers from across the globe were based at the University of the Witwatersrand (Wits). This diverse group of researchers, from as far afield as Russia, South Korea, Cameroon, Mauritania, India, Italy, the Netherlands, Britain and the US, were involved in a number of investigations ranging from accounting and social work to fracture mechanics.

This article features only a few of the international researchers based at Wits.





Wits'

global village



Faculty of Commerce, Law and Management

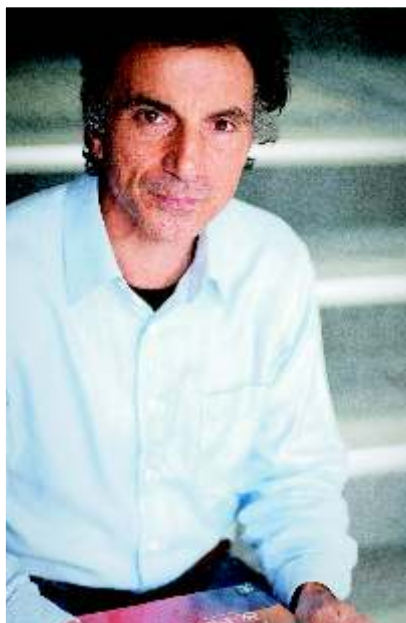
Dr Abdel Halabi Australia

Dr Abdel Halabi in the School of Accountancy selected Wits based on its reputation as a well established teaching and research institution with international links. His research includes accounting education, history, accounting for sporting clubs and Islamic Banking. Since joining Wits in 2009 he has been involved in a number of research projects including investigating the accountability of the Sector Education and Training Authority, a joint project with the South African Institute of Chartered Accountants. Their final report was presented to a parliamentary sitting of the Department of Education and Training.

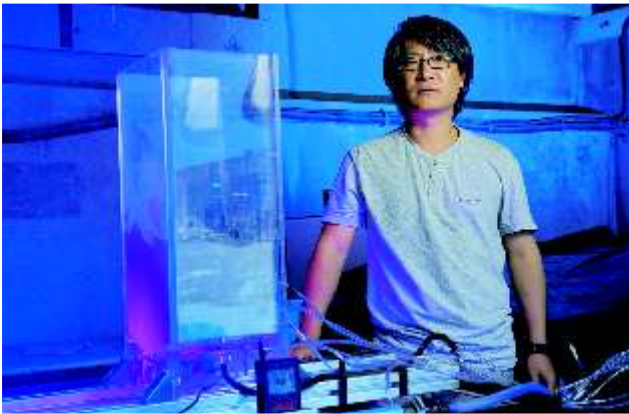


Dr Samantha Ashman United Kingdom (UK)

Dr Samantha Ashman selected Wits because the research undertaken in the Corporate Strategy and Industrial Development Research Unit fits in well with her own research interests. Her research centres on the nature of neoliberalism and its effects on the world economy. A central part of neoliberalism has been the rise of finance. She is currently looking at how finance, or what is now commonly called financialisation, is affecting accumulation and the prospects for development. Since joining Wits in 2009 she has been involved in a project that looks at the different dimensions of South Africa's political economy, but one area of particular interest is the way in which South African corporations have responded to the global processes of financialisation since the end of apartheid and how this is affecting the South African economy.



Faculty of Engineering and the Built Environment



Prof. Tong Kim
South Korea

Prof. Tong Kim in the School of Mechanical, Industrial and Aeronautical Engineering applied for a position at Wits in 2010 after seeing an advertisement in an international magazine. He based his decision on Wits' excellent cadre of students and the fact that research is well supported financially by government and other funding agencies compared to other countries. His research focus area is thermo-fluids engineering dealing with heat and mass transfer in a variety of engineering systems. He is currently involved in research that focuses on the development of novel lightweight ventilated brake discs for heavy duty vehicles, a new open-cellular radiator for sports utility vehicles under extreme environments, a new vertical wind-turbine with local flow acceleration as well as the fluidisation of fly ashes for Eskom and cooling optimisation for a furnace.



Dr Jacob Muthu
India

Dr Jacob Muthu, who joined Wits in 2009, selected Wits because of the University's excellent international research reputation. His research focus area is fracture mechanics, numerical analysis, fibre/nano composites and alloys. Since joining the University, he has been involved in projects investigating the fracture characterisation of fibre/nano composites using both experimental and numerical analysis and the development of a nanocomposite anode material for Lithium-ion batteries. Muthu works in the School of Mechanical, Industrial and Aeronautical Engineering.



Wits' global village

Faculty of Health Sciences

Faculty of Engineering and the Built Environment



Prof. Lesley Cornish
UK

Prof. Lesley Cornish joined Wits in 1989 when she accepted a position as a lecturer. She worked her way up the ladder and was eventually appointed as the assistant dean for admissions for the former faculty of engineering. She left Wits to lead a research project for Mintek, but returned to Wits in 2007 when she was appointed as the Director of the Department of Science and Technology/National Research Foundation Centre of Excellence in Strong Materials. According to Cornish, who was born in Uganda, but grew up in the UK, she returned to Africa at the first opportunity. While living in the UK she completed her Masters degree in Computer Science and her Doctorate in Metallurgic and Materials Science at Birmingham University. Although at first hesitant to apply for the position at Wits because of the political situation in the country, Cornish realised that Wits was an outspoken critic of the apartheid system and felt that she could accept a position at the University 'with a clear conscience'. It was also clear, she says, that the apartheid system was crumbling. Her research focus area is physical metallurgy with a special focus on phase equilibria and alloy development.



Dr Eamon Armstrong
United States (US)

Dr Eamon Armstrong, a senior lecturer and specialist family physician, returned to his alma mater in 2010. He chose Wits because of his strong affinity to his alma mater and felt given the exciting changes in family medicine since graduate training in SA, that he could make a more meaningful contribution here than he could in the US. His main area of academic interest is teaching and role-modelling skills required to finding the best available evidence to answer patient related clinical questions at the point-of-care. In other words using technologies like the internet and hand-held devices (personal digital assistants and smart phones) in real time while seeing a patient.



Prof. Dave Gray

UK

Prof. Dave Gray, Head of the School of Physiology, first came to South Africa in 1986 when he was awarded an overseas scholarship by the Max-Planck Society which allowed him to complete his doctoral degree at the University of Port Elizabeth. He was involved in the study of osmoregulation in sea birds. He left the country shortly thereafter only to return in 1992 to take up a position at Rhodes University. He retained this position until he joined the Department of General Physiology at Wits. His research interests continued to be in the field of avian osmoregulation, however, following the amalgamation of the two departments of physiology into a single department in 1996, the focus of his work moved to that of avian thermal biology, specifically the febrile response in birds.



Dr Alisha Wade

Barbados

Dr Alisha Wade, a senior lecturer and researcher in the Department of Internal Medicine, joined Wits in 2010. The reason she decided to accept the position in the Division of Endocrinology and Metabolism, says Wade, was because she was intrigued and impressed with the scope of opportunities that Wits offers. Her research focus area is chronic disease epidemiology and endocrinology. Her current field of study is the evaluation of research incentives and barriers in health sciences students and staff and determinants of health in elderly patients in sub-Saharan Africa.



Dr Franco Arato

Italy

Dr Franco Arato, in the School of Literature and Language Studies (Italian Studies), says he needed a 'refreshing experience' at a university out of Europe, and selected Wits. He joined the University in 2009 and during his time at Wits developed new interests in African Anglophone and Francophone contemporary authors: Athol Fugard, Ivan Vladislavić and Véronique Tadjo. His books and articles mainly focus on Italian literature from the 18th to the 20th centuries.



Faculty of Humanities



Prof. Dilip Menon
India

Prof. Dilip Menon, Mellon Chair in Indian Studies, joined Wits in 2009. According to Menon he joined the University after encountering some of the work done by the History Workshop, while completing his studies at the University of Cambridge in the UK. He was especially inspired by the work of Professors Peter Delius and Philip Bonner. The University's radical, committed and innovative research also impressed him. His research focus area is intellectual history and the political economy of colonial and post-colonial societies. He is currently engaged in research on the histories of the Indian Ocean. The Centre for Indian Studies in Africa, which he leads, recently received a major grant of R 8.5 million from the Ministry of Overseas Indian Affairs to conduct research into the migration of Indian capital and labour into Africa and the Middle East.



Dr David Hornsby
Canada

Dr David Hornsby is a lecturer in the Department of International Relations and joined the University in 2009 – shortly after completing his doctoral degree at the University of Cambridge (UK). He joined Wits because of the University's excellent international reputation and viewed it as an opportunity to 'broaden his horizons'. His research focus is the politics of risk regulation. Having started out in the biological sciences, he wanted to combine his experience and interest in science with his passion for politics and international relations in particular. He looks at how governments, international institutions and interest groups cope with regulating risk in such areas as climate change, food safety and human health. He is particularly interested in how science is perceived by different groups active in policy-making including scientists, lawyers, civil servants and non-governmental organisations and how this can result in political conflict and impact on the regulation of these areas. Much of his work to date has focused on the influence of international trade institutions and rules on domestic regulation of risk in Canada, the European Union and the US. He recently embarked on a new project that focuses on southern Africa.

Dr Edwell Kaseke

Zimbabwe

Dr Edwell Kaseke selected Wits based on its reputation as a worldclass, research intensive university with a long history of excellence. Kaseke, a lecturer in the Department of Social Work in the School of Human and Community Development, joined Wits in 2009 and since then has been involved in research on colonialism and social welfare in Zimbabwe, specifically exploring how colonialism influenced the provision of social assistance in Zimbabwe. His research focus area is social protection and social policy with particular emphasis on the southern African Development region.



Prof. Tommaso Milani

Italy

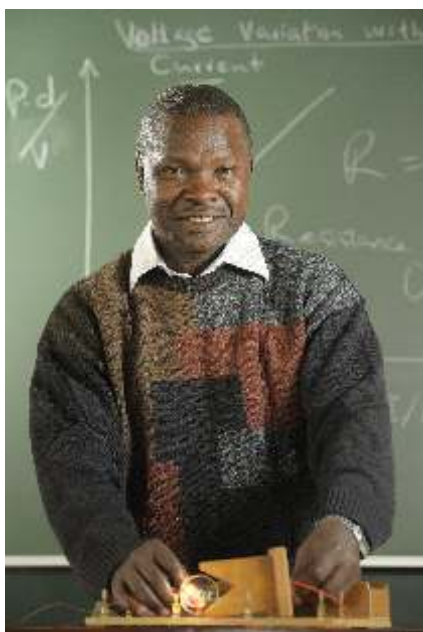
Prof. Tommaso Milani joined Wits in 2009 and is based in the School of Literature and Language Studies. He selected Wits because it is an internationally renowned university. He adds that he has always wanted to live in South Africa in order to conduct research on multilingualism and on language, gender and sexuality. His main research areas are the politics of language and language, gender and sexuality with a particular focus on representations of men who desire other men in online communities.



Dr Samuel Oyoo

Kenya

Dr Samuel Oyoo, a researcher in the School of Education's Marang Centre for Mathematics and Science Education, joined Wits at the beginning of 2010. He chose the University because of the myriad of research opportunities available and to be part of a 'vibrant science education research team.' Oyoo's research covers the general area of science education, but with current twin foci in language and communication in science as well as physics education.





Faculty of Science



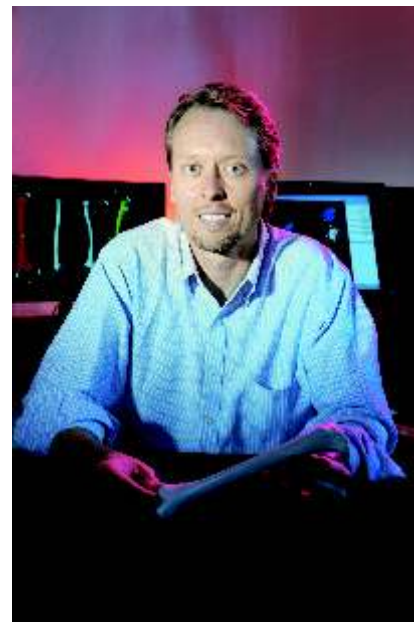
Dr Trevor Vickey
US

Dr Trevor Vickey, a senior lecturer in the School of Physics and a member of the research team working on the Large Hadron Collider project, the world's largest elementary particle physics experiment, joined Wits in 2010. He was awarded the National Research Foundation's President's Award and a P-rating for his research in 2010. Read more about his work on page 141.



Dr Deanne Drake
New Zealand

Dr Deanne Drake, a researcher in the School of Animal, Plant and Environmental Sciences, accepted a position at Wits in 2009. Prior to that she worked in the private sector and was thrilled to join academia and the opportunity to work in Africa – especially after a visit to the Kruger National Park, which she says, formed part of her interview. Her research focus area is aquatic and ecosystem ecology and she is currently involved in studies in savannah biogeochemistry, the effects of invasive nitrogen-fixing plants in streamside ecosystems, and urban water quality. She plans to expand her research to include acid mine drainage.



Dr Kristian Carlson
US

Dr Kristian Carlson, a senior researcher in the Institute for Human Evolution (IHE), selected Wits because of the University's long and prestigious history in palaeoanthropology. When the IHE advertised vacant positions, he immediately applied because, he explains, he was quite keen to be involved in something that he considered as having limitless potential. His main research focus area is studying the functional morphology of primate limbs. He uses a variety of approaches in order to understand what limb design tells one about the behaviours that extant animals exhibit, or infer behaviour in the case of fossils. Since joining Wits in 2009, he has been involved in the work on the Malapa hominin fossils (*Australopithecus sediba*).



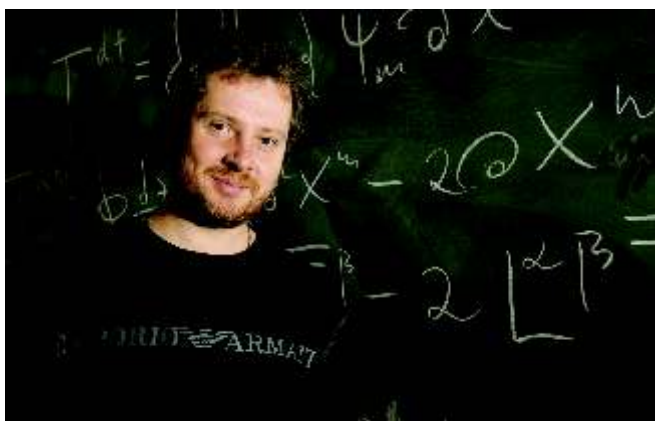
Prof. Stefan Weiss
Germany

Prof. Stefan Weiss, a senior lecturer and researcher in the School of Molecular and Cell Biology, joined Wits in 2009. His decision was based on the fact that Wits is one of the top universities in the world and enjoys an excellent international reputation. The University offers him ample research opportunities and he found the scientific 'vibe' at the University 'attractive'. He has a vibrant research group and currently supervises four masters and two honours students. Read more about their work on page 147.



Prof. Alexander Quandt
Germany

Prof. Alexander Quandt joined the School of Physics in 2010 based on the fact that there was a strong overlap of his research interests with theoretically/experimentally oriented groups at Wits, and at the Centre of Excellence in Strong Materials. He adds that unlike many other places, Wits still has a balance between academic, scientific and administrative tasks, which leaves the space necessary for the development and the teaching of new concepts and ideas. His research focus areas are nanostructured materials and nanotechnology, photonics, aperiodic solids and computational physics. Since joining the University, he has been involved in projects that focus on the magnetic and electronic properties of low-dimensional nanomaterials, in particular of graphene and related boron nanomaterials. He has also been involved in the development of layout principles for nanometer sized wires within low-dimensional semiconductors, new concepts and software tools to quantify order/disorder in complex solids, and theoretical support for experiments that examine the scattering of plasmonic surface waves from aperiodic hole arrays.



Prof. Dimitri Polyakov
Russia

Prof. Dimitri Polyakov in the School of Physics joined Wits in 2009 because of the University's international reputation as an excellent research facility in the field of theoretical high energy physics. Theoretical high energy physics studies the elementary subatomic constituents of matter and radiation, and their interactions.



Prof. Tamiru Abiye
Ethiopia

Prof. Tamiru Abiye joined Wits in 2007 after an 18-year stint at the Addis Ababa University in Ethiopia. He completed his Doctoral degree in Environmental Hydrogeology at the Polytechnic in Italy in 1998. He joined Wits because of a 'lack of academic transparency and freedom' at Addis Ababa University. The situation, he explains, was not conducive to conducting scientific research. He received a number of offers from European universities, but when he was approached by Wits, he grabbed the opportunity with both hands. He believes that Wits is considered as one of the key players in the field of geological sciences worldwide. His research focus area is ground water science or hydrogeology. In his research he looks at community water supply problems, hydrochemical modelling, ground water flow and transport through heterogeneous aquifer materials, surface and ground water interaction, aquifer vulnerability to pollution, hard rock aquifer studies, spatial and temporal variability of ground water recharge, environmental isotopes (stable and radioactive), numerical ground water modelling, hydrogeological mapping, lake and wetland hydrology.

Wits researchers publish in highly ranked journals

During 2010 a number of Wits researchers in the various faculties published articles in high impact journals covering a wide range of topics ranging from Roman Dutch Law to conversations with cannibals, the treatment of HIV patients with drug resistant tuberculosis and black holes. This section highlights a few of these articles.

Commerce, Law and Management

Deeksha Bhana, a researcher in the School of Law, published an article entitled *The enforcement of pre-emption: A proposed new form of specific performance* in the prestigious *Journal of Contemporary Roman-Dutch Law*.

In this article she develops a specific performance remedy for the enforcement of the positive co-operative dimension of the pre-emption contract. It operates on a two-tiered presumption as to the competence and content of an offer (or acceptance) made *arbitrio boni viri*.

In his article entitled *Relational socio-economic rights*, Marius Pieterse, a professor in the School of Law and Assistant Dean of Research in the Faculty of Commerce, Law and Management, investigates relational access to socio-economic rights in South Africa, with the aim of identifying public law interventions, or changes to the private law landscape, that would assist vulnerable parties in dependency-producing relationships to access the objects of their socio-economic rights.

The article, which appeared in the *South African Journal of Human Rights*, is increasingly being cited.

Engineering and the Built Environment

Applied Catalysis A: General

Researchers from the Faculties of Engineering and the Built Environment and Science joined forces to author a paper entitled *Fischer-Tropsch synthesis over model iron catalysts supported on carbon spheres: The effect of iron precursor, support pretreatment, catalyst preparation method and promoters*, which appeared in the journal *Applied Catalysis A: General*. The article was co-authored by Prof. Neil Coville, Dr Haifeng Xiong, Mahluli Moyo and Myriam Motchelaho from the School of Chemistry and Dr Linda Jewell from the School of Chemical Engineering. The paper highlights the fact that the Fischer-Tropsch process is still of great importance to South Africa.

Catalysis Today

Co-directors of the Centre of Material and Process Synthesis, Profs. Dianne Hildebrandt and David Glasser, co-authored an article with Tumisang Seodigent, David Milne and Brendon Hausberger that was published in the journal *Catalysis Today*. The title of the article is *The oxidative dehydrogenation of n-butane in a differential side-stream catalytic membrane reactor*.

The synthesis of butenes and butadiene from the oxidative dehydrogenation of *n*-butane is a chemical reaction of economic relevance and the choice of catalyst is of considerable importance. In this simulation exercise a V/MgO catalyst in a differential side-stream catalytic membrane reactor was studied.

The Recursive Convex Control algorithm was used to determine the operating parameters required to determine the maximum yields of hydrocarbon products. The algorithm, in addition to selecting for the duty a single differential side-stream catalytic membrane reactor in preference to a Continuous Stirred Tank Reactor and a Plug Flow Reactor, also developed the profile for the optimal addition of oxygen along the length of the reactor. The maximum yield of butenes, all three isomers, was found to be 0.119 carbon mass fraction.

The maximum yield of butadiene from the ODH of *n*-butane was found to be 0.799 carbon mass fraction. The rates of formation of hydrocarbon reactants and products are discussed. Statistical analyses of the ratios of formation rates of the butene isomers and of carbon dioxide to carbon monoxide are presented. The interplay between alternative reaction routes for the formation of butadiene is reviewed as well as the validity of the kinetic data at low oxygen partial pressures.

Tetrahedron

Dr Jewell and Sanyasi Sitha from the School of Chemical and Metallurgic Engineering co-authored an article entitled *Non-catalytic hydromination of alkenes: A computational study* which was published in the journal *Tetrahedron*.

The detailed reaction profiles of the neutral-neutral as well as the cation-neutral direct hydroamination reactions between ethylene and ammonia are analysed using MP2 (Full)/6-31++G(2df,2p) and B3LYP/6-31++G(2df,2p) methodologies.

Analysis shows that both neutral-neutral, as well as the cation-neutral reactions are exothermic and the latter is >100 kJ/mol more exothermic than the former. Calculations show that a very large barrier height (>200 kJ/mol), and very

large negative reaction entropy prevent the neutral-neutral reaction from proceeding in the forward direction.

Analysis of the cation-neutral reaction, which is barrierless (the transition state is more stable than the reactants) and highly exothermic, indicates that the direct hydroamination reaction is thermodynamically attainable via a cation-neutral reaction pathway without a catalyst. Their calculations also suggest that although the cation-neutral direct hydroamination reaction is very fast, the cation of either ethylene or ammonia goes through a structural relaxation process before reacting with the other neutral reactant.

Composites Part A: Applied Science and Manufacturing

Composites Part A-Applied Science and Manufacturing – Effect of processing conditions on the mechanical and water absorption properties of resin transfer moulded kenaf fibre reinforced polyester composite laminates is the name of an article co-authored by Prof. Ratnam Paskaramoorthy, Stefan Rassmann and Robert Reid from the School of Mechanical, Industrial and Aeronautical Engineering.

The article was published in the journal *Composites Part A: Applied Science and Manufacturing* and focuses on the mechanical and water absorption properties of kenaf fibre reinforced polyester laminates manufactured by resin transfer moulding.

Varying processing conditions were considered as alternatives to fibre treatments, thereby potentially avoiding additional cost and complexity in the manufacturing process. Laminates were produced by altering fibre moisture content, mould temperature and mould pressure following injection.

Tensile, flexural, impact and water absorption tests were conducted. Processing conditions were found to have little effect on properties except for pressurisation which increased tensile and flexural strength and decreased water absorption at low fibre volume fractions. Examinations using a scanning electron microscope showed that all the laminates failed by fibre pull-out.

Health Sciences

Researchers in the Faculty of Health Sciences published a number of articles in some of the highest ranked journals in the world, including the *New England Journal of Medicine* and *The Lancet*.

New England Journal of Medicine

Drs Fransesca Conradie and Lerato Mohapi, researchers in the Clinical HIV Research Unit, co-authored an article entitled *Antiretroviral therapies in women after single-dose nevirapine exposure*.

The researchers enrolled 241 women, infected with the human immunodeficiency virus type 1 (HIV-1), whose CD4+ T-cell counts were below 200 per cubic millimeter and who either had or had not taken a single-dose nevirapine for at least six months, in a trial to test the efficacy of antiretroviral therapy (ART) with tenofovir-emtricitabine plus nevirapine as opposed to tenofovir-emtricitabine plus lopinavir boosted by a low dose of ritonavir.

They found that in women with prior exposure to peripartum single-dose nevirapine (but not in those without prior exposure), ritonavir-boosted lopinavir plus tenofovir-emtricitabine was superior to nevirapine plus tenofovir-emtricitabine for initial antiretroviral therapy.

Prof. Glenda Gray, Director of the Perinatal HIV Research Unit, and Dr Guy de Bruyn, Project Director, co-authored an article entitled *Acyclovir and transmission of HIV-1 from persons infected with HIV-1 and HSV-2*. The article reported the findings of a trial investigating the effectiveness of daily acyclovir therapy to reduce the risk of transmission of HIV-1.

Most persons who are infected with human HIV-1 are also infected with herpes simplex virus type 2 (HSV-2), which is frequently reactivated and is associated with increased plasma and genital levels of HIV-1.

Findings indicate that daily acyclovir therapy did not reduce the risk of transmission of HIV-1, despite a reduction in plasma HIV-1 RNA of 0.25 log copies per millilitre and a 73% reduction in the occurrence of genital ulcers due to HSV-2.

The Lancet

Prof. Shabir Madhi, Executive Director: National Institute for Communicable Diseases: Division of the National Health Laboratory Service, Professor of Vaccinology and Department of Science and Technology/National Research Foundation Research Chair in Vaccine Preventable Diseases, co-authored an article entitled the *Effect of human rotavirus vaccine on severe diarrhea in African infants*.

The authors focused on the findings of a trial to assess the efficacy of the rotavirus vaccine in African children. Rotavirus is the most common cause of severe gastroenteritis among young children worldwide.

Researchers found that although the vaccine efficacy was lower in Malawi than in South Africa (49.4% vs 76.9%), the number of episodes of severe rotavirus gastroenteritis that were prevented was greater in Malawi than in South Africa (6.7 vs 4.2 cases prevented per 100 infants vaccinated per year).

Madhi also co-authored an article that appeared in *The Lancet* entitled the *Global burden of acute lower respiratory infections due to respiratory syncytial virus in young children: A systematic review and meta-analysis*.

In this article, Madhi and his fellow authors focused on the global burden of disease attributable to respiratory syncytial virus (RSV), which is still unknown. The researchers aimed to estimate the global incidence of and mortality from episodes of acute lower respiratory infection (ALRI) due to RSV in children younger than five years in 2005.

They found that between 66 000 and 199 000 children younger than five years died from RSV-associated ALRI in 2005, with 99% of these deaths occurring in developing countries.

Prof. Ian Sanne, Director of the Clinical HIV Research Unit, co-authored two articles that appeared in *The Lancet*. The first is *The Scale-up of services and research priorities for diagnosis, management, and control of tuberculosis: A call to action* and the second is entitled *Nurse versus doctor management of HIV-infected patients receiving antiretroviral therapy: A randomised non-inferiority trial*.

In the first article, the authors call on national governments and organisations to support the efforts of non-governmental organisations and others to develop creative and new strategies to halt the spread of tuberculosis (TB) by 2015 and to begin to reverse the worldwide incidence. After the introduction of standard control practices in 1995, 36 million people were cured and about six million deaths were averted. The authors also appealed to governments to fund their own programmes.

In the second article, Sanne and his co-authors compared outcomes of nurse versus doctor management of ART care for HIV-infected patients. A randomised non-inferiority trial was undertaken at two South African primary-care clinics. The researchers found that 371 (46%) patients reached an endpoint of treatment failure: 192 (48%) in the nurse group and 179 (44%) in the doctor group.

Prof. Frederick Raal, Head of the Division of Endocrinology and Metabolism and Director of the Carbohydrate and Lipid Metabolism Research Unit, co-authored an article entitled *Mipomersen, an apolipoprotein B synthesis inhibitor, for lowering of LDL cholesterol concentrations in patients with homozygous familial hypercholesterolaemia: A randomised, double-blind, placebo-controlled trial.*

This study reported the efficacy of a novel cholesterol lowering drug, mipomersen that reduces LDL cholesterol by about 25% in patients who have homozygous familial hypercholesterolaemia.

The latter is an inherited disorder characterised by markedly elevated LDL cholesterol and poses a high risk of early cardiovascular disease and, if untreated, death often before the age of 30 years.

Gray and De Bruyn joined forces with their fellow authors to pen *Daily acyclovir for HIV-1 disease progression in people dually infected with HIV-1 and herpes simplex virus Type 2: A randomised, placebo-controlled trial.*

The aim of their article was to investigate the effect of acyclovir on HIV-1 progression. They found that the role of suppression of herpes simplex virus type 2 in reduction of HIV-1 disease progression before initiation of antiretroviral therapy warrants consideration.

Humanities

In the Department of History, Prof. Peter Delius attracted attention with his article entitled *Recapturing captives and conversations with 'cannibals': In pursuit of a neglected stratum of South African history.*

The article, which appeared in the *Journal of Southern African Studies*, argues that the role of captives in African society has been neglected despite there being sufficient evidence to explore the issue in some depth.

Our understanding of important dimensions of the historical experiences of women and children, and of vital power dynamics in decisive phases of social transformation is limited as a result, says Delius.

He uses this perspective to re-analyse the 'cannibal narratives', which he describes as 'a tantalising yet intractable form of evidence'.

He ends his article by suggesting that the silences within oral traditions, Africanist sensibilities, structuralist approaches to slavery, and the particular form of the 'mfecane' debate have all contributed to the failure to engage with this topic effectively.

Dr Loren Landau, Director of the Centre for Forced Migration Studies, published his thought provoking article entitled *Loving the Alien? Citizenship, law and the future in South Africa's demonic society.* The article appeared in *African Affairs* 109 and focuses on the widespread xenophobia attacks that attracted worldwide attention in 2008.

In this article, Landau tries to make sense of the violence. He describes how decades of discursive and institutional efforts to control political and physical space have generated two demons with which the country must now contend.

South African political leaders face a dilemma, whether to extend legal identities and constitutionally promised protections to outsiders and other foreigners at the risk of being seen as betraying the national project by the 'demonic and visibly violent society they have helped create'.

Veerle Dieltiens, a researcher in the Education Policy Unit co-authored an article that appeared in *The Lancet* entitled *The Millennium Development Goals: A cross-sectoral analysis and principles for goal setting after 2015*.

Dieltiens and his co-authors investigated the progress that has been made in terms of the Millennium Development Goals (MDGs), aimed at reducing poverty. They found that while progress in achieving some goals has been impressive, global targets will not be met in some regions, particularly in sub-Saharan Africa and south Asia. They suggest a set of principles by which development could be achieved.

Science

Nature and *Science* are two of the most prestigious international journals in the natural science community. A number of researchers in the Faculty of Science published articles in these and other high ranking journals during 2010.

Dr Sonja Webb from the School of Geosciences co-authored an article entitled *Diamonds sampled by plumes from the core-mantle boundary*, which was published in *Nature*. Read more about this research on page 150.

Prof. Lee Berger, Reader in Human Evolution and the Public Understanding of Science in the Institute for Human Evolution, and Prof. Paul Dirks, former head of the Wits School of Geosciences, and now from James Cook University and a researcher in the Wits School of Geosciences, both published articles in *Science*.

Berger co-authored an article entitled *Australopithecus sediba: A new species of Homo-like Australopithecus from South Africa*, while Dirks and his fellow authors' article was entitled *Geological setting and age of Australopithecus sediba from southern Africa*. Read more about this discovery on page 152.

Deputy Director of the Bernard Price Institute for Palaeontological Research, Prof. Marion Bamford, co-authored an article entitled *the Early hominin diet included diverse terrestrial and aquatic animals 1.95 Ma in East*

Turkana, Kenya, which was published in the *Proceedings of the National Academy of Sciences of the United States (PNAS)*.

The paper in PNAS is a good example of multidisciplinary research looking at several lines of evidence to show that early hominids consumed red meat as well as turtles, crocodiles and fish, and that they lived in a well wooded environment. The latter evidence is provided by the fossil woods identified by Bamford.

Well-known physicist, Prof. Robert de Mello Koch co-authored an article in the *Journal of High Energy Physics* entitled *Hints of integrability beyond the planar limit: Nontrivial backgrounds*.

Integrable field theories have an infinite number of conservation laws that allow the exact solution of the theory, explains De Mello Koch.

This article argues that strings moving in a large class of supersymmetric spacetimes are integrable by demonstrating new non-trivial conservation laws. The importance of the result is that it gives new non-trivial examples of stringy dynamics that can be studied rather completely.

Drs Kevin Goldstein and Dimitrios Diataganas, both from the School of Physics, published articles in the *Journal of High Energy Physics*. Their articles were entitled *Holography of charged dilaton black holes* and *On the non-BPS string solution in Sasaki-Einstein gauge/gravity duality* respectively.

In their paper on black holes, the authors studied several aspects of charged dilaton black holes with planar symmetry in $(d+2)$ -dimensional space time and revisited the exact solutions with both zero and finite temperature and discussed the thermodynamics of the near-extremal black holes.

Diataganas and his team present an extensive analysis on several string solutions in Sasaki-Einstein manifolds in their article and find some interesting properties of their energy-spin relations. These findings are useful in the context of the gauge/gravity dualities.

Researchers in the School of Chemistry published an article in the *Journal of Inorganic Chemistry* with Dr Alvaro de Sousa as the lead author. The title of their article was *Amino-alcohol ligands: Synthesis and structure on N,N'-bis (2 hydroxycyclopentyl) ethane-1,2-diamine and its salts, and an assessment of its fitness and that of related ligands for complexing metal ions.*

According to De Sousa, predisposition of reinforced β -amino alcohol ligands towards metal ion chelation is investigated through analysis of their conformational space. Conformations adopted by solution structures show intramolecular interactions may contribute towards ligand pre-organisation and fine tune metal complex stability.

Prof. Allan Wilson in the School of Geosciences co-authored an article entitled *The Tongde dioritic pluton (Sichuan, SW China) and its geotectonic setting: Regional implications of a local-scale study* in the journal *Godwana Research*.

The geological setting of the western part of the Yangtze craton (western China) is important in understanding plate tectonics and continental accretion in the NeoProterozoic (c. 800 Million years ago). Accurate dating and geochemistry by Wits researchers of the Tongde intrusive complex have established the timing and composition of intrusions and metamorphism indicating an extensive arc-type setting and subduction in that area.

Dr Lewis Ashwal and Wilson joined forces to co-author an article entitled *New evidence for a volcanic arc on the western margin of a rifting Rodinia from ultramafic intrusions in the Andriamena region north-central Madagascar.*

The article was published in *Earth and Planetary Science Letters* and focused on Precambrian ultramafic rocks in central Madagascar. Their research involved high-precision measurements of Platinum-Group Elements (PGE) including Osmium, Iridium, Ruthenium, Rhodium, Platinum, Palladium and Gold in the rocks.

The results show a marked depletion in Ruthenium relative to the other PGE, which is only possible in the products of subduction zones at continental margins, like that of the

present-day volcanically active Andes of South America or of Alaska.

This indicates that such a subduction zone existed at the edge of the supercontinent Rodinia, where Madagascar lay at 750 million years ago.

Head of the School of Geosciences, Prof. Roger Gibson, was one of the co-authors of the article entitled *Origin of large-volume pseudotachylite in terrestrial impact structures*. The article was published in the journal *Geology*.

Using detailed outcrop-scale geometric analysis of pseudotachylite dykes from the Vredefort and Sudbury impact structures, this paper proposes that voluminous melts derived by shock and/or frictional processes during large impact events are highly mobile, migrating into dilational sites formed during collapse of the impact structure.

Dr Barend Erasmus in the School of Animal, Plant and Environmental Sciences, co-authored an article in the journal *Diversity and Distributions*. The article was entitled *Getting the most out of atlas data.*

The aim was to review some of the applications in ecology and conservation biogeography of datasets derived from atlas projects. The authors discuss data applications and data quality issues and suggest ways in which atlas data could be improved. They concluded that atlases have an important role to play in biodiversity conservation and ideally should aim to offer reliable, high quality data that can withstand public, scientific and legal scrutiny.

Major grants boost Wits' research capacity

Several researchers managed to secure major grants amounting to more than R100 million in support of their research projects. The projects that benefitted included research on African rock art, the establishment of a Centre for Creative Arts of Africa, testing the effectiveness of influenza vaccines and the establishment of the Global Change and Sustainability Research Institute, one of six research institutes envisaged by Wits within the next decade.



Faculty of Health Sciences

Respiratory and Meningeal Pathogens Research Unit

The largest grant ever received by Wits, in excess of R80 million over a four year period, was donated to the Respiratory and Meningeal Pathogens Research Unit (RMPRU) by the Bill and Melinda Gates Foundation at the end of 2009.

The team at the RMPRU who will be responsible for the research is led by Prof. Shabir Madhi, who holds a Department of Science and Technology/National Research Foundation South African Research Initiative Chair in Vaccine Preventable Diseases and is the Co-director of the Medical Research Council's Respiratory and Meningeal Pathogens Research Unit.

The grant was awarded after the Unit competed successfully against

several other applicants to evaluate whether the vaccination of pregnant women with inactivated influenza vaccine is able to protect their young infants from developing influenza illness, explains Madhi.

The rationale was that the influenza vaccination of the mother would induce a maternal antibody that would be transferred to the fetus in-utero and confer protection on the young infant.

Influenza vaccination of young infants is not feasible because of their immature immune system. The grant will examine the effect of this strategy in HIV-infected and HIV-uninfected women and is being led by Madhi in collaboration with other local and international investigators.

Internal Medicine

Prof. Yosuf Variava, Chief Specialist in the School of Clinical Medicine, announced that they received a grant of more than R4 million from the

Carnegie Foundation for the advancement of teaching.

The grant is part of a bigger project spearheaded by Prof. Andrew Crouch, Dean of the Faculty of Science and Prof. Helen Laburn, Dean of the Faculty of Health Sciences. The project is entitled *Building the Next Generation of African Scholars*.

The grant totalling R16 million was awarded for a period of two years, with an option to renew it for another two years. The award focuses on the fields of Academic Medicine and Global Change Research (based in the Faculty of Science), building on existing research strengths and addressing institutional priorities and needs, while also looking outward to African partners. It supports Wits' Vision 2022 to train and retain young excellent researchers, and attract distinguished scholars.

According to Variava, whose department received 43% of the grant, the money will be used to fund the studies of four doctoral students.

Faculty of Humanities

Centre for Creative Arts of Africa

The Wits Research Office and the Wits School of Arts (WSOA) joined forces to establish a Centre for the Creative Arts of Africa (CCAA) after a grant worth R6.4 million was received from the Andrew W. Mellon Foundation for this purpose, says Prof. Anita Nettleton, Head of the Wits Art Museum (WAM).

This Centre will be positioned as a

research entity physically located in the WAM, but managed by the WSOA. The grant makes provision for a chair, two postdoctoral students per year and a researcher for four years.

The Centre will offer a research focus that will enable artists to place their own work in historical or theoretical perspective when working on installations, performance and other contemporary modes cutting across traditional boundaries. It will also focus on postgraduate teaching.

While the Centre will provide a platform for public events in the arts, and will facilitate linkages between Wits and arts communities and institutions nationally and internationally, its primary focus will be on academic research, says Nettleton.

This will be rooted in an understanding that Wits' renowned African art collections will provide the foundation for investigating both historical and modernist forms of African arts.

In line with the Wits 2010 drive to be one of the top-100 universities by 2022, the research outputs of the CCAA at Wits and the WAM will include not only exhibitions and associated, refereed, catalogue essays, but also, colloquia, accredited journal articles and books.

Centre for Indian Studies in Africa

A grant of R8 million over a period of five years was awarded to the Centre for Indian Studies (CISA) in Africa by the Andrew W. Mellon Foundation.

The grant was made on the basis of

the excellent work that the Centre had been conducting under Prof. Isabel Hofmeyr on histories of circulation in the Indian Ocean in the early modern and modern period, says Prof. Dilip Menon, Director of the Centre.

The Centre's research focuses on the histories of the global south looking at the historical and contemporary connections between Asia, Africa, the Middle East and Latin America.

Menon was appointed as the Mellon Chair in Indian Studies and has since been joined by three postdoctoral students and one doctoral candidate. The three postdoctoral students are Dr Rebecca Walker (University of Edinburgh), who works on violence and memory in modern Sri Lanka; Dr Madhumita Lahiri (Duke University), who works on literary modernisms in the Global South and Dr Heloise Finch Boyer (University of Michigan), who does research on the island of Reunion. The doctoral candidate, Nisha Mathew, is writing her dissertation on the history of Dubai as a centre for the flows of international capital and labour.

Faculty of Science

Rock Art Research Institute

The aim of this project is to engage high calibre university graduates in targeted research on issues relating to African rock art as part of their chosen higher degree projects, explains Prof. Benjamin Smith, Director of the Rock Art Research Institute (RARI).

Students will be chosen from across the postgraduate spectrum and from

not produce 'commissioned reports' where the researcher has no personal interest in the work and engages with it on a superficial, strictly commercial, basis.

"In this project, every student will conduct research as a fundamental part of a degree that will be crucial to their personal career development and in a topic in which they had already expressed research interest before the initiation of this project. "

This project is something of a research experiment in itself, to see if contract research can be incorporated as an integrated component within higher degrees. There are many potential advantages to this approach:

- Project funding is used to support students and therefore a by-product is the development of future African professionals; and
- A high standard of publishable output is guaranteed. This standard is expected of all postgraduate theses at leading

universities. A strict time framework will be adhered to as students must complete all work within tight and regulated deadlines.

Five research projects will be conducted within this programme:

Project 1: Reconciling Community custodianship and Nationally Legislated Heritage Management Practices.

Project 2: When does local living heritage qualify to become World Heritage and how should it be managed when it does?

Project 3: Approaches to monitoring and managing African heritage sites in conflict zones so as best to mitigate potential threats to the sites.

Project 4: A risk analysis of the effects on global warming on Drakensberg sandstones.

Project 5: Rock Art and the Living Landscape at Kondoa, Tanzania.

57% of the grant made available to the University by the Carnegie Foundation for the advancement of teaching, says Dr Barend Erasmus from the School of Animal, Plant and Environmental Sciences and a member of the Climate Systems Analysis Group.

Apart from helping to manage the GCSRI, the grant will be used to support 21 doctoral students and two postdoctoral fellows. There is also a strong emphasis on developing an interdisciplinary community of practice to deal with the unique challenges that global change presents to researchers and includes focused courses and structured seminars.

Lessons learnt from the implementation of the Carnegie grant will support the development of Wits' institutional strategy to develop young academics, adds Erasmus.

The grants contribution to the Global Change Research Thrust, together with complementary fundraising efforts by Professors Mary Scholes, Coleen Vogel and Crouch, have resulted in total funding of R27 million towards the establishment of the GCSRI.

Global Change and Sustainability Research Institute

The Global Change and Sustainability Research Institute (GCSRI) received



CENTRAL SERVICES

strengthens Wits' research capacity

Wits has five units that offer professional research support to all schools and departments at the University. The services range from teaching staff and students how to humanely use animals when they conduct research to ensuring that the rules and regulations relating to the Hazardous Substances Act of 1973 are adhered to by users of radioactive material. It includes overseeing the erection of the multimillion rand Wits Art Museum and the acquisition of a Scanning Electron Microscope combined with a Focused Ion Beam, which is unique to Wits.

These services are provided by the Central Animal Service, the Radiation and Health Physics Unit, the Wits Art Museum and the Microscopy and Microanalysis Unit. The fifth unit, known as Central Optics, is a small concern servicing and repairing optical microscopes.

Central Animal Service

The Central Animal Service is made up of two laboratory animal units and provides professional support to all departments involved in biomedical and scientific research and teaching using animals.

The primary objective of the unit, headed by Dr Leith Meyer, is to provide a professional service which assists in the advancement of scientific knowledge with the aim of improving the understanding and quality of life of both humans and other animals.

The Central Animal Service strives to provide the highest quality of animal husbandry and veterinary expertise to all animals in its care. It also strives to ensure that stringent ethical standards are followed and that all animals' behavioural and welfare needs are met.

In 2010 the Central Animal Service supported a diverse range of

research on a diverse range of species both in the field and in the laboratory.

In the field, research on the ecology, behaviour and thermoregulation of vervet monkeys, puff adders and African rock pythons was supported.

In the laboratory support was provided to research on novel drug delivery systems, Hepatitis B virus, bone morphogenesis, chronic wound healing, fever in birds and mammals, hypertension, heart failure, HIV vaccine development, gastrointestinal physiology, post-operative pain, pain mechanisms, and the mechanisms of thermoregulation. Research on the behaviour and biology of a number of wildlife species that were housed in the laboratory was also supported.

The Central Animal Service also supported a number of teaching activities for both undergraduate and postgraduate students and professionals. Undergraduate teaching support consisted mainly of dissections and the studies of organogenesis and embryology.

Postgraduate teaching support focussed on surgical training courses which are designed to improve the skills of human surgeons in emergency and trauma situations.



Radiation and Health Physics Unit

The Director of the Unit is appointed as the "Responsible Person" as identified in the Hazardous Substances Act 1973, sections 111 and IV, and is responsible for ensuring that all the rules and regulations relating to the Act are known and adhered to by all users of radioactive material and various pieces of machinery identified in the Act, generally apparatus capable of producing ionizing radiation, some laser products and certain items that produce non-ionizing radiation.

The basic aim of the Unit, under the directorship of James Larkin, is to achieve the following objectives:

- To limit the health hazards arising from the use of radiation and radioactive material;
- To prevent the radioactive contamination of properties and the environment; and
- To ensure that radioactive waste and effluent are disposed of safely.

Aside from the statutory role of the Unit, there is a small group of students who are working on a number of radiation protection and nuclear power generation related topics at masters and doctoral levels.

During the 2010 Fédération Internationale de Football Association (FIFA) Soccer World Cup, the Unit, as part of a larger team put together by the South African Nuclear Energy Corporation on behalf of the Department of Energy, ran security teams searching for illegally held radioactive material at both OR Tambo International Airport and the Ellis Park venue.

This involved searching every venue prior to and on match-day and scanning every single person and vehicle that entered any of the venues. In addition any international travellers arriving from Cape Town and Durban International

Airports or other Johannesburg airports, were screened for illicit radioactive material.

Wits Art Museum

Much of 2010 was concerned with the construction of the new Wits Art Museum (WAM), says Julia Charlton, senior curator.

Approximately R39-million was raised to build the first phase of the 5 000 m² museum, located on the corner of Jan Smuts Avenue and Jorissen Street in Braamfontein, where the University shakes hands with the city.

Phase 1 provides the structure of the Museum, a fully climate-controlled, secure home for the University's unique 9000-plus-piece African art collections and beautiful galleries within which art can be displayed.

Ancillary spaces include a coffee shop, offices, meeting rooms and a library. Fundraising continues to secure the balance of funds required to complete the project.

Phase 1 is scheduled for completion in 2011. The collections will be moved from their current storage into their new location in 2011 and the Museum will officially be opened in 2012.

The Museum will be an environment for creative growth through the dynamic showcasing, interpretation and curating of original artworks and art making, says Charlton.

Considerable value will be added to school learning areas of art and drama by offering input into the enhancement of school syllabi, supporting teaching through the development of focused materials and providing programmes for school learners to interact with real art.

The Museum will enable University constituencies to access original artworks for core teaching activities and offer a valuable public interface. As part of the urban renewal of Johannesburg, the museum's exciting exhibitions will attract the public and tourists to experience the joy of real African art for all.

In 2010 funding was received from the Andrew W. Mellon Foundation for the establishment of a Centre for the Creative Arts of Africa, a research entity located in the WAM.

Provision is made for a Chair, two postdoctoral students per year and a researcher within the Centre for four years. In conjunction with the Wits School of Arts and other schools, the Centre will create a unique opportunity to expand the research potential of the African art collections of the WAM, which will provide the foundation for investigating both historical and modernist forms of African arts.

The Centre will also provide a platform for public events in the arts such as symposia and lectures, and will facilitate linkages between Wits and arts communities and institutions nationally and internationally. Research into historical and contemporary traditions of art making in Africa will be fed into the community in many ways.

A total of 300 artworks were acquired by the WAM in 2010. Of these new acquisitions, 43 were acquired for the Standard Bank African Art Collection, seven as donations from Standard Bank and the balance with the Standard Bank annual purchasing grant, which was increased in 2010.

Nine were acquired with the purchasing grant allocated by the University and the remaining 258 works were acquired as donations to the University's collections. A special exhibition and accompanying catalogue were commissioned to coincide with the 2010 FIFAr World Cup.

Halakasha!, an exhibition featuring a wide range of African interpretations and responses to the global phenomenon of soccer and the passion it evokes, was held at the Standard Bank Gallery in 2010 and was described as "the best visual art experience for 2010" in the Sunday Times (26 December 2010).

Microscopy and Microanalysis Unit

The Microscopy and Microanalysis Unit (MMU) has strengthened its efforts and capabilities to facilitate and support research in the nanosciences and nanotechnology – a path it has chosen to pursue in recent years. Electron microscopy has always been an indispensable experimental tool, able to interrogate the structure of matter at the smallest possible scale.

The MMU has, in the past few years, expanded its instrumental capabilities considerably, encompassing two

powerful Transmission Electron Microscopes (TEM) and two highly versatile Scanning Electron Microscopes (SEM).

These instruments are able to reach spatial resolutions down to four Angstroms in the TEM and highest chemical sensitivity using state-of-the-art Electron Dispersive Spectroscopy (EDS) instrumentation.

The SEMs available allow performing characterisation not only at high vacuum, but also at much lower levels enabling slightly humid and gaseous environments inside the specimen chamber by using a differential pumping setup.

Furthermore, the DualBeam configuration of a SEM combined with a Focused Ion Beam (FIB) allows micromachining of the sample under investigation, while it is inside the microscope. Sample preparation, cutting, slicing, deposition, and manipulation can be done, all inside the microscope under vacuum conditions. These capabilities are now unique to Wits and its scientific staff.

The scientific work performed at the MMU in 2010 involved primarily the nanosciences in the chemistry, chemical engineering and physics departments. Carbon nanotubes, quantum dots, catalysts, and nanoparticles with a variety of chemical composition, shape and form were investigated using the instrumentation available at the MMU.

Analogous microscopy work on biological, geological and archaeological samples was also performed. The goal set for the coming year is to include all engineering and science departments as users of this central university facility. To achieve this, the MMU is on a course to expand the instrumental capabilities as well as the user base.

Prof. Michael Witcomb retired at the end of 2010. Prof. Alexander Ziegler has been appointed as the new Director.



Prof. Michael Witcomb

NRF A-rated researchers

The University of the Witwatersrand was home to 14 National Research Foundation (NRF) A-rated researchers during 2010. Their research interests include the development of thermodynamic tools, reduce carbon emissions, shock and acoustic waves, the development of strategies and vaccines to fight the pneumococcus bacterium, the effects of climate change on mammals, teacher education and the impact of history on societal change, the travelling book, light scattering, unlocking the secrets hidden in San rock art and mega-herbivores.

ENGINEERING AND THE BUILT ENVIRONMENT



Prof. David Glasser

Prof. David Glasser

Chemical Engineering

Prof. David Glasser is the co-founder and Co-director of the Centre of Materials and Process Synthesis (COMPS). Together with his team in the School of Chemical Engineering they developed thermodynamic tools that, once implemented into the design of an industrial plant, can lead to an increase in their efficiency and a radical reduction in carbon emissions.



Prof. Beric Skews

Prof. Beric Skews

Mechanical, Industrial and Aeronautical Engineering

Director of the Flow Research Unit, Prof. Beric Skews' groundbreaking research into how shock waves behave and why they do what they do, has earned him his A-rating. He was also instrumental in developing the aeronautical engineering degree programme at Wits in the 1970s.

HEALTH SCIENCES



Prof. Charles Feldman

Prof. Charles Feldman

Pulmonology

Prof. Charles Feldman is Head of the Division of Pulmonology at the Charlotte Maxeke Johannesburg Academic Hospital and an expert in community acquired pneumonia, a lower respiratory tract infection most commonly caused by a bacterium called the pneumococcus. Feldman and his team are particularly interested in studying the way that pneumonia comes about, the risk factors for pneumococcal infection and the way that this bacterium interacts with its human host.



Prof. Keith Klugman

Prof. Keith Klugman

Infectious diseases

Prof. Keith Klugman, Co-director of the Respiratory and Meningeal Research Unit (RMPRU) is the world's leading expert on antibiotic resistance in the pneumococcus. Klugman and his team's research focuses on the relationship between the burden of disease in very young children and the elderly. He has been working on the development of a pneumococcal vaccine since the 1980s and in the late 1990s led the first trials to test a vaccine designed to prevent Type 1 and Type 5 pneumonia in children - common in Africa and South America respectively. The trial showed that the vaccine prevented pneumonia in children and also protected HIV-infected children against pneumonia.



Prof. Shabir Madhi

Prof. Shabir Madhi

Vaccinology

The research undertaken by Prof. Shabir Madhi and his team in the Department of Science and Technology/NRF Vaccine Preventable Disease Unit and the Medical Research Council's RMPRU has shown that severe childhood diseases can be prevented with the help of new vaccines. In particular, the team has shown that severe pneumonia in HIV-infected and –uninfected children can be reduced substantially with pneumococcal conjugate. In addition, the team, and other investigators, determined the efficacy of the rotavirus vaccine in preventing severe diarrheal illness. The research led to South Africa becoming the first country on the continent to introduce these new vaccines into the public immunisation programme – resulting in the of saving thousands of lives.

Prof. Duncan Mitchell

Physiology

Prof. Duncan Mitchell in the Department of Physiology is currently considered one of the world's leading experts on thermal physiology. Together with Prof. Helen Laburn, Dean of the Faculty of Health Sciences, Mitchell set up the Brain Physiology Research Programme, forerunner of the Brain Function Research Group in 1978. The Group's mandate was research that focused on physiological functions regulated by the brain, namely fever, pain and sleep. He is currently involved in research on global warming and the future of big mammals. The objective of his research is to establish whether the big mammals that are being threatened by global warming have latent physiological talents that will help them to survive. This research is extremely important for South Africa, says Mitchell, because one study predicts that 67% of all the species in the Kruger National Park will become extinct as a result of climate change.



Prof. Duncan Mitchell

Prof. John Pettifor

Paediatrics

During his time as an intern and registrar, Prof. John Pettifor, Head of Paediatrics at the Chris Hani Baragwanath Hospital in Soweto, says that it was generally accepted that nutritional rickets was caused by vitamin D deficiency. Pettifor questioned this and after an extensive study, ruled it out of the equation. He proceeded to treat children with rickets with calcium supplements and they immediately showed improvements. This novel research finding established Pettifor as one of the world's leading experts in rickets. When rickets became an almost obsolete disease in South Africa, Pettifor switched his attention to the study of paediatric and adult bone diseases as well as the investigation of basic pathophysiological mechanisms of various aspects of bone and mineral metabolism.



Prof. John Pettifor

HUMANITIES

Prof. Jill Adler

Education

Prof. Jill Adler is recognised worldwide as one of the leading experts in mathematics education research. Adler was one of the first researchers in the world to investigate mathematics teaching and learning in multi-lingual classrooms and today her pioneering work in this field remains influential internationally. Her book, entitled *Teaching Mathematics in a Multilingual Classroom*, was published in 2001 and has been used by a number of universities in the United States (US), Canada and the United Kingdom (UK). Her initial research on mathematics learning in multilingual classrooms was premised on a shift in the conceptualisation of language as a problem to seeing it as a resource that could be used in the classroom.



Prof. Jill Adler



Prof. Belinda Bozzoli

Prof. Belinda Bozzoli

Sociology

Prof. Belinda Bozzoli, Deputy Vice-Chancellor: Research, is the only sociologist in the country who has been awarded an A-rating by the NRF. She enjoys worldwide recognition as an historical sociologist and two of her sole-authored books have been published internationally. They are used extensively locally and by universities in the US and Europe. Her book *Women of Phokeng: Consciousness, Life Strategy, and Migrancy in South Africa, 1900 – 1983* was published in 1991 and earned her the Human Sciences Research Council's Top Researcher Award. *Theatres of Struggle and the End of Apartheid* was published in 2004. The common thread between these two books and much of her other work is the degree to which poor people are able to adapt their thinking and to devise mechanisms that allow them to cope with their circumstances.



Prof. Isabel Hofmeyr

Prof. Isabel Hofmeyr

Literature and Language Studies

The research which earned Isabel Hofmeyr, a professor of African Literature and a research associate in the Centre for Indian Studies in Africa, her A-rating, focused on what happens to books when they travel. She used John Bunyan's book *The Pilgrim's Progress* as the focus of her research because it is one of the world's best-selling books and has been translated into 200 languages – 80 of which are African. Her book, entitled *The Portable Bunyan: A Transnational History of the Pilgrim's Progress*, was published in 2004. The questions that she posed in her research included how a book changes when it is translated, how translators re-interpret a book as well as what they put in and what they leave out. The book also highlighted globalisation from a literary point of view.



Prof. Darrell Comins

SCIENCE

Prof. Darrell Comins

Physics

Prof. Darrell Comins, Leader of the Optical Spectroscopy Laboratory, is one of the world's leading experts on optical spectroscopy of solids – the study of the properties of materials by means of their interactions with light. His main research interest is experimental physics, which combines various facets of the subject ranging from theoretical understanding to the design and construction of equipment to test new concepts and to perform challenging measurements. Over the past 40 years he has been involved in research on the application of optical and laser-based spectroscopic techniques, providing powerful, non-contact ways of determining materials properties. He has conducted experimental and theoretical work in the fields of radiation effects that have led to the understanding of the mechanisms of defect creation and stabilisation including the formation of clusters, nanostructures, ion tracks and amorphised regions. His work has pioneered the application of these techniques to high temperatures and high pressures in unique experiments and has impacted areas of industrial importance.

Prof. Arthur Every

Physics

Arthur Every, an emeritus professor in the School of Physics and world renowned expert in the field of acoustic waves, started his research career focusing on low temperature phonon imaging of crystals, a field developed by researchers based at the University of Illinois in the US. In more recent years he has increasingly directed his research to guided acoustic waves at surfaces and interfaces.



Prof. Arthur Every

Prof. David Lewis-Williams

Archaeology

David Lewis-Williams is an emeritus professor in the Rock Art Research Institute (RARI) and is considered the world's foremost authority on San rock art. He has been credited with discovering the key that unlocked the secrets of the symbolism used in San's rock art. Apart from his reputation as an expert in this field, he is also recognised worldwide for his research on European or Palaeolithic art dating back between 10 000 and 30 000 years ago. His latest book, entitled *Deciphering ancient minds: The mystery of San Bushman rock art*, co-authored with Dr Sam Challis, a researcher in the RARI, was published in 2011.

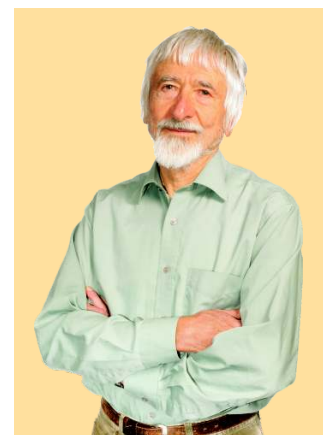


Prof. David Lewis-Williams

Prof. Norman Owen-Smith

Ecology

Prof. Norman Owen-Smith is an internationally renowned natural scientist and Leader of the Centre for African Ecology. His most significant contribution is without doubt his work on the establishment of the concept of mega-herbivores, from distinctions in the ecology of animals weighing more than 1 000 kg shared by elephants, rhinos and hippos. This was the title of one of his books, which continues to be a standard reference on the ecology of African large herbivores, and very recently he was invited to write articles on this topic both for the *Encyclopaedia of Biodiversity* and for a book on studies done in the Hluhluwe-iMfolozi Park. His earlier studies contributed to concepts of territoriality, while later he made frontline contributions to the feeding ecology of large herbivores.



Prof. Norman Owen-Smith

ETHICS COMMITTEES RESPONSIBLE RESEARCH

The University of the Witwatersrand has a responsibility to society in much of the research which it conducts. In research which directly involves people or animals, it is of paramount importance to treat the participants with respect and do nothing which would have an adverse effect on the wellbeing and health of the human participants, or cause unnecessary suffering to animals.

For this reason, many research projects require prior approval of one of the four committees described below. The respective Chairpersons of the committees describe briefly how they are constituted and what it is that they do.

Human Research Ethics Committee (Medical)

Chairperson: Prof. Peter Cleaton-Jones



Prof. Peter Cleaton-Jones

Following revelations at the Nuremburg War Crimes Trials of Nazi human research atrocities, codes of ethical behaviour in research were drawn up across the globe, the best known of which are the Nuremburg Code and the Declaration of Helsinki.

In June 1966, Dr Henry Beecher, emeritus professor of anesthesiology at Harvard Medical School, published an article in the *New England Journal of Medicine* exposing current unethical research behaviour and recommending the establishment of institutional committees to screen human research proposals to protect the rights of research participants.

Four months later, Prof. John Hansen of the Wits Paediatric Department persuaded Wits to establish such a committee. This was a decade before any other institution in South Africa did the same. Indeed, the Committee is the oldest in the southern hemisphere and one of the oldest in existence.

Applications received by the 7th of a month are normally considered at the meeting of the same month.

The Committee has some 37 members across many disciplines as well as from outside Wits. The national research ethics guidelines followed by Wits may be seen at www.witshealth.co.za. It is registered with the South African National Health Research Ethics Council and with the United States (US) Office of Human Research Protections.

The Committee must ensure that all human research undertaken by staff or students in the Faculty of Health Sciences or in hospitals by staff or students of any Wits faculty is safe, ethical, soundly based and respects individual rights.

Applications for general research are made through the Research Office on 011 717-1234 and for clinical research via www.doh.gov.za/nhrec.

Meetings are held on the last Friday of each month excluding December in the Faculty of Health Sciences board room. Attendance at the meeting is open to any Wits staff or student from 15:30 – such attendance is recognised for Continuing Professional Development points. The purpose of this is to increase knowledge of practical research ethics.

Annual application totals are typically 100 clinical trials plus 600 general research projects. About 25% of applications are approved at once (approval lasts five years and may be renewed), 70% require revision and about 5% are not approved.

Applicants are notified of the outcome of an application generally about 10 days after a meeting. Members of the committee may be contacted for advice on applications before submission. Contact details may be obtained from the Research Office.

Human Research Ethics (Non-medical) Committee

Chairperson: Prof. Robert Thornton

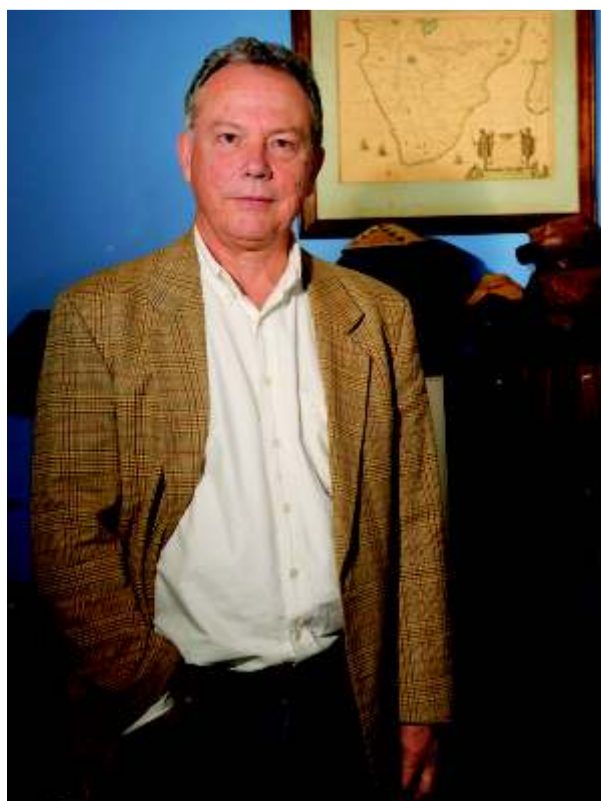
Research in the Humanities and Social Sciences takes many forms. One important source of information to researchers is of course other people and the knowledge, experiences, opinions and insights they carry around in their heads. Many research projects are based on being able to interrogate this wealth of information in all manner

of contexts, for example from topics as divergent as knowledge of AIDS transmission mechanisms to belief in witchcraft, from attitudes to saving money regularly to experiences of service delivery by government, from attitudes and behaviours towards immigrants to allegations of corruption in the public service; the list is almost endless.

The University has a duty to make sure that, in the search for information of this nature, its staff and students at all times respect their information sources, their human dignity and their physical and mental wellbeing, amongst many other considerations.

No person who voluntarily agrees to co-operate in a research project should be in any way worse off for the experience. To the contrary, he or she should be able to see that there will be some long-term benefit for society by participating. Particular regard has to be paid when soliciting information from vulnerable groups such as children, prisoners, the homeless, the disabled, the unemployed, victims of crime and others.

Prof. Robert Thornton



For these reasons, the University has a standing Human Research Ethics Committee (Non-Medical). It has separate committees for medical and animal research and biosafety.

The Human Research Ethics Committee meets monthly, under the Chairmanship of Prof. Robert Thornton, a distinguished social anthropologist, to consider applications from staff and students who wish to conduct research which, in the broadest sense, involves the interrogation of human subjects, or data held about identifiable persons or groups.

From time to time, it is also consulted by external research organisations. The Committee has built up a collective corpus of expertise which few can match in this still relatively young discipline in South Africa.

Institutional Biosafety Committee

Chairperson: Prof. Caroline Tiessemen



Prof. Caroline Tiessemen

The Institutional Biosafety Committee (IBC) was established about 10 years ago in order to review all University research involving recombinant DNA technology in accordance with the US National Institutes of Health (NIH) guidelines. Also included is research using infectious agents, or other potentially biohazardous material.

The overall purpose is therefore to identify potential risks to the safety of the general public and that of staff and students. It is essential to comply with NIH requirements, if researchers want to access US government funds. This means that the Committee must include persons with expertise in recombinant DNA and research involving human and animal subjects, botanical matters and environmental safety.

Wits also includes expertise in radiation safety, chemistry, health and safety and a range of molecular bioscientists. At least two members are required to be external to the University. The University is also required to renew its registration annually with the NIH and to keep them updated on changes to the membership.

The Committee meets to consider projects or study trials considered to have potentially significant biosafety risks, or that require Committee input into improving biosafety processes employed.

Once approved, a certificate of clearance is provided for the project, valid for five years, but with an annual review that requires a statement that no aspects pertaining to biosafety have changed from the original application. The Committee should be informed of any changes as they occur, via the Research Office.

Heads of laboratories are encouraged to submit an overarching application that outlines biosafety procedures of the laboratory in the context of the broader projects that are being conducted (as these procedures are usually the same for a particular laboratory), rather than multiple small project applications that all utilise exactly the same biosafety procedures.

This will devolve the responsibility to the laboratory heads to ensure that biosafety aspects of all student projects, or other projects, meet the expected biosafety requirements. Where funders such as the NIH and other funding agencies require approval for the particular study or trial, these are to be submitted as individual projects.

Animal Ethics Committee

The University of the Witwatersrand accepts that animal-based research and teaching is fundamental to the life sciences, but that the Institution has a responsibility to ensure that this research and teaching is conducted according to the highest possible ethical standards.

As such the Animal Ethics Screening Committee (AESC), under the guidance of the Animal Ethics Control Committee (AECC) which formulates policy and ratifies decisions made by the AESC, carries the responsibility of ensuring that all animal-related research and teaching performed by staff of Wits and their collaborators are conducted according to these ethical principles.

The AECC and AESC, which resides under the portfolio of the Deputy Vice-Chancellor: Research, largely follow the principles and practices set out by the South African National Standards for the Care and Use of Animals for Scientific Purposes (SANS 10386:2008).

The purpose of the AESC and AECC is to ensure that based on sound scientific principles, refinement of techniques limits suffering in individual animals, that as few animals as possible are employed in studies without compromising scientific relevance and that where possible, studies that do not require the use of animals are conducted in place of animal studies.

Where pain, suffering, distress or harm are unavoidable, before deciding on whether these studies will be approved, the AECC and AESC consider whether the benefits to society outweigh the suffering to animals and ensure that pain, suffering, distress or harm are kept to a minimum.

The AESC consists of experienced scientists in a variety of life science fields, veterinarians, clinicians, as well as representatives of groups concerned with animal welfare like the National Society for the Prevention of Cruelty to Animals and Nature Conservation.

Thus, the committee includes individuals with expertise related to the science of individual studies, and the veterinary care, welfare and conservation of animals. In addition, expertise exists for decisions regarding the societal importance of individual animal studies.

The AECC has a similar profile of membership, but in



addition has representation from experts in Bioethics and outside bodies that have no relationship with animal experimentation or teaching.

The AESC meets on a monthly basis and considers new applications that are submitted according to an extensive formal application form, applications for modification or extension of the original protocol, information received from investigators clarifying outstanding issues that the committee has requested, unexpected animal mortality and morbidity, and any issues related to animal experimentation or teaching.

Animal experimentation or teaching may not occur until formal approval of applications and modifications or extensions is obtained in the form of an approval certificate and the committee is satisfied with responses to requests for clarity.

COMMERCE, LAW & MANAGEMENT

Message from the Dean



The Faculty of Commerce, Law and Management continued to deliver high-quality scholarly and applied research in a range of fields. Staff produced publications in local and international journals, conference proceedings, chapters in books, academic textbooks as well as a number of high-profile scholarly books. The Faculty's research profile was further enhanced by staff members' attendance at various national and international conferences and their involvement in a wide range of applied research projects.

Graduate School of Business Administration

Research in the Wits Business School spanned themes such as brand and customer management, entrepreneurship and strategic innovation management. Particularly noteworthy has been Prof. Courtenay Sprague's involvement in a multi-disciplinary research project pertaining to HIV stigma in the workplace. Read more about her work on page 66.

Meanwhile, the School's Centre for Entrepreneurship hosted a high profile conference on researching entrepreneurship in Africa and produced a book from its proceedings. Its Director, Prof. Boris Urban, was further involved in an Entrepreneurship Education Project Panel Study, coordinated by the University of Wisconsin.

Graduate School of Public and Development Management

Research produced by the School of Public and Development Management continued to focus on themes of democracy, politics, regional security and service delivery.

Notably, the School won a World Bank bid to establish a Centre for Learning on Evaluation and Results, which is expected to produce original research and also to build research capacity in relation to performance management, monitoring and evaluation.

Moreover, activities commenced at the School's recently established Research Hub, which was set up to provide support to students engaged in the research process, as well as major research projects in the public and development arena located in the School.

The School also continued with its popular 'Wednesday Conversations' seminar series, where papers on a wide range of topics were delivered.

School of Accountancy

In addition to more 'traditional' accountancy-based research, members of the School have been involved in exciting cross-disciplinary research projects, such as an ongoing collaboration with the Wits School of Public Health, which investigates the dynamics of rural poverty and household instability in order to promote the success of rural development initiatives.

The School also remains actively involved in two long-term research projects initiated by the South African Institute of Chartered Accountants (SAICA), pertaining, respectively, to cultural variables which influence performance in the annual SAICA qualifying examinations and the efficiency of South African Sector Education and Training Authorities.

School of Economic and Business Sciences

Research in the School of Economic and Business Sciences continued to evolve around a number of clustered research programmes, the most active of which were the Corporate Strategy and Industrial Development (CSID) Programme and the African Microeconomic Research Umbrella (AMERU).

The CSID was predominantly involved itself in a variety of commissioned research projects dealing with the national and regional dimensions of industrial policy, such as research commissioned by the Department of Trade and Industry in relation to the conceptualisation, content and implementation of its Industrial Policy Action Plan, as well as the development of a framework for an Industrial Policy for Gauteng, under the auspices of the Gauteng Department of Economic Development.

The AMERU, in addition to several of its members presenting policy-based research papers at the Centre for the Study of African Economies at the University of Oxford (UK), completed a three year International Development Research Centre-funded project on African labour markets.

Funding was also secured from Treasury for a randomised study of youth labour market interventions (pertaining to training and subsidies) - the results were fed into the 2011 National Budget process. The AMERU also organised a Keynote Public Lecture by Dr Dominic Strauss-Kahn, the Managing Director of the International Monetary Fund, in mid-2010.

In November 2010, the School hosted a prestigious Economic Research Southern Africa workshop on Financial Contract Theory, which gave a state-of-the-art introduction into the theory of corporate finance to participants from across the country.

School of Law

The School of Law remains the centre of public law and human rights research in the country, and is also increasing its reputation in the fields of commercial law and international development law.

In addition to an impressive number of local and international journal publications, 2010 saw the launch of three books produced by permanent or honorary staff. They are Prof. Bonita Meyersfeld's highly acclaimed book on *Domestic Violence and International Law*, Prof. Heinz Klug's *The Constitution of South Africa: A Contextual Analysis*, and *Constitutional Deference: Courts and Socioeconomic Rights* by Dr Kirsty McLean from the Centre for Applied Legal Studies.

In July of 2010, the School hosted an international conference on the future of international criminal justice in Africa, which was attended by scholars from across the continent and beyond.

The Mandela Institute, a research centre in the School which focuses on various aspects of international economic law, further hosted a conference on globalisation and governance, while its Director, Prof. Laurence Boulle, won an award for international Alternative Dispute Resolution publications, for his book *Mediator Skills and Techniques: Triangle of Influence*.

The Institute, in partnership with the World Trade Institute and the University of Berne (Switzerland) further received a substantial research sponsorship from the Swiss government, to advance research, teaching and exchanges amongst the three institutions.

Other noteworthy accomplishments include Prof. Tracy-Lynn Humby's receipt of the University's annual award for academic citizenship, for activities connected to her research in environmental law.

Prof. Mthuli Ncube
Dean

HIV stigma and discrimination in the workplace



Prof. Courtenay Sprague

While the HIV stigma and discrimination in broader society has been fairly widely researched, there is little research about HIV stigma and discrimination in the workplace and how people living with HIV experience stigma and discrimination.

For the last decade, the Wits Business School has conducted groundbreaking, applied social research on HIV in the workplace. The research being conducted by **Prof. Courtenay Sprague**, an associate professor, investigates stigma and discrimination in the world of work in Africa.

In 2010 she conducted an international research project in this area, in collaboration with two key international partners, working across three continents: Africa, Europe and the United States.

"Together we investigated HIV stigma and discrimination as related processes in the world of work in northern, southern, eastern, western and central Africa. We examined trends from respondents across the spectrum of the world of work – from independent contractors to small and large companies," explains Sprague.

Sprague has a doctoral degree in Development Studies from Wits, a Masters degree from Boston University (US) and has held research and programme posts at Harvard University (US) and the Carnegie Corporation.

"In my research I look at the links between health and development. HIV is one of the key development challenges we face towards achieving good health in Africa, particularly in South Africa, where we live in a generalised HIV epidemic."

International collaborators

Sprague works closely with two international collaborators: Sara Simon, Manager of the international Communications and Consultation Facility of the non-governmental organisation (NGO) Delegation to the UNAIDS Board, based in Brussels, Belgium; and Laurel Sprague from Wayne State University in Michigan, who is the US representative to the Global Network of People living with HIV/AIDS, or GNP+.

Sprague also collaborates with UNAIDS on developing global stigma indicators to measure and monitor HIV stigma.

International conference

Their research on HIV stigma and discrimination in the workplace, together with other significant, cutting edge research in microbicides, safe male circumcision, women's health, tuberculosis, regional and national workplace programmes and practices, and other aspects related to HIV prevention in the world of work, was presented at the highly successful 3rd HIV/AIDS in the Workplace Research Conference which was held in Midrand in November 2010.

The conference was co-organised by the Wits Business School, the Health Economics and HIV Research Division at the University of KwaZulu-Natal and the South African Business Coalition on HIV/AIDS.

One of the objectives of this international conference was to signal the important role that university-based academics and researchers play in conducting evidence-based research on HIV in the world of work in order to inform and improve workplace policies and practices in Africa.

Project objectives

The objectives of the research conducted by Sprague, Simon and Lauren Sprague in 2010 had a number of legs.

"Firstly, we needed to research and map the trends in the workplace in terms of HIV stigma and discrimination to determine what is taking place."

"Secondly, we wanted to share and disseminate the findings of the research with all stakeholders, including employers, business people and researchers who would be interested in managing HIV in the world of work. In communicating the research we wanted to enhance understanding of the ways in which HIV stigma and discrimination persists in the workplace."

"Thirdly, we wanted to make targeted recommendations based on the findings and to contribute to efforts to respond effectively to the HIV epidemic within the world of work, especially on the African continent."

Three surveys

Three surveys were conducted to gather data for the research. They contained a range of questions about the experience of living with HIV and employment stigma and discrimination.

The first survey was a global, anonymous web survey conducted by the non-governmental organisation delegation to the UNAIDS Board in Africa, Asia and the Pacific, Europe, Latin America and the Caribbean, and North America. Of the 1 021 respondents 60% were male, 36% were female and 4% were transgender. The online survey was distributed in ten languages.

The second and third surveys were based on face-to-face interviews with people living with HIV in Kenya and Zambia conducted as part of the People Living with HIV Stigma Index (a joint project of GNP+, the International Community of Women with HIV/AIDS, International Planned Parenthood Federation and UNAIDS), and managed by the national networks of people living with HIV in each country.

A total of 1 086 people were interviewed in urban and rural districts. In Kenya 59% of the respondents were female, and in Zambia 57% were female. The rest were male. The

respondents were primarily in the prime employment ages of between 20 and 50 years.

The three collaborators managed and assessed the data from the surveys and extrapolated trends and results.

The three main questions they were trying to answer were:

1. How widespread and significant does employment discrimination based on HIV status appear to be?
2. What are the primary ways in which HIV-related stigma and discrimination manifest in the workplace, if any?
3. Given the research indicating that HIV positive individuals keep their status a secret within the workplace, what do we know about individuals' willingness to disclose their status to employers and co-workers, and when a person's status is disclosed in the workplace how do employers and co-workers respond to that information – are they supportive or not?

Findings

The findings of the three surveys indicated the following:

Finding 1: Employment discrimination based on HIV status is pervasive in every region of the world and includes forced disclosure of HIV status, exclusion in the workplace and job termination.

Finding 2: Employment discrimination based on HIV-status, particularly exclusion in the workplace and job termination, is reported in all African sub-regions surveyed.

Finding 3: People living with HIV in Kenya and Zambia report significant barriers to employment, including discrimination in hiring, loss of promotions, and job termination because of their HIV-status.

Finding 4: Wide variances exist in the percentage of HIV positive employees who disclosed their serostatus in the workplace and in the level of support versus discrimination that they experienced as a result of their disclosure.

Recommendations

If the workplace is a key location for stigma and discrimination as the findings indicate, then it follows that it can be a crucial setting for addressing stigma and discrimination. What, then, can employers and managers

do to de-stigmatise HIV and practice non-discrimination in the world of work, particularly in Africa?

Recommendation 1: Ensure equal opportunity for those living with HIV in hiring and promotions, including ending mandatory testing to ensure that HIV-status is not a barrier to obtaining a job.

Recommendation 2: Evaluate workplace practices and norms for differential or hostile treatment towards those who are living with HIV and implement HIV workplace programmes to combat stigma and discrimination.

Recommendation 3: Establish a workplace environment in which mistreatment based on HIV is not tolerated, with mechanisms for confidentially resolving complaints.

Recommendation 4: Communicate and strongly enforce legal and workplace confidentiality policies.

Recommendation 5: Establish support groups in the workplace.

Recommendation 6: Critically examine job termination procedures to rule out the possibility of discrimination.

Sprague explains that while some employers have created workplaces that provide support and employment protections for employees living with HIV, it is clear from the findings that far too many individuals work in environments that include the kinds of discriminatory practices identified in the three surveys.

Apart from contravening the law, poor workplace treatment of persons living with HIV sends a message to other employees about how they can expect to be treated should they test positive – or be perceived as being HIV positive – countering broader public health messages urging the uptake of testing and treatment services.

The research findings, apart from being presented at the conference, were published as a journal article in a special edition of the peer reviewed, internationally accredited *African Journal of AIDS Research*. Sprague and Gavin George from the Health Economics and HIV Research Division guest edited this special edition, which included selected papers from the conference, which underwent a double-blind process of expert peer review.

Seventeen years of the ANC in POLITICAL POWER



Prof. Susan Booysen

"I am a political scientist and I love South African politics. You cannot appreciate South African politics without delving into the issues in and around the African National Congress (ANC)," says **Prof. Susan Booysen** from the Graduate School of Public and Development Management (P&DM).

In 2009/2010 Booysen's primary research project was her book *The ANC and the Regeneration of Political Power* published by Wits University Press in September 2011.

"My research explores the ANC's power quest – its continuous consolidation and regeneration of political power amidst changing conditions – in its 17 years as the ruling government, 1994-2011," explains Booysen who describes this period as a crucial yet under-explored part of the ANC's first 100 years.

Booyesen originally started researching the ANC during the negotiations period pre-1994, and has published several papers in international and local journals on the evolution of the ANC.

Her book, which she describes as more of a reference book than a casual night time read, explores the ANC's power across four 'faces' or domains of power:

- In government;
- The ANC organisationally;
- In relation to the people and people's power; and
- In the multi party electoral contest.

"In each of the four domains I investigate and illustrate how the ANC has gained, consolidated and defended its power, for example in government and in the multi party elections," says Booysen.

Disillusions, disappointments and shortcomings

"Despite disillusionments, disappointments and manifest shortcomings, especially in government, the ANC remains electorally unchallenged (on this front, despite provincial and local setbacks and occasional defeats) and in a close and largely trusted relation to the bulk of the people of South Africa."

"However, the bottom line is that while the ANC has proved remarkably adept at reinventing itself and its power, all indications suggest that the ANC is beyond its peak. This does not mean it is on the point of collapse or it is in fatal decline, as it has a huge reservoir of power and maintains a substantial edge over the other parties. Although unlikely, one cannot rule out that the ANC could still ascend again on the power graph," continues Booysen.

Public governance

The major challenge for the ANC is to get its public governance project right.

"SA has transformed for the better, way beyond the dark days of apartheid, but so much needs to be pulled together in government to significantly address the key triad of poverty, unemployment and inequality, particularly as they affect the upcoming youth generation."

In a chapter on the ANC and people's power she questions how people respond when their expectations of a substantially better life have not been met 17 years down the line:

"The majority of South Africans are not ready to shift their allegiance from the ANC to vote for other parties. They rather suspend disbelief and unite ranks against a party political enemy of the ANC, or abstain from voting. There is plenty of protest about their grievances, but they still hope the ANC will respond. All the while the opposition parties, notably the Democratic Alliance are growing stronger and trying to break the ANC bond," says Booysen, who addresses this issue on two levels.

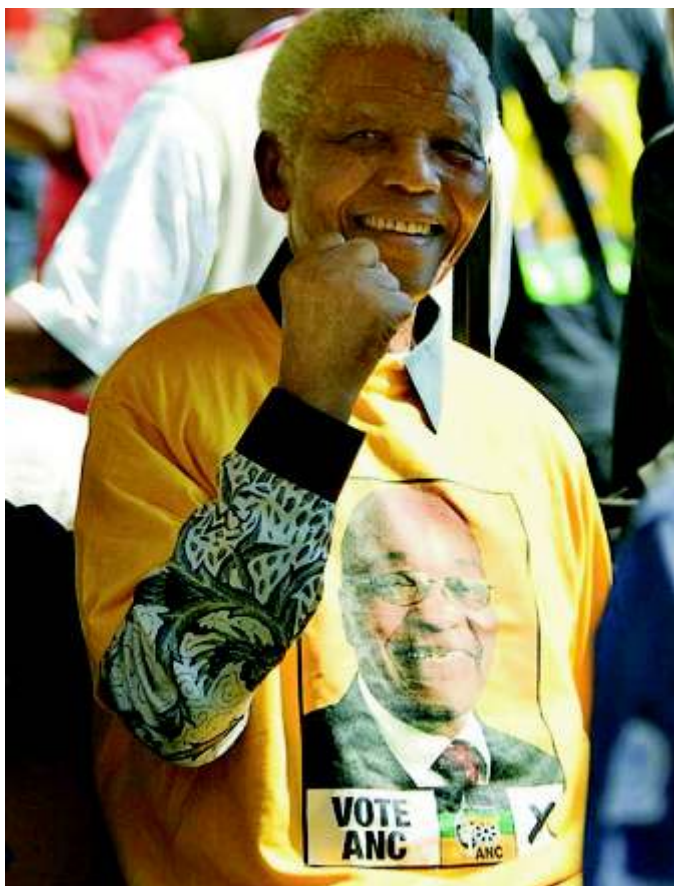
Inter-party policies and politics

Firstly, she looks at competitive inter-party policies and politics, and secondly, she looks at the direct bond between the ANC and the people, and investigates signs of this bond weakening, which is what opened the door for the formation of the Congress of the People (COPE).

"Despite COPE's failure, it was an important message to the ANC that many people are looking for an alternative."

The Zuma-ANC government promoted itself as being a more caring ANC, one that would shift more to the left and bring about policy change, such as national health insurance, and more definitive land transformation.

"While there has been plenty of talk, the ANC under Zuma has not been very successful in 'getting that additional change done'. This has been used by the ANC Youth League as a rallying cry, and to effectively turn the tripartite alliance of the ANC, Cosatu and the South African Communist Party into a quadripartite alliance that cannot be dismissed."



One of the chapters in the book addresses this and investigates the ANC's position in the tripartite alliance.

"Despite apparent differences I think the alliance remains strong and that criticisms of the ANC by Cosatu effectively serve rather than erode the alliance," she says.

She explains that objections to ANC actions raised within the alliance give the impression of healthy debate, but it is safe debate because it is under the wing of the ANC and hence it is not a threat to its power base.

Scramble to consolidate power

In a chapter entitled *ANC and State Power*, Booysen looks at the ANC's scramble to consolidate power within state institutions, including parliament, provincial structures and municipalities. In many instances it has been ANC factions asserting power over one another.

"This scramble for power is summed up by the phrase 'it is our turn to drink at the trough'," she explains. "The ANC's members and cadres are political animals and they mobilise their power by leveraging state positions. While this happens all over the world, the ANC has stepped it up a few degrees."

"The consequence is that it undermines state capacity. Instead of performing at their best as 'servants of the people', we often find ANC people using state institutions as sites of political power mongering, with political repercussions. It is idealistic to think that state institutions could be separated from politics, but it requires a very firm hand on the part of government to ensure the needs of the people are put first."

Up and down term

Regarding the ANC's future over the next couple of years, Booysen refers to Zuma's 'up and down term' that brought the ANC to a point of governmental and policy uncertainties, whilst the organisation is contemplating its next round of internal electoral battles.

Booyesen says: "The indications are that Zuma is going for a second term, and if this is the case, what will be especially interesting to see is who will run for deputy."

In addition to her primary research (and some political crystal ball gazing) she leads the Masters programme on public policy at P&DM.

"Being here has added a wonderful extra layer to my South African politics specialisation," she says. In the 2010 period at P&DM she was supervising 15 masters and five doctoral students.

"I like to think, despite the state not being in great shape, that we at P&DM have made some difference to public and development management through our postgraduate degrees and, very importantly, our short course capacity training. I like to believe that governance will improve and that we will be able to make a significant contribution going forward."



unpacking the rules of the game

Since his undergraduate days, the principal research interest of **Giampaolo Garzarelli**, an associate professor of Economics, Director of Research and Coordinator of the Masters Programmes in Economics and Economic Science in the School of Economic and Business Sciences (SEBS), has been the economic analysis of the costs and benefits of centralisation and decentralisation, in both its private (firm versus market) and public (unitary versus federal state) contexts.

In the process, he has combined insights from the theory of economic and industrial organisation and comparative institutional analysis into the standard framework of public economics (especially in its Public Choice incarnation), and vice versa.

He has been a major contributor to the so-called second-generation theory of fiscal federalism and to the organisational analysis of voluntary Open Source Software production.

In 2010, Garzarelli founded and serves as Director of the Institutions and Political Economy Group (IPEG), a research programme in SEBS.

"The IPEG explores the co-evolution of technology and firm boundaries, institutional change and the public economy, and the relationship between public policy (including technology policy) and economic performance through time," Garzarelli asserts.



Prof. Giampaolo Garzarelli

The IPEG has a distinguished International Advisory Board, and, thanks to the Strategic Planning and Allocation of Research Committee (SPARC) funding, was proud to host its first international conference on campus entitled *Open Source Software, Innovation and New Organisational Forms* in August 2011.

"Essentially, what we are mostly interested in is unpacking society's rules of the game, namely, institutions," he explains.

"All social and economic interactions rely on institutions, whether formal (e.g. money, contracts) or informal (e.g. traditions, mores). The market itself, for example, does not exist in a vacuum, but is actually institutionally embedded. Without the formal and informal rules of exchange there would be no prices and quantities."

Organisations, too, are systems of rules. However, unlike the market that is spontaneous in origin, organisations are planned. As such, organisational rules are directed towards a specific end and are not purpose-independent as in the market, continues Garzarelli, whose current primary research focuses on non-market phenomena.

Non-market decision making

"I am interested in how economic theory can explain non-market phenomena, such as the distribution of power and functions among levels of government in a federation and the division of labour in organisations where the supply of effort is without formal remuneration. In this regard, I adhere to a view of economics that is more classical than neo-classical, where the focus is more on economics as

science of exchange rather than on economics as science of optimisation."

"If one views economics in these terms, even non-market processes can be explained with the most basic economic intuition."

"If, for example, we consider any political interaction and apply the simple logic of economics as exchange," he says, "we immediately see how politics is about an exchange of favours. This exchange of favours in political markets leads to welfare losses for society. And one of our jobs as economists is to devise institutions that constrain the selfish political behaviour that leads to welfare losses for all. Indeed, this is one of the fundamental driving forces of the economic theory of Public Choice," explains Garzarelli.

Fiscal Federalism

Through this analytical lens, Garzarelli studies the theory of fiscal federalism, namely, the economic decentralisation of government.

"Instead of looking primarily at what optimal taxation function each level of government can have, I look at fiscal federalism organisationally, i.e. from a theory of the firm perspective."

This approach, of which Garzarelli was a pioneer, is called the Second-generation theory of fiscal federalism.

By viewing matters organisationally, the focus is on how to structure governments so that they can create more economic options for ordinary people (citizen-voters) with minimal interference.

"Here, too, the matter is one of institutions," he says, "Specifically, the question is how public institutions can be used so that the public sphere more closely resembles the private one, most notably the market. This is an important and topical question because history shows that the

greatest economic growth and well-being originates in societies where the state facilitates economic exchange rather than impedes it."

"But remember we cannot change human nature – people tend to behave according to self-interest," Garzarelli continues.

"Given omnipresent self-interest, the critical issue then hinges on how to employ known federal institutions for the advantage of all (citizen-voters) rather than for the few (politicians)."

In this sense, one of Garzarelli's fundamental contributions has been to view intergovernmental grants not just as anonymous tools for taxation and subsidisation, but also as contractual institutions amongst levels of government.

"If grants are seen as contracts among levels of governments, we automatically view government institutionally. Contractual exchange is about commitment. If, for example, the local government does not deliver on what the central government wanted at the time it disbursed the grant, then that same local government may not receive any more future grants. In this way, we build public incentives without the need to always have discretionary intervention," says Garzarelli, who is currently extending his previously published work on the matter with two doctoral students, Lyndal Keeton and Aldo Sioe.

Exchange and incentives bring us to another major contribution of Garzarelli – his work on the theory of the firm.

"Here, I have been researching, since reading for my masters, how Open Source Software communities organise themselves," he explains.

Voluntary open source production

In voluntary Open Source Software production, contributors dispersed throughout the world produce software through open standards, and do not receive any salary or profit. Garzarelli addresses two economic questions here. Firstly, where do the incentives to contribute lie? Secondly, what does the division of labour of a number of individuals dispersed around the world look like?

"Open Source contributors are long term rational. They

maximise their reputations by solving complicated software problems on a daily basis. By doing so, their reputations improve and not just within the Open Source community. Thus, it is not uncommon that through reputation, an open source volunteer ends up being hired by a top company, like Google and Hewlett Packard," he explains.

But if anyone can work on anything at any time, what does volunteer Open Source production look like? Don't we have an inefficient situation where everyone steps on everyone's toes?

"The key aspect of voluntary Open Source production is that one contributes based on interest, irrespective of whether or not one specialised in solving the particular problem at hand," continues Garzarelli.

"This means that the possible inefficiency created by a number of individuals all working on the same problem is simultaneously trumped by the knowledge gained all round the community. For instance, a mistake of one individual generates new ideas in another individual in a manner that bears fruit to new, productive ideas."

"Each learning opportunity extends the innate knowledge of production participants. This in turn expands the arsenal of knowledge that can be used to scrutinise any given problem at any given point in time. With potentially thousands of individuals spontaneously contributing at any given moment, the potential for novel knowledge generation, use and sharing is vast."

Garzarelli has published several international articles on the subject of fiscal federalism and voluntary Open Source Software production in journals including the *American Journal of Economics and Sociology*, the *Cambridge Journal of Economics*, *Public Finance Review*, *Industry and Innovation*, and *Information Technology for Development*.

One of several forthcoming papers being published in 2011 is on Open Source organisation. It was submitted for publication in 2010 to the *American Journal of Economics and Sociology*, and is co-authored with honours degree student Riccardo Fontanella.

The global DOMESTIC

More than one million people are employed as domestic workers – making it one of the largest sources of employment for black women in South Africa. In 2010 an important paper was published in *Social Dynamics* that reviewed the domestic workspace in South Africa from a global rather than an apartheid perspective.



Claire Beswick

"Analysis of employment relationships and working conditions in this sector and the search for ways of bringing about greater equity and improved conditions has focused largely on understanding this relationship as an artefact of apartheid," explains **Claire Beswick**, Case Study Unit Coordinator at the Wits Business School (WBS) and one of the four authors of the paper.

The other authors are **Jeffrey du Preez**, a WBS graduate and currently a doctorate student, **Prof. Louise Whittaker** of the WBS and **Prof. David Dickinson**, formerly of the WBS and now with the Department of Sociology at Wits.

"We reviewed literature on domestic workers globally and compared this with the study that Du Preez conducted into the impact of the Sectoral Determination for the Domestic Worker Sector, promulgated in South Africa 2002," explains Beswick.

"Based on this we argue for a broader understanding of the power asymmetry and exploitation that characterises employment relationships in domestic workspaces: one that



Jeffrey du Preez

takes into consideration its global similarities rather than narrowly attributing it to racist apartheid ideology and legislation."

Entitled *The employment relationship in the domestic workspace: Beyond the apartheid legacy*, the paper was developed from the research report that Du Preez conducted for his MBA. He examined the effects of new South African laws, which had introduced requirements such as minimum wages and maximum working hours for domestic workers in SA.

Du Preez interviewed 22 domestic workers and 22 domestic employers in rural and urban areas of SA. Employers from all race groups were interviewed (12 African, six white, three coloured and one Asian) and both male and female employers were included in the sample.

"The findings showed mixed adherence to legislative requirements and markedly asymmetrical power relationships in South African domestic workspaces," Beswick continues.

"Thus, for example, although none of the employers in his study objected in principle to paying a reasonable wage, in more than half of the cases, across the employer and domestic worker sample, domestic workers were paid less than the minimum wage."

In most instances the existence of the Determination had little real influence on working conditions. Where working conditions did comply with requirements of the Determination, this was generally inadvertent. It was because employers decided that

these conditions are suitable for them and not because they were seeking to comply.

Thus, the greatest determinant of whether or not the domestic worker was paid above the minimum wage appears to have been the income of the employer, not the existence of the Determination.

Moreover, domestic workers' desire to hold onto their jobs and not to alienate their employers overrode considerations of insisting on improved conditions.

"While apartheid legislation certainly played a huge role in creating the structures that gave rise to a large pool of disempowered, black, predominantly female labour, the tendency towards power asymmetry and exploitation is inherent in the relationship itself. It is not simply a consequence of racism or racist legislation and it is far from a uniquely South African situation," says Beswick.

"Domestic workers in SA will be exploited by employers (black or white) in the same way that Thai, Polish, Chilean or any other nationality of domestic worker will be exploited by their employers."

Hence interventions to create greater employment equity that are based on an incomplete apartheid-based paradigm will inevitably be incomplete because they fail to take into account the universal complexities inherent in the domestic workspace.

"They do not take into consideration, for example, the employer's desire for

cheap, relatively disempowered domestic workers. This is a global phenomenon, and as long as there is a pool of this kind of labour readily available, employers will seek it out."

In SA the government continues to respond to the domestic workspace from an apartheid-based paradigm. The assumption, Beswick explains, is that if they readdress the absence of laws governing domestic relationships in the apartheid era, and put employment contracts, minimum wages and minimum working hours in place, this will automatically improve the conditions of domestic workers.

However, studies worldwide over the past 20 years have shown that introducing legislation to govern domestic employment relationships has little impact. Beswick cites several examples from their paper:

In the United States Hongagneu-Sotelo (2001) found that although they have wage and labour regulations governing domestic work, very few employers or employees know about them.

In Zimbabwe, research by Pape (1993) revealed that a large number of the improvements in the working conditions of domestic workers that had occurred immediately after the reforms were introduced, had gradually been eroded, 'because of the army of unemployed ready to charge through the gate at the first sign of a job vacancy'.

In Chile, policies regulating domestic work were introduced in the mid 1990s and seem to have given Chilean

domestic workers a sense of empowerment, and some freedom to assert their rights. However research by Staab (2005) concluded that the legislation had, in practice, not formalised or raised the status of domestic work. Instead it had stimulated demand for the more disempowered domestic workers from Peru.

"It is clear that a far more comprehensive understanding of the domestic employment relationship is needed if strategies for real changes are to be effected and real empowerment of domestic workers is to take place," says Beswick.

"International comparisons show that improved education and self-worth levels, economic growth that leads to reduced income inequality, professionalisation of domestic work and a move towards live-out contracts are all factors that tangibly improve employment equity in the domestic workspace," says Beswick.

Howell (2002) found that some domestic workers in Oaxaca, southern Mexico, felt more confident to switch jobs in search of better working conditions and were opting to work on a daily or hourly basis, instead of live-in. The attitude of employers was also changing, and a number were recognising that it was important to treat their domestic workers fairly.

She said two things had brought about this change: increased levels of education amongst the population in general because the level of mandatory education in Mexico had

increased and an increased demand for live-out workers.

The findings of researchers Stiell and England (1997) in Toronto suggest that the degree of exploitation in the employment relationship is directly related to the domestic worker's sense of self-confidence and the employer's concern with equity.

Thus, one of the live-in nannies they interviewed was a white, Anglophone Canadian who came from a background quite similar to that of her employer. She felt well able to assert her rights, saying, 'the difference with me is that I have more choice, more freedom. Tomorrow if I think "well, screw you", I can walk out the door and go home'.

While there is need for further investigation, according to Du Preez's research (2007) it appears that the Domestic Worker Forums in the Eastern Cape created by the local Department of Labour to empower domestic workers, have gone some way to achieve this, giving domestic workers a greater sense of self-confidence and ability to negotiate better conditions. The Forums seem also to have had some effect in changing employer attitudes.

"We need to build on this and SA needs to learn from the international examples where domestic workers are more empowered, and find ways of applying this to the local situation. If we do this, it might make a greater impact," concludes Beswick.

ENGINEERING

AND THE BUILT ENVIRONMENT

Message from the Dean



This was a year in which the Faculty experienced an increased participation in the creation of research outputs, including publishing journal papers, books, chapters and conference proceedings, presenting invited and contributed papers at conferences, seminars and workshops, graduating masters and doctoral students and undertaking funded research and development work.

The Faculty was able to attract a further number of productive researchers who are adding to the new energy in research as schools consolidate their research areas and postgraduate offerings. The seven centres associated with the Faculty play an important role in advancing the research profile of the Faculty as they build important partnerships with industry and communities.

The Faculty prides itself on the number of graduates it produced in 2010. The percentage postgraduate students (post-honours level) makes up about one third of the student body and about one third of the degrees awarded in 2010 were made at the post-honours level. These include 21 Doctoral and 263 Masters level graduates.

A few of the highlights in the seven Schools and the academic development unit are described below.

School of Architecture and Planning

The School of Architecture and Planning did exceptionally in 2010. Prof. Phil Harrison took up his position as the South African Research Chair in the field of Development Planning and Modelling, and also his appointment as a Commissioner on the National Planning Commission.

Together with Professors Alison Todes and Vanessa Watson, he won the 2010 South African Planning Institute award in the academic/research category for their

The School established the Yeoville Project as a community orientated teaching, learning and research initiative in partnership with the Yeoville community organisation. In 2010, approximately 200 students from second year to doctoral level were involved, collectively or individually, in projects in Yeoville.

Some 20 staff members were involved and triggered joint work (research/teaching) discussions across the School. The initiative, aims to equip residents and local leaders with research results, outputs, ideas and databases, that they can use in their endeavour to solve local issues and improve their own neighbourhood. Eighteen workshops and three exhibitions were held. The project is now attracting the interest of other disciplines and books and other publications are being developed.

The Corus programme known as *The voice of the poor in urban governance*, held bi-monthly seminars, which served as the basis for the development of two special issues of peer reviewed publications; namely *Geoforum* and the *Journal of Asian and African Studies*.

Papers were also presented by Claire Benit-Gabaffou, a senior lecturer in the School, and postgraduate student Boitumelo Matala at an international seminar on urban governance in Africa held in Dschang, Cameroon in November 2010.

In the Jugurta Research programme entitled *Spatial justice, governance and the city – African comparisons*, several members of CUBES participated in an international workshop held in Kenya in May 2010.

The School produced one doctoral and 44 masters level graduates. Furthermore, 17 journal papers, one book, eight book chapters, six conference proceedings and a review were published.

School of Chemical and Metallurgical Engineering

In the School of Chemical and Metallurgical Engineering there was a continuing spirit of co-supervision between senior and junior staff and the publication output remains high, despite the increasing numbers of the undergraduate student body.

The research outputs of the School were once again the highest in the Faculty. These include 52 journal papers, seven chapters in books and six published conference contributions. Staff and students did, however, present their work at many conferences all over the world. Most staff contributed towards the outputs. The number of postgraduates produced by the School includes six doctoral and 25 masters level students.

The South African National Energy Research Institute (Saneri) Chair, Prof.

Rosemary Falcon and the South African Research Chair, Prof. Diane Hildebrandt, performed very well. Read more about Falcon's work on page 92.

Hildebrandt entered the fourth year of SARChi funding and based on the four-year review results, may continue for another five years. Prof. Sunny Iyuke, the Head of School, was particularly active and co-authored 25 papers during the year.

The Centre for Materials and Process Synthesis (COMPS) had a productive year. Two South African projects in biotechnology and one project in the field of Fischer Tropsch (FT) have been funded by Saneri.

The projects were completed in 2010. They have begun a project with E-scrap, which seeks to develop a commercially viable pilot facility for the recovery of various metals from electronic waste material, and discussions around the formation of a Department of Science and Technology (DST) Centre of Competence continued during the year.

Furthermore, various discussions took place with the Industrial Development Corporation to develop a roadmap for the implementation of their FT technology using Municipal Solid Waste (garbage to energy project). A proposal has been submitted for the conduction of a feasibility study.



The COMPS and the South African Research Chair were finalists in the 10XE competition of the American Institute of Chemical Engineers and the National Science and Technology Forum (NSTF) awards, the winner of the NSTF NGO Award and the Academy of Science of South Africa Science for Society Gold Medal award.

School of Civil and Environmental Engineering

From the School of Civil and Environmental Engineering Prof. Mitchell Gohnert was invited to deliver a keynote address at the International Pro-Africa conference at the University of São Paulo in Brazil.

Furthermore, the School successfully bid for a research project known as the SPIN Project. The Spin Project was initiated by the European Union and is worth R2.5 million. Prof. Herbert Uzoegbo, Dr Stephen Ekoru and Gohnert played crucial roles in the successful bid.

The School was very active and produced 19 journal papers, 18 conference papers, three technical

reports and two patents during the year.

The School produced six doctoral and five masters level graduates during the year. The staff members are also engaged in serving the scientific communities by serving as reviewers for journals and evaluators of rating applications.

School of Construction Economics and Management

During 2010 the School of Construction Economics and Management recruited a new Head, Prof. David Root, and new academic staff to strengthen the School's research and teaching capabilities.

Research focuses on improving construction industry practice, construction education and advancing property research in the areas of finance, management, property economics and development.

During 2010, papers have been presented at key international conferences in Europe and West Africa and South Africa. Staff members attended these conferences as well as other symposia.

Nationally, the School continues its engagement with local organisations

such as the South African Property Owners' Association and the Construction Industry Development Board (CIDB) and has presented research at local conferences organised by the South African Council for the Quantity Surveying Profession during 2010.

In 2010 research output consisted of one journal paper and 11 conference papers. Towards the end of 2010, the School submitted a bid to host one of two CIDB Centres of Excellence, with funding of up to R1 million per year over three years, in which the School was successful.

The overall objective is to encourage research and the development of staff in alignment with the 'growing our own timber' philosophy.

School of Electrical and Information Engineering

The School of Electrical and Information Engineering continued to consolidate its research activities within its three identified strategic themes of Energy, Information and Systems. This has allowed the formation of dynamic teams thus establishing critical mass in specific areas of research and breaking down the very limiting silos that previously existed.

A highlight of the year has been the progress made towards the re-establishment of a number of the

research laboratory facilities that had, over the years, been incorporated as undergraduate teaching spaces.

Currently the Biomedical, Communications and Signals, Systems and Control and Power Electronics laboratories are under construction – made possible by the refurbishment activities in the Chamber of Mines Building.

The School has also embarked on a vigorous programme aimed at stimulating postgraduate research productivity and includes an annual orientation workshop for all postgraduate students, two research seminars where each postgraduate student writes and presents a paper summarising their work, and the establishment of a postgraduate study to encourage cross-boundary interaction in line with the School's three strategic research themes.

The period under review was the third year of the operation of the Applied Research Unit at the Johannesburg Centre for Software Engineering. The Unit was formed with the objective of providing research and related services to the information and communication technology sector, by being a credible focal point for information and analysis about the status of the domestic software sector and its relationship with the local and global ICT market. Their contribution was again significant.

The School produced four doctoral and 16 masters level graduates together with eight journal papers and contributed to a large number of international and national conferences.

School of Mechanical, Industrial and Aeronautical Engineering

Research activities and outputs in the School of Mechanical, Industrial and Aeronautical Engineering are progressing with an upward trajectory - 14 journal papers, 17 conference proceedings and one book produced in 2010, together with 19 masters level graduates and five doctorates.

A significant portion of these outputs were associated with the Flow Research Unit, covering flow systems that are typically compressible and/or highly transient.

However other areas are productive, emergent or showing promise in the School: there is a strong materials and manufacturing impetus in the School that embraces the diversity of composite structures, nano-composites, rheometry, friction welding, titanium machining and cold gas spraying, with inputs from eight staff members.

This informal grouping (that includes the Aerospace Manufacturing Processes and Materials thematic

area) has produced strong outputs. It is being funded by the European Union Commission's Seventh Framework Programme the Marie Curie International Research Staff Exchange Scheme and various other funding agencies.

Strong outputs in the areas of thermodynamics/internal combustion engines/heat transfer/alternate energy are taking place.

Aeronautical research is progressing robustly, embracing aeromorphing, aerodynamics, control systems and

the commercial development of a light sport aircraft.

Industrial Engineering research, embracing chain risk management in small, medium and micro enterprises, healthcare and the optimisation of airline scheduling and routing, is becoming increasingly productive.

Centres in the School such as the National Aerospace Centre and the Centre for Mechanised Mining Systems are proving to be integrating factors that contribute both directly and indirectly to research outputs.

The School's research capacity received a significant boost with the appointment of Prof. Nielen van der Merwe as the Centennial Chair of Rock Engineering. He succeeded Prof. Dick Stacey, whose expertise is still available through his appointment as Visiting Professor.

Following underground pillar collapse in the platinum sector in 2010, Van der Merwe produced a research proposal on *Platinum Board and Pillar Design*. This proposal received financial support from several platinum mining companies, and it is expected that the initiative will produce research graduates in addition to assisting the mining industry with better understanding of pillar strength and stability problems.

The School has been involved with Coaltech 2020 since its inception. Through this relationship a number of research projects have been undertaken and postgraduate students supported.

A research project involving the development of guidelines for surface coal mines faced with the problem of spontaneous combustion has recently been completed, while fundamental research into total station monitoring for mine stability is on going.

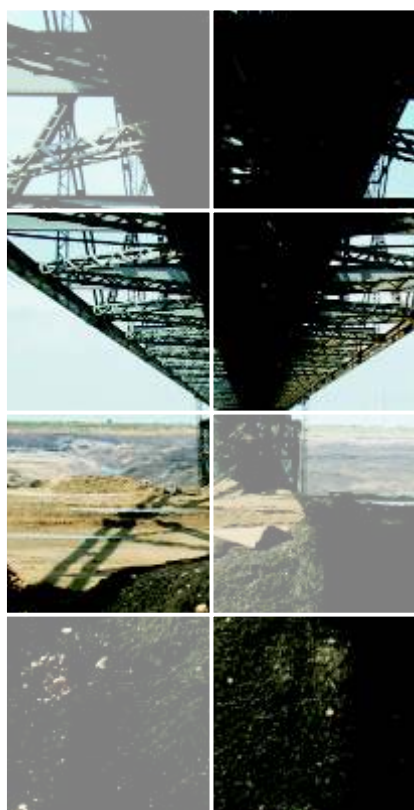
Prof. Beatrys Lacquet
Dean

School of Mining Engineering

Research activities in the School of Mining Engineering culminated in the publication of 15 journal papers, one book, one review and seven conference proceedings. The School produced two doctoral and 27 masters graduates.

The School hosts the Centre for Sustainability in Mining and Industry headed by Prof. Hermanus. The research report on mine closure literature survey, case studies and guideline was published in the journal of the *Southern African Institute of Mining and Metallurgy*.

Strong links with the Fossil Fuel Foundation and the Geostatistical Association of South Africa (through Dr Christina Dohm) also contributes to the School's research outputs.



The reclassification of lightning activity

The passion to pursue lightning activity research hit Dr Michael Grant in December 2004 during a blizzard when lightning struck the glacier about ten metres from him during a mountaineering expedition in Bolivia.



"At 5 500m, on Huayna Potosi, I heard this noise like crushing ice. I lifted my ice axe and electrical streamers emitted from the tip of the axe. I knew this meant that lightning was about to strike really close to me," explains Grant.

Morbid fascination

He observed the lightning strike with "morbid fascination" and survived. The moment he was back in telephone contact he phoned Dr Ken Nixon of Wits' School of Electrical and Information Engineering who is a member of the Lightning and Electromagnetic Compatibility Research Group.

"I asked him if he would supervise me as I knew then that I had to do my Masters on

lightning activity," Grant recalls.

Nixon agreed and supervised Grant's masters and subsequently his doctorate, which he received in 2010. Grant attributes what he has achieved in the field to Nixon's "phenomenally good" supervision.

How it started

Thus began Grant's journey that started out with him attempting to build a Triggered Lightning Research Facility to protect important national assets and structures (such as Eskom power stations and Transnet railway lines) from lightning strikes by predicting the nature, peak current and occurrence of the phenomenon.



Dr Ken Nixon from the School of Electrical and Information Engineering (back) with (l - r) Andrew Dickson, Yu-Chieh Lui, Dr Michael Grant, Hugh Hunt and Craig Hare

He received permission to build the facility at the South African Air Force test facility in Hammanskraal, north of Pretoria.

"Basically, this meant I had to dig a lot of holes to create the foundations for the control structure where a rocket will ultimately tow a wire up into a lightning storm. You hope the lightning follows the wire down so that you can simulate a stroke in order to develop the systems that will ultimately protect structures against real strikes," Grant explains.

Digging gave him time to think and while he was digging, it struck him that the existing lighting data provided by the South African Weather Service (SAWS), which he was studying, "did not look right".

"The SAWS has been incredibly collaborative with the School of Electrical and Information Engineering," says Grant. "They allowed us access to the raw data from their

wonderful lightning detection network throughout the country, which was installed in 2006, and which led to the breakthrough."

He went back to his office and re-examined the raw data, which comprises long lists of lightning strokes with their accompanying time, latitude, longitude, peak current and type.

Misclassification problem in every set of data

"Again, I got this feeling that the data just didn't look right," he says. He was correct. Not just in South Africa's lightning activity classification, but the world over, a misclassification problem was present in every data set.

"I'm just lucky to be good at maths," is how he describes his phenomenal breakthrough.

Grant discovered that the data of both cloud-to-ground

and intracloud lightning data sets contained strokes that were incorrectly classified.

"The misclassification problem was understood in the positive cloud-to-ground data set, but the presence of misclassified strokes in the other data sets was ignored. For example, a section of the positive cloud-to-ground data set was discarded in an attempt to reduce the presence of misclassified strokes, which are more prevalent at lower peak currents (usually below 10 kA)," he explains.

This was not unique to South Africa; the United States (US) has been doing the same since 1998. The problem of doing this is that more than half the data set is discarded, even though there are correctly classified strokes with peak currents less than 10 kA.

Positive cloud-to-ground lightning activity is the measure of a thunderstorm's state. In other words, it tells you whether it is building up or passing over. Negative cloud-to-ground lightning, by comparison, accounts for the vast amount of lightning, which has a lower energy and different composition, and does not indicate a thunderstorm and therefore is not used to measure thunderstorm age.

Grant realised that all the data for under 10kA was vital and came up with a method that allowed him to separate all cloud-to-ground readings from all intracloud readings, irrespective of whether they were above or below the reclassification limit to get a full and true reading. In addition to this, he included all the negative cloud-to-ground readings that no one in the world had considered including.

Recovering data

"Effectively I recovered more than half of the data, which was simply being discarded, and which is critical to understanding the meteorology of lightning," says Grant who devised a mathematical formula that he applied to all detected lightning strokes, which reclassified them naturally with all the data included. It worked.

He tested it on the South African network and on the Austrian and greater European Lightning Detection Networks (together they are known as the EUCLID Network). All showed the same results.

Eureka!

"It was a Eureka moment," says Grant, who used the revised data to refine the measurement and deconstruction of thunderstorm activity and thunderstorms.

"Essentially what I do is fold all the data over the diurnal cycle and this clear pattern of lightning activity emerges. I have also investigated lightning flash density over the surface of South Africa which reveals orographic detail, including the aspect and terrain, and reveals specific detail, such as the far higher flash density on the Highveld than in the Western Cape.

"We can predict the state a storm will be in, and this is particularly useful when assessing the risk a storm will pose to a power line crossing the path of the storm. In this way preventive or responsive measures can be implemented in advance, from turning off whole sets of lines to re-routing planes."

Grant wrote up his research findings last year, published it as his doctoral thesis and presented it at the International Conference on Lightning, Physics and Effects in Brazil in November 2010.

Response

"The response was radical," he says. "The guys from the North American Network were blown away and one guy from the North American Space Agency actually said 'this is radical' and made further suggestions for me to try," says Grant, who now straddles an academic and business career.

He lectures in microprocessor engineering at Wits and works as a senior engineer at CBI-electric on the East Rand that manufactures circuit breakers and surge protection devices.

In the meantime he has continued working on his Triggered Lightning Research Facility Project at Hammanskraal, in collaboration with Wits doctoral student Andrew Dickson.

Dickson is researching the effect of Highveld thunderstorms on shacks in the informal settlements, coupled with practical ways to solve the associated risks.

Is there any risk of losing him to the first world?

"Not a chance. There is so much opportunity in South Africa. What I would like to do is to get my hands on the US data, but so far I haven't been able to do so."

GREEN ENERGY PROJECT

in southern Africa: A mining investment approach

The financing of renewable energy projects needs to come from the government and from the traditional fossil-fuel-based energy and mining sector, says mining engineer and Wits alumnus **Dr Mike Seeger**, who has been active in South Africa's (SA) primary energy sector – coal mining – for many years.

Practising what he preaches, Seeger has used his personal finances, earned through his participation in the coal mining sector, to pioneer renewable energy projects for SA. A laudable entrepreneur, he is the founder and director of GX Energie, a renewable energy company, with offices in SA and Germany.

Investment in renewable energy

I am originally from Germany and it opened my eyes to what is being achieved there and in other countries like Abu Dhabi in terms of large-scale investment in renewable energy and the harvesting of sunlight, biomass and wind for energy," says Seeger, who in 2008/9 spent a year overseas investigating a wide range of renewable energy projects.

"In Abu Dhabi, for example, the leaders of this oil-rich nation are allocating revenues from the oil business to establish a prototype renewable energy city called Masdar City, which I have visited. It will be up and running by 2020 and it will house 40 000 people."

Using the most advanced renewable energy technology in the world, they are harnessing wind, sun and geothermal energy to provide energy and natural air-cooling for this sustainably built city.

Locally available natural clays are being used for bricks, there will be no skyscrapers, which are highly energy inefficient, and they will have electric motor cars and underground substations, all solar-powered.

Why is this oil rich nation doing this?

"Because they are well aware that oil resources are finite and not sustainable and they recognise the need to become world leaders in renewable energy, which is the future," responds Seeger.

Renewable energy seminar

In November 2010 in collaboration with Seeger, Wits hosted SA's first three-day implementation-focused renewable energy seminar called *Implementing Green Energy Projects in southern Africa*.

Innovators from international renewable energy companies as well as sustainability professionals, such as architects who design off-grid houses, addressed the conference.

"The interest was enormous – to the extent that we are going to host another two seminars in 2011," says Seeger.

The seminar attracted a wide range of shareholders – from entrepreneurs interested in breaking into the renewable energy sector, government officials, bankers, investors, academics and representatives from the United Nations in Mozambique and Zimbabwe.

"Many African countries do not use coal-based electricity as SA does, and they are looking at vast renewable energy projects," he explains.

Renewable energy is the inevitable future and Wits is supporting this drive by providing Seeger with a site on campus where solar technology donated by Germany will be used to demonstrate how electricity is produced from the sun.

Energy villages

"Successful, working models of renewable energy are widely used in Germany," says Seeger.

"Energy villages are now commonplace there, with communities producing their own electricity to supply their entire village and selling their surplus into the national grid. They can sell as much or as little as they have available, with the feed-in tariff regulated by the government to ensure a fair, guaranteed price."

The beauty of this system is that the energy supply is decentralised, and there is no monopoly company or parastatal controlling it.

"I studied how Germany transformed itself from a country with four Eskoms into a country with a huge drive for renewable energy with a decentralised, open market system of energy production," says Seeger who investigated large solar and wind farms of four to 20 megawatts, as well as biogas plants.

All are perfectly suited to SA where a stalemate as to the pricing of electricity generated by renewable energy is stalling the process.

"The South African government or Eskom needs to create a fund to finance renewable energy projects and to initially subsidise the electricity-from-renewable-energy feed-in



Dr Mike Seeger

tariff which, because of the significant start-up investment required, cannot initially compete with the 60c per kilowatt hour currently paid for electricity-from-coal."

SA's current electricity need is 40 000 megawatts installed capacity. Of this, 800 megawatts or 2% has been assigned to renewable energy under the government's REFIT Phase I, which will hopefully be on the grid by mid-2011.

Seeger, in partnership with GX Sun Resources, applied to be one of the renewable energy suppliers, and has secured project sites in Newcastle and Thabazimbi.

"If our application is successful each site will provide 10 megawatts installed capacity, generated from 44 000 solar panels over a 20-hectare area."

He has also applied for a wind farm near Windy Corner near Harrismith.

International pressure to reduce carbon emissions

With international pressure to reduce carbon emissions, and SA being Africa's highest emitter, the renewable energy sector has to grow, and the current 800 megawatts assigned for renewable energy will have to substantially increase.

The job creation from this sector will be significant, as will the many manufacturing opportunities for the low-tech components of renewable energy plants and systems. The high-tech components such as the solar panels are currently being manufactured in Germany, but this too, could be achieved in SA down the line.

As part of the way forward, Seeger believes that mining operations throughout Africa need to help develop renewable energy

projects wherever they are based.

In October 2010 Seeger co-authored an article with Prof. Richard Minnitt from the Wits School of Mining Engineering entitled *Developing Green Energy Projects in southern Africa – a mining investment approach*.

"Mining companies should be compelled to use renewable energy resources to power their mines and to contribute surplus electricity to the communities where they operate in exchange for mining resources," he explains.

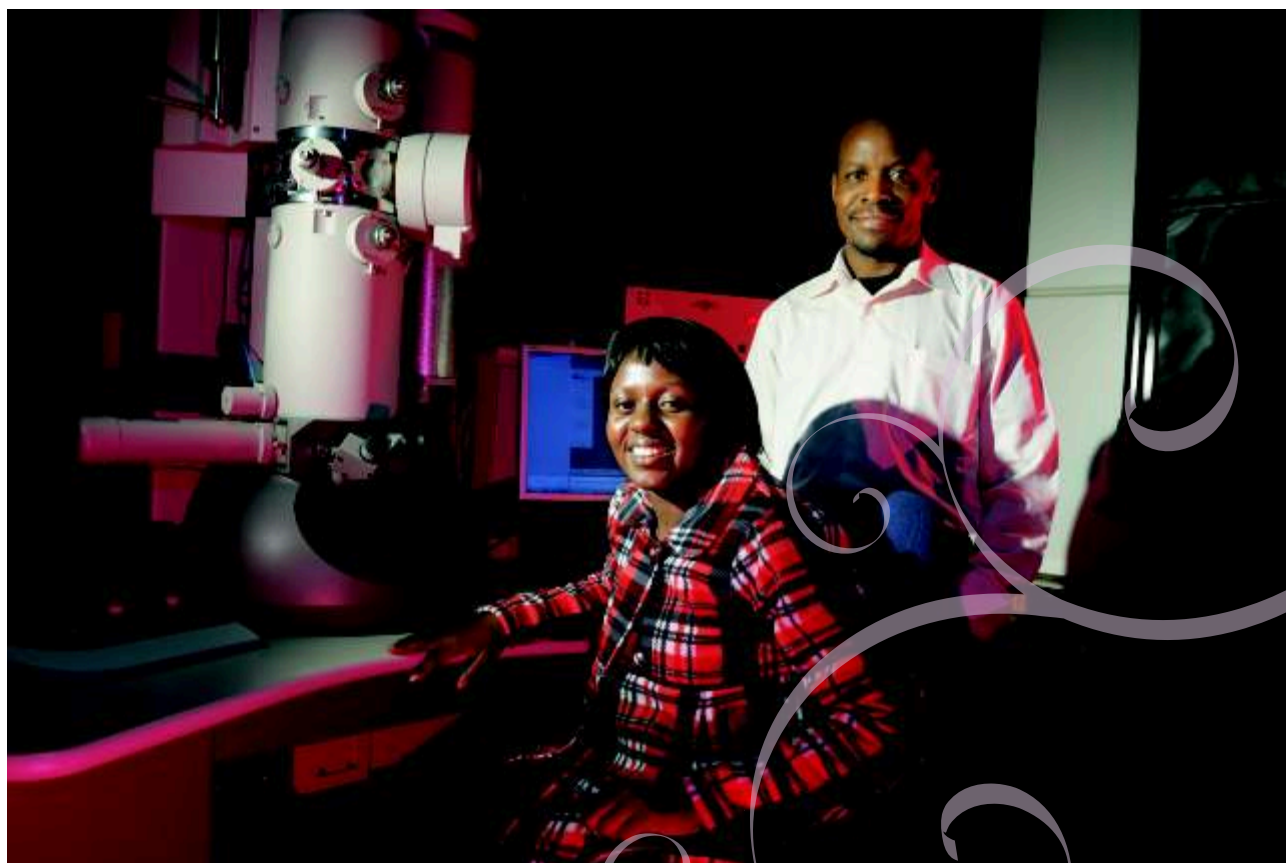
Once the minerals have been depleted, what remains is a renewable energy power plant that continues generating sustainable electricity for the surrounding area – a lasting legacy."

Some mining companies feel threatened by this, while others are recognising this quid pro quo as a viable way forward. Exxaro Resources, a JSE-listed South African-based mining group, for example, has launched a renewable energy department and is aggressively launching a wind power project.

"As a coal-mining industry professional, my attitude is that instead of stalling the renewable energy drive we need to embrace it, be part of it and ensure that SA becomes a leader in the low carbon sustainability field instead of dragging our heels," says Seeger, adding that the financing of renewable energy projects shares many similarities with the financing of mining projects in terms of complexity, skills required and risk profile.

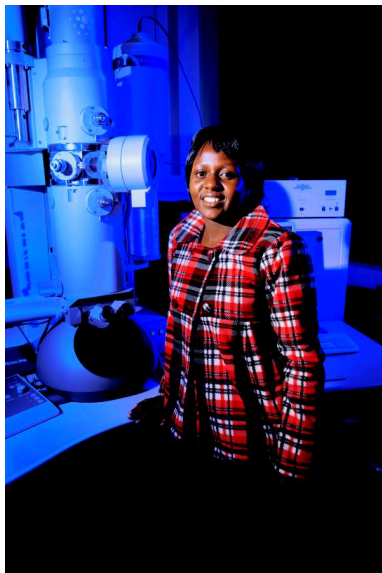
"The renewable energy sector can benefit from the skills and systems required to establish large scale mining projects in remote locations and adapt these to renewables."

In vitro | of the | effects EVALUATION | physiochemical | OF DRUGS



Nyaradzo Chigumbu and Geoffrey Simate, a lecturer in the School of Chemical and Metallurgical Engineering

Recruiting top masters and doctoral students to collaborate in the pioneering field of nanotechnology has always been a key goal for Prof. Sunny Iyuke, Head of the School of Chemical and Metallurgical Engineering. The other has been to continue his team's National Research Foundation-funded research in the advancement of fuel cell and nanotechnology at the cutting edge of science. It is a field for which Nobel prizes are sure to be awarded.



Nyaradzo Chigumbu

"I teach my students that in order to achieve at the highest level they need to work hard and keep a positive attitude," says Iyuke. "This kind of science doesn't come easy. We need to accept this and go forward."

One of his masters student who has taken this attitude to heart is Nyaradzo Chigumbu whose research in 2010 on drug delivery using carbon nanotubes shows huge future potential.

Chigumbu's work has been graded with distinction by Prof. Viness Pillay from the Department of Pharmacy and Pharmacology at Wits was her co-supervisor. The title of her research is *The in vitro evaluation of the physicochemical effects of drug loaded carbon nanotubes on toxicity*.

"I was looking at the physicochemical effects when delivering a drug using carbon nanotubes," she says.

Insignificant pile of soot

To understand her work we first need to understand something about the carbon nanotube, which to the naked eye, appears as a tiny, insignificant pile of soot. It is only when you look at it through a microscope that you clearly see the tiny cylinders or 'tubes'.

Very light and very small they are: 100 – 1000 times stronger than steel, and have extraordinary potential in a variety of applications, including biomedical, pharmaceutical,

electronic, mechanical and aeronautical.

The pharmaceutical potential of the carbon nanotube is being developed to 'deliver' drugs. Iyuke's team is doing research with colleagues in the School of Medicine where this technology is being used to deliver drugs to specific organs in the body.

It is a unique area of drug delivery because it seems to have the potential to cross the blood-brain barrier which has not been possible before. It has therefore always been difficult to treat illness in the brain because scientists have not been able to get medicines into the brain.

Geoffrey Simate, a lecturer in the School has assisted Chigumbu in the production of carbon nanotubes. Simate produces carbon nanomaterials for various applications. The production of carbon nanomaterials in terms of the type and quality for various applications, for example, is controlled by several factors including carbon source and type of reactor.

Simate has been involved in the tailor making of these materials through the manipulation of various parameters, explains Iyuke.

He has also been involved in the scaling up of the swirled floating catalytic chemical vapour deposition reactor for continuous or semi-continuous production of carbon nanomaterials. This reactor was developed within the School by Iyuke and is patented.

Changes in physical and chemical properties

Chigumbu's work has been to research the effects of changes in the physical and chemical properties on toxicity that arise when using carbon nanotubes to deliver a drug used to slow down Amyotrophic Lateral Sclerosis called Riluzole.

"Most people with Amyotrophic Lateral Sclerosis die within two to five years. With Riluzole, which is the only United States Food and Drug Administration (FDA) approved drug for the treatment of the disease, patients live for another two to three months without the relief of symptoms," she explains.

She adds that using carbon nanotubes presents an opportunity to enhance the cellular uptake, transport and biodistribution of Riluzole. Consequently, they are hoping to increase the efficacy of this drug and extend the patient's life expectancy.

Riluzole taken orally, has 60% bioavailability, which is low, as this means only 60% goes to the target site. Various drugs are not reaching the targeted sites in high enough concentrations. The higher the bioavailability the higher the chance of the disease being treated. Carbon nanotube delivery of Riluzole is expected to reduce the metabolic oxidation time and increase the bioavailability.

As with everything in this field, it is not simple. In the process of attaching Riluzole to the nanotubes, the length of the nanotubes is reduced and the surface area increases. Chigumbu had to look at the effect of these physicochemical changes and found there was no toxicity generated on PC12 neuronal cells in a laboratory setting over a 24-hour period.

In her experiment, she had one set of cells treated with Riluzole attached to nanotubes, a second set treated with Riluzole alone, and a third with carbon nanotubes alone.

"I tested the toxicity of all three on the cells, and all three controls did not seem to cause any toxic effect in a 24-hour period," she says.

What this means in terms of its possible application is it gives hope for its potential application in humans. Because carbon nanotubes are new on the market a lot of research needs to be done to show toxicology results that are consistent if the application of carbon nanotubes in nanomedicine is to be a reality. Chigumbu's research helps to show and echo that carbon nanotubes are not toxic in an *in vitro* setting.

In vitro refers to experiments conducted outside a living animal or human being. There are strict regulations governing this research before it may potentially be tested on humans.

The concept of attaching drugs to nanotubes started with research using cancer drugs. "Targeted delivery with nanotubes meant you could avoid damaging healthy cells along with cancerous cells during chemotherapy," she explains. "The cancer drug research showed that attaching drug molecules to carbon nanotubes is possible and my work echoes this finding in addition to the non-toxicity finding."

It goes a step further into the future where several drugs could be attached to the carbon nanotube to attack the disease on several fronts.

Iyuke supervised the research and believes it is significant in the development of nanotube technology, which is going to be huge in the future.

"He is an excellent supervisor. He is very hands on and immediately available to his students whenever we have a problem. He expects us to work hard; we meet every Monday to explain our challenges and findings, and we have to produce a progress report every three months. This way, he helps us to exponentially improve," says Chigumbu. "Because we are busy with new research, there are new challenges all the time, and we are rapidly improving our knowledge and understanding as we go along."

South Africa's first lady of COAL

If you consider that 93% of South Africa's (SA) energy is currently produced from coal, you can understand how important it is to our economy and our country, says **Prof. Rosemary Falcon**, Department of Science and Technology (DST)-South African National Energy Research Institute (SANERI) Chair in Clean Coal Technology based in the School of Chemical and Metallurgical Engineering.

Of the nine Energy Chairs awarded by the DST and the Department of Energy via the SANERI between 2007 and 2010, Falcon's is the only Chair focusing on coal, which is critical to South Africa's energy demands.

Over the five-year period (2007-2012), in addition to the groundbreaking research conducted by Falcon and her team, by 2012 the Chair alone will have produced six doctoral and 28 masters degree students by research.

Under Falcon's leadership the team has also developed several coal science and technology masters level courses, each of which is attended by between 30 and 90 students from government, the coal industry and the financial sector. Since its introduction, in excess of a thousand such candidates have attended these courses and acquired higher degrees, diplomas or certificates for their efforts.

"For too long coal has been considered the 'Cinderella mineral', playing second fiddle to gold and platinum," says Falcon, who is widely recognised as SA's 'first lady of coal'. Over several decades she has made it her life's mission to elevate coal to its rightful position at the foreground of SA's economy.

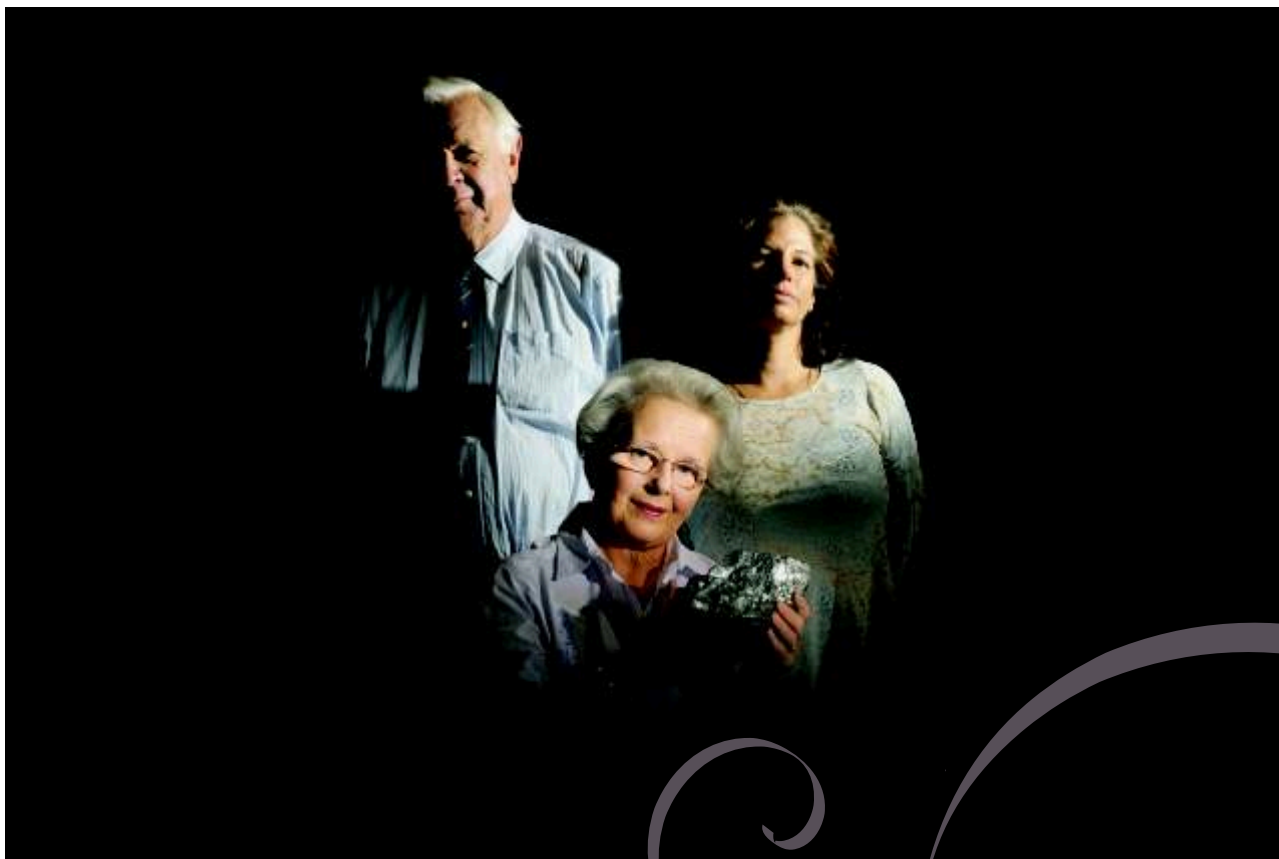
"For many decades no one considered coal important or worthy of in-depth study," she explains.

"Only relatively recently have producers and users of coal begun to realise its importance and its extreme variability in terms of exploration, extraction and technical performance." In addition to energy, coal is a key component in industry.

Approximately 40% of all liquid fuels are derived from coal, 95% of all metallurgical processes are coal-dependent, Sasol produces over 200 major chemicals for SA, which are used in thousands of products, including plastics, explosives, paints, food and textiles. Coal provides over 90% of the energy required for the pulp and paper, sugar, cement and wine industries, and many others.

Clean coal technology

Given the serious environmental constraints being levelled at coal usage worldwide, Falcon and her team are researching cutting edge technology to enhance clean coal technologies for SA.



Lionel Falcon, Prof. Rosemary Falcon and Prof. Nikki Wagner

Key members of her team are geologist Nikki Wagner, Associate Professor in the School of Chemical and Metallurgical Engineering and metallurgist Lionel Falcon, formerly a consulting metallurgist for base metals and coal at Goldfields. Maggie Blair, programme convenor and personal assistant, and specialist librarian Gail Gordon support the team whose primary aims are to:

- Process and beneficiate the low grade coals more efficiently in the coalfields currently being mined and to test seams in coalfields that have yet to be exploited in SA;
- Enhance and optimise the utilisation of current coal-using technologies including combustion and power generation plants in order to extract maximum efficiencies whilst reducing greenhouse gas emissions;
- Develop new combustion and power generation technologies that may be more suitable for the low grade coals of the region,
- Start using the over one billion tons of coal discards in SA, for which processes have thus far not been available; and
- Explore alternative high-value high-tech uses for coal in terms of its use as a valuable carbon-based chemical.

"Most coal is put through a washing or beneficiation process in order to reduce or eliminate unwanted rock or high-ash coal contaminants, but the quality of the low-grade reserves is so poor that the processes in SA are battling to process it economically," Falcon explains.

"SA's industrial combustion and power plant boilers and gasification plants, many of which were brought into this country between the 1950s and 1970s, were designed in Europe, the United Kingdom or the United States (US) and all for high-grade coal, but our high grade and middling grade coal products are now being exported.

"This means that Eskom and other coal users in SA either have to pay export prices for high-grade coal or their boilers and gasifiers have to operate on the lowest grades of coal. This is currently causing severe efficiency and maintenance problems. Using low-grade coal increases the cost of power because you need more coal to generate the same amount of energy," Falcon continues.

Some of the new technologies being researched to beneficiate coal and efficiently use low-grade coal include:

Circulating fluidised bed combustion technology

Whilst fluidised bed technology is not new in SA, the introduction of *circulating* rather than *bubbling* fluidised bed boilers is new and is currently being researched. In this respect, a research partnership with VTT and Metso in Finland (Finnish power utilities) is proving extremely promising. One of Falcon's doctoral students, Mohamed Belaid is investigating this process using South African coals in collaboration with a doctoral student from Finland, Pasi Vainikka.

"Finland has the technology that efficiently uses low-grade and discard coal, and we now know that they need our low-grade and discard coal for its high-ash content," she explains.

"In 2010 they discovered that the clay contained in the high-ash coal neutralises the alkalis which negates the corrosion effect of the sawdust and other biomass materials which the Finnish use as their source for energy."

This critical research will help both Finland and SA.

"With this technology we can use the one billion tons of discard coal in this country. Our pulp and paper and sugar industries will also benefit from this anti-corrosion effect provided they use the correct combustion technology in the first place."

Coal beneficiation

Another important avenue of research is to investigate more efficient and new methods of beneficiating or cleaning the coal and separating it into different grades.

"Current beneficiation methods use huge amounts of the rarest mineral we have in this country – water – which we don't have enough of," explains Lionel Falcon, a specialist in beneficiation.

"The thrust now is to optimise water-based beneficiation processes by redesigning certain equipment, as well as to develop dry beneficiation processes. To this end, one of our doctoral students, Samson Bada, went to the University of Kentucky in the US in 2010 to continue his research in the field of electrostatic separation of coal as this is the only region in the world using this form of dry beneficiation technology."

A further form of dry processing is the 'Microsort' process. This is currently being used to de-shale and reduce rock contamination in coal mining, but it has also

been used successfully on a specific type of coal known as torbanite, of which SA has large resources.

Torbanite is comprised of fossilised algae, which collect in bands in normal coal seams and which cannot be separated from normal coal using conventional beneficiation processes. The Microsort process separates coal from torbanite to extremely high efficiencies. The value of torbanite lies in its capacity to produce high oil and hydrocarbon products when simply heated in a retort to about 350 to 400°C.

Another research student from Eskom, Priven Rajoo, is working on optimising boiler performance by modelling pulverised fuel combustion. Others are undertaking research into integrated gasification combined cycle, pressured bubbling fluidised bed technology, enhanced metallurgical reduction processes and gaseous and particulate emissions technologies.

Nanotube technology in collaboration with NASA

With some of the new technologies listed above, SA could economically beneficiate greater reserves of coal, produce cleaner coal and, amongst other uses, potentially use this cleaner coal as the source of carbon for nanotube manufacture. This is currently produced from high-value oil and gas.

"Another of our doctoral students, Kapi Moothi, started on this research in 2010 in collaboration with the North American Space Agency (NASA)," explains Falcon.

Carbon nanotubes have extraordinary potential in a variety of applications, including biomedical, pharmaceutical, electronic, in the mechanical and aeronautical spheres.

Carbon storage

With the global emphasis on carbon (CO₂) emission reduction and the problem of high emissions from low-grade coal, in 2009 Wagner and her students started researching methods for carbon storage.

CO₂ needs to be stored under high pressure in geological strata more than 800m deep on land or offshore where it needs to mineralise and become part of the rock and not escape.

Wagner is also researching the potential for storing CO₂ in deep coal seams that may never be mined.

Coal characterisation

Wagner has also established a valuable coal petrographic laboratory, which supports the detailed research and characterisation necessary for the better understanding of the nature of coal in all aspects of research. Initially trained by Falcon, Wagner is now one of the leading coal petrographers in the country.

The future of coal

With this and more research and development underway, Falcon says the future of coal is 'excellent - provided you understand it and know how to match the type of coal to the right process and vice versa in order to be able to produce and use it economically, efficiently, environmentally soundly and to its maximum potential'.

With the kind of research and results achieved three years into her Chair in 2010, several world firsts in coal technology will certainly be achieved by 2012.

HEALTH Sciences

Message from the Dean



The year 2010 proved to be a highly rewarding year for the Faculty of Health Sciences, particularly with respect to the significant honours and awards which were bestowed on its researchers, some of which are reflected in the next few pages.

Emeritus Professor Philip Tobias was awarded the National Research Foundation (NRF) President's Award for Lifetime Achievement for his contribution to the development of science in South Africa (SA).

The NRF Award for Transformation of a Science Cohort was awarded to Prof. Shabir Madhi. In addition, Madhi also received the Vice-Chancellor's Research Award for 2010. Prof. Maureen Coetzee was awarded the National Science and Technology Forum award for achievements over the last five to 10 years for her substantial contribution to the understanding and control of malaria in Africa.

The Royal Society of South Africa bestowed the prestigious John F. W. Herschel Medal on Prof. Keith Klugman for his multidisciplinary contributions to science in SA and to the reduction in childhood mortality through the implementation of conjugate pneumococcal vaccination in developing countries.

The number of scientists with NRF ratings in the Faculty increased from 52 to 60 in 2010. Three new NRF A-ratings were awarded to Faculty researchers. They are Professors Klugman, Valerie Mizrahi and Charles Feldman.

Emergent researchers Dr Bavesh Kana, Dr Marco Weinberg and Dr Penny Moore were recipients of the Friedel Sellschop Award for 2010.

In celebration of the success of staff members in various aspects of research, the following staff were presented with Research Achievement Certificates at the annual Faculty Research Awards Dinner in August:

- Prof. Patrick Arbuthnot
- Associate Professor Daynia Ballot
- Prof. Maureen Coetzee
- Adjunct Professor Demitri Constantinou
- Dr Clare Cutland
- Dr Abdullah Ely
- Associate Professor Kennedy Erlwanger
- Prof. Charles Feldman
- Associate Professor Andrea Fuller
- Dr Karen Hofman
- Associate Professor Kathleen Kahn
- Dr Bavesh Kana
- Prof. Keith Klugman
- Prof. Lizette Koekemoer
- Associate Professor Anna Kramvis
- Dr Elena Libhaber
- Prof. Shabir Madhi
- Dr Michael Madziva
- Dr Harold Majane
- Prof. Valerie Mizrahi
- Dr Penny Moore

- Associate Professor Sarala Naicker
- Dr Maria Papathanasopoulos
- Prof. Viness Pillay
- Prof. Frederick Raal
- Prof. Michéle Ramsay
- Prof. Helen Rees
- Prof. Karen Sliwa
- Prof. Wendy Stevens
- Professor Emeritus Philip Tobias
- Associate Professor Steve Tollman
- Dr Marco Weinberg
- Prof. Angela Woodiwiss
- Professors Lynn Morris and Charles Feldman were appointed as members of the Board of the Medical Research Council (MRC) in November 2010.

New Initiatives in 2010

The Faculty welcomed a new research institute in 2010. Formerly the Reproductive Health Research Unit, the entity was awarded institute status by the Faculty Research Committee (FRC) and University Research Committee. The Institute under the Directorship of Prof. Helen Rees will be known as the Wits Reproductive Health and HIV Institute.

An initiative from the Aurum Institute for Health Research to collaborate with the Faculty of Health Sciences resulted in the signing of a Memorandum of Understanding (MOU). The remit of this MOU is to investigate and establish an institute for research into tuberculosis (TB) and related infectious diseases.

The Research Thrusts *Diseases of Lifestyle: an Emerging African Problem* under the leadership of Prof. Sliwa and Associate Professor Nigel Crowther, and the Research Thrust,

Molecular Biosciences: Health for Africa under the championship of Prof. Christine Rey (Science) and Prof. Ramsay (Health Sciences) is increasing in strength from year to year.

These thrusts bring together the many clinicians and researchers who are interested in understanding the aetiology of diseases of lifestyle in our communities and those who are interested in the molecular exploration of biological questions.

Students in research

The nurturing of our postgraduate and undergraduate research students remains an important focus in the Faculty:

First African team to MIT Competition

A team of students from Wits University represented South Africa and the continent as the first African team ever to participate in the prestigious International Genetically Engineered Machine (iGEM) competition, run by the Massachusetts Institute of Technology (MIT).

iGEM is a synthetic biology competition where teams of students from all over the world are invited to create a machine made out of biological parts. The two Health Sciences honours students in the team, Michelle Robinson and Gregory Meyer, were supervised by Dr Weinberg.

The team devised a novel technique for the detection of the Human Papillomavirus (HPV) in women. In their experiment, modified lactic acid

bacteria turned purple when exposed to HPV. At the competition, the team was awarded a bronze medal for their efforts.

Pfizer-UKZN Young Health Scientists Symposium

Undergraduate students from across the Faculty were selected to attend the Pfizer-University of KwaZulu-Natal Young Health Scientists Symposium in September. Wits students participated in three categories: Clinical Research, Community-based Research and Laboratory Research.

Wesley Aichison was awarded the prize for the best presentation in the Clinical Research category for a paper entitled *The Value of Surveillance of Healthcare Associated Infections in a Trauma ICU Setting*.

Emergent and young researchers

We are strengthening the future of research at Wits and in SA by training and supporting our young and emergent researchers. As part of initiatives for nurturing and support of these future generations of scientists, the Faculty initiated an Emergent Researchers Group and a Postdoctoral Fellows Group in 2010.

In addition, in order to strengthen clinical research in the Faculty, a Carnegie Grant was obtained to support the training of clinician scientists in research. The group of young clinicians will begin their doctoral degrees in 2011. In a new venture in 2010, postgraduate students met for monthly talks with experienced Faculty researchers in the ever popular Postgraduate Hub.

Building a rich research environment

While the Faculty acknowledges that its research productivity and the graduation of research and clinical scientists is a measure of its research productivity, an additional aim of the Faculty is to grow a vigorous research environment within the Faculty.

To this end, the Faculty hosted a number of important international researchers in 2010. Amongst these were Prof. Dhanjay Jhurry (University of Mauritius) and Prof. Mona Marei (University of Alexandria). Both academics are specialists in the field of biomaterials and tissue engineering.

As part of its new Diaspora Alumni Programme, the Faculty invited notable alumni, now resident internationally, to return to their alma mater for research interactions and collaborations. Seven alumni participated in the programme. They are:

- Prof. Rhian Touyz from the University of Ottawa (Canada)
- Prof. Denis Daneman from the University of Toronto (Canada)
- Prof. Roy Zent (with Prof. Ambra Pozzi) from Vanderbilt University (US)
- Prof. Aubrey Milunsky from Boston University (US)
- Prof. Owen Sparrow from the Wessex Neurological Centre, Southampton General Hospital (UK)
- Prof. Seth Love (with Dr Lynne Herschowitz) from the University of Bristol (UK)

- Prof. Thomy de Ravel from the University of Leuven (Belgium)

While all the alumni gave research lectures/seminars, the major benefit was derived from their one-on-one interaction with either staff or postgraduate students and subsequent suggestions of further collaborations.

Community engagement

In our quest to provide ongoing links and interaction with local communities through our research, the Faculty pursued its Prestigious Research Lecture Series in 2010. The series aims to showcase the Faculty's top researchers and to engage the public on issues pertaining to health.

The two lectures delivered in 2010 were:

Mandela's Children: Securing the health and well-being of future generations

Prof. Tollman, Director of the MRC/Wits Rural Public Health and Health Transitions Research Unit, Associate Professor Kahn from the same Unit, Associate Professor Shane Norris from the Wits Birth to Twenty Research Programme and Prof. John Pettifor, an NRF A-rated researcher and previously the director of the MRC/Wits Mineral Metabolism Research Unit and Birth to Twenty Research Programme, delivered this lecture. The lecture focused on different aspects of child health in SA, presenting substantial and thought-provoking data. Prof. Haroon Saloojee, Head of the Division of Community Paediatrics at Wits, provided challenging commentary.

Should we be giving antiretroviral drugs to HIV-negative people?

This lecture, in the form of a debate, was led by Professors Rees and Lynn Morris, Head of the AIDS Unit housed in the National Institute for Communicable Diseases. The aim of the debate was to stimulate thought around the issues surrounding the use of antiretroviral drugs as pre-exposure prophylaxis. Dr Yogan Pillay, Deputy Director of Strategic Health Programmes in the National Department of Health acted as commentator, providing valuable insight from the Department's perspective.

Research and the community

Continuing with our aim to contribute and interact with the community, the Faculty embarked on a Malaria Awareness Campaign with Yvonne Chaka Chaka, who is both a World Health Organization and United Nations Children's Fund Ambassador for malaria.

Researchers in the Faculty, including Prof. Coetzee, leader of the Malaria Entomology Research Unit, Prof. Thérèse Coetzer of the Plasmodium Molecular research team and Dr Robyn van Zyl of the Anti-malarial Drug Discovery research team, took part in the campaign.

Community radio station Radio Today, was approached and its CEO, Dr Ivan May who sadly passed away at the end of 2010, responded with enthusiasm. An awareness campaign was broadcast on radio in November. Besides being broadcast in English,

snippets of the interviews were translated into Zulu, Xhosa, Afrikaans, Shangaan, Sotho and Swahili.

Research output

The Faculty's direction in research continued to be mainly in the fields of HIV, TB, malaria, cancer, drug delivery and related areas. While the Faculty's research publication output of 245 Department of Higher Education and Training units in 2009 was slightly less than in 2008 (259), individuals and entities continued to have an impact globally.

Statistics emanating from the Faculty show that our most prolific researchers with respect to 2009 publications were Prof. Norris, who produced 19 publications in 2009, Prof. Glenda Gray from the Perinatal HIV Research Unit who contributed 15 publications. They were followed by Prof. Pettifor and Prof. Wendy Stevens in the School of Pathology with 13 and 12 publications respectively.

Impact factors of journals and citations of papers emanating from the Faculty of Health Sciences remain high. For example a paper entitled *Radiotherapy plus cetuximab for squamous-cell carcinoma of the head and neck* by Bonner, Harari, Giralt, Azarnia, Shin, Cohen, Jones, Sur, *et al.* (2006), published in the *New England Journal of Medicine* Vol. 354, no. 6, pp 567-578 (I.F. 47.05), has been cited 1192 times.

Similarly, a paper by Klugman, Madhi *et al.*, (2003) entitled *A trial of a 9-valent pneumococcal conjugate vaccine in children with and those*

without HIV infection in the New England Journal of Medicine Vol. 349, no.14, pp1341-1348 (IF 47.05), was cited 417 times.

Faculty research day and postgraduate expo

The biennial Faculty of Health Sciences Research Day, which took place in September, was attended by 892 delegates. It included two plenary lectures, 91 oral presentations and 200 poster presentations.

Oral and poster presentations were grouped under five themes: HIV/AIDS, Healthcare Delivery, Education and Management, Infectious Diseases, Diseases of Lifestyle and Chronic Diseases, Molecular and Comparative Biosciences.

The event was held in conjunction with the Faculty Postgraduate Expo, which promoted postgraduate study opportunities in the Faculty. Participants from the NRF and numerous pharmaceutical companies participated in the event.

Research equipment

The FRC continued to provide much needed research equipment in the Faculty through funding derived from the 2010 Wits Health Consortium dividend. Approximately R2 million of the dividends were provided from this source, with a further R840 000 being added from other research sources.

In addition, over a two year period, the Faculty contributed R1.6 million from its Wits Health Consortium dividend towards the cost of

acquiring a new confocal microscope. A grant worth R2.5 million was made to Prof. Beverley Kramer, Deputy Dean, by the NRF. Additional funding was received from the University which made it possible to order a confocal microscope. The acquisition is the first step to setting up a long needed Imaging Facility for life sciences research in the Faculty.

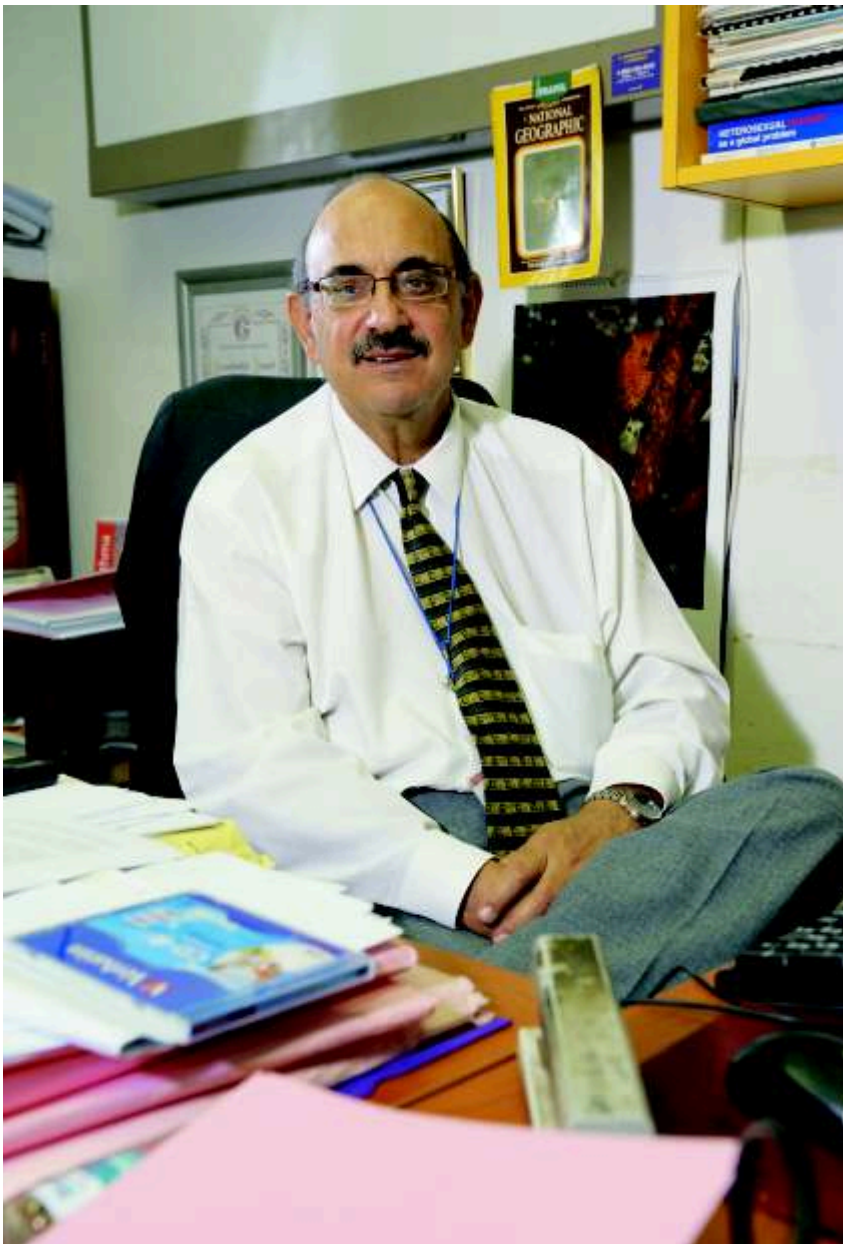
Prof. Pillay received grants from the NRF's National Equipment Programme and National Nanotechnology Equipment Programme (NNEP) to purchase a Micro Imaging Platform and an *In Vivo* Imager, while Dr Papathanasopoulos received a grant of R2.4 million to purchase a Surface Plasmon Resonance Analyser System.

In summary, the Faculty of Health Sciences sees itself as a research-intensive Faculty where the fields of research are addressing local and international needs with respect to diseases of importance to the health of our own and sub-Saharan African communities.

In addition, our basic science research addresses important issues which underpin our fundamental understanding of science and the generation of knowledge. We strive for quality in research in collaboration with other southern African and international institutions and produce research that is both applied and relevant.

Prof. Helen Laburn
Dean

Getting a GRIP on pneumonia



Prof. Charles Feldman

Pneumococcal diseases are the number one vaccine-preventable cause of death worldwide. According to the World Health Organization approximately 1.6 million people die annually as a result of pneumococcal diseases such as pneumonia and meningitis. **Prof. Charles Feldman**, Head of the Division of Pulmonology at the Charlotte Maxeke Johannesburg Academic Hospital and Wits, has devoted much of his career to the study of these diseases. His groundbreaking research in this field was recently recognised by the National Research Foundation with an A2-rating.

Feldman was born and bred in Johannesburg and studied medicine at Wits. He completed his degree in 1975 and did his internship at the former Johannesburg General Hospital, now known as the Charlotte Maxeke Johannesburg Academic Hospital.

After completing his two years national service, he joined the Johannesburg General Hospital as a medical registrar and completed his four-year specialisation in Internal Medicine. In 1988 he joined the Imperial College of London's Royal Brompton Hospital in the UK funded by a South African Medical Research Council postdoctoral scholarship.

He was also subsequently admitted as a Fellow of the Royal College of Physicians (London). In 1991 he received his doctorate and in 2009 his senior doctorate, both in the field of community acquired pneumonia (CAP). He currently enjoys international recognition as one of the leading authorities in this field.

Community acquired pneumonia

CAP is a lower respiratory tract infection most commonly caused by a bacterium called the pneumococcus. It is a common illness and affects people of all ages.

His research focus over the past 20 years has been on CAP. In South Africa the entity of 'pneumonia and influenza', which often occur together, is currently the second most common cause of death in adults, a major cause of death in children under five and one of the most common chest complications in HIV infected individuals.

The specific aspects of CAP that his research has covered include studies aimed at understanding the pathogenesis of pneumonia and others investigating various antibiotic and non-antibiotic treatment strategies.

In terms of pathogenesis, Feldman and his team are particularly interested in studying the way that pneumonia comes about, the risk factors for pneumococcal infection and the way that this bacterium interacts with the human host.

The researchers are also looking at ways of improving treatment with antibiotics and other, so-called adjunctive therapies, to try and increase the patient's odds of survival. Antibiotics are the drug of choice to treat pneumococcal diseases, but despite their high success rate, some patients still die, says Feldman.

"Studying the pathogenesis of the infection may help us determine and develop novel alternative treatment and/or preventative strategies for CAP, adjunctive to antibiotics," he adds.

In these studies, the research team has focused on the virulence factors of the pneumococcus and is

particularly interested in a toxin called pneumolysin. Pneumolysin itself is very toxic and causes inflammation in the lungs on its own and is thought to be contributing significantly to the lung inflammation that occurs with pneumococcal pneumonia.

"If you can inhibit the production of pneumolysin in some way, you can either prevent or treat the disease more effectively," says Feldman. They have found that certain antibiotics, such as the macrolides, can lower the levels of pneumolysin produced by the pneumococcus. This may lessen the severity of pneumococcal pneumonia.

Developing an optimal vaccine

Pneumolysin is also a protein and is highly antigenic so that it may potentially be a useful protein conjugate that can be used in a pneumococcal conjunctive vaccine. Such vaccines are particularly recommended for use in children. However in order to be able to develop a pneumolysin conjugate vaccine, one would need to have a pneumolysin molecule that is not harmful to humans.

The challenge now is to develop a pneumolysin that is not toxic or inflammatory, but retains its antigenicity. Researchers have managed to develop molecules that they call pneumolysoids, which they believe are not toxic. Feldman and his team are currently studying these to see whether they have any residual inflammatory effects.

International collaborations

Apart from collaborating with Professors Keith Klugman and Shabir Madhi, Feldman also works closely with a number of researchers from around the globe and is, amongst others, a member of the International Pneumococcal Study Group (IPSG) and the Community Acquired Pneumonia Organization (CAPO).

The IPSG recently completed an observational study which involved 844 hospitalised patients with blood cultures positive for *Streptococcus pneumoniae*, the number one cause of purulent meningitis, bacteraemia, CAP and acute otitis media.

They found that 9.6% of the organisms that were isolated from their subjects carried resistance to antibiotics such as the penicillins. The latter has been used effectively in the treatment of pneumococcal diseases since its discovery in the 1940s. Resistance to the drug became more pronounced in the 1960s when researchers started noticing that the pneumococcal strains found in Australia and New Guinea were demonstrating resistance.

In the 1970s the same trend became evident in South Africa and in the 1980s and early 1990s the US started



experiencing similar problems. It is estimated that up to the 35% of the pneumococcal isolates in the US are resistant to penicillin.

However, there has been considerable debate in the literature as to whether penicillin resistance had an impact on the outcome of patients with pneumococcal infections, treated with these agents, and therefore whether other antibiotics should rather be used instead of the penicillins.

This study clearly showed that provided appropriate penicillins are used in correct doses, penicillin resistance as it was defined at that time had no impact on the outcome and the penicillins could still be used.

As a member of CAPO, he is currently involved in an observational study to evaluate the current management of hospitalised patients with CAP.

Awards and achievements

During his long and distinguished career, Feldman has received various prizes and awards including the Vice-Chancellor's Research Award. He is also an Honorary Fellow of the South African Thoracic Society (SATS), Honorary Member of the Federation of Infectious Diseases Society of Southern Africa, served as president of the SATS for two terms, is a previously international regent and governor of the American College of Chest Physicians, is currently a national delegate for South Africa in the European Respiratory Society and an active member of the American Thoracic Society for many years.

Advanced DRUG DELIVERY TECHNOLOGIES offer HOPE to patients with life-threatening diseases

Prof. Viness Pillay and his team in the Department of Pharmacy and Pharmacology have successfully developed a number of biocompatible and biodegradable drug delivery technologies that can improve the efficacy of drugs used to treat diseases and conditions ranging from cancer to tuberculosis, HIV, epilepsy and other neurodegenerative disorders. If these technologies prove to be as effective as initial animal studies have shown, it offers new hope to patients. In addition, it will also result in a drastic reduction in the cost of medicine.

Pillay was awarded a South African Research Chair by the National Research Foundation in Pharmaceutical Biomaterials and Polymer-Engineered Drug Delivery Technologies in 2007. He is also Director of the Wits Advanced Drug Delivery Platform (WADDP) based in the Department of Pharmacy and Pharmacology and was designated as the Institutional Director of the Wits Hub of the National Medical Devices Innovation Platform (NMDIP), an initiative of the Medical Research Council (MRC) of South Africa since 2010.

What is a drug delivery system?

Pillay describes a drug delivery system (or technology) as a “device” that is different from conventional dosage forms such as tablets, capsules or suspensions. The difference lies in the fact that these specially engineered systems comprise various intricate mechanisms that control or regulate the manner in which a drug is released, absorbed, distributed, metabolised and eliminated by the body.

‘If you can control these parameters in the appropriate manner, you can get a drug to function more effectively in the body,’ says Pillay.

And that is exactly what Pillay and his team have set out to do. Their novel drug delivery technologies can be used to

release drugs in various ways and at different time periods – ranging from a few seconds to 24-hours, or even one year - depending on the formulation and the type of disease in a patient. Other technologies that he has developed can be used to ensure that drugs are released in specific areas where it is needed, such as the brain.

Research approach

According to Pillay, pharmaceutical companies are continually developing new drug molecules, instead of improving the efficacy of existing molecules.

The development of new molecules is extremely expensive and can take up to 20 years to develop. Patients often have to bear the brunt of these costs.

The reason why companies develop new molecules is because when they compare the risk/benefit ratio of molecules that present adverse side-effects, they decide to either discontinue the product or to develop a new product.

Pillay and his team have an entirely different approach. Their philosophy is to rather modify the effectiveness of existing molecules by incorporating them into one of their drug delivery technologies.



Prof. Viness Pillay

According to Pillay, their drug delivery technologies can be used to treat both the positive and the negative effects of older molecules that have presented adverse side-effects.

Research focus

Pillay has been working on a suite of drug delivery technologies for the past 19 years and together with his team, have developed the following niche technology development foundations:

■ Nano-Neuropharmaceutics

This team includes researchers from the Division of Neurosciences and Neurology, the School of Chemical and Metallurgical Engineering and the Department of Pharmacy and Pharmaceutics, focuses on the development of brain implants to treat patients with neurodegenerative disorders, including Parkinson's,

Alzheimer's and Motor Neuron Disease. The device or implant can be stimulated electronically or through the use of ultra-sound to release the drug.

■ Oncology

Drugs or chemotherapeutic agents that are used to treat cancer are highly toxic and patients are adversely affected by these molecules. The molecules not only target cancer cells, but also other cells in the body. Pillay and his team have succeeded in developing drug delivery technologies that only target cancer cells.

■ Wafer-technology

Drugs are administered using a wafer that is placed in the buccal (cheek) cavity of the mouth. Two wafer categories have been developed; namely rapid and slow release technologies.

The rapid release platform can be used in the treatment of paediatric HIV. There are currently no HIV drugs available to treat infected babies and young children. The current practise is to crush adult tablets and to mix it with milk.

However, the problem is that anti-retrovirals are highly unstable in liquids. "In addition, if a baby only drinks half a bottle of milk, he or she is not getting the prescribed dose, which means that you are wasting your time," says Pillay. "By making use of our wafer technology, the drugs are absorbed within eight seconds."

The slow or prolonged release platform can be utilised to treat patients with epilepsy. A patient sticks the wafer in his or her cheek at bed-time and the drug is released over a period of eight hours.

■ Chronotherapeutics

This technology can be used to treat diseases or conditions that only show signs and symptoms at certain times of the day. These include hypertension, rheumatic arthritis and heart attacks. Symptoms are triggered as a result of hormonal changes in the body, which occur at certain times in the day.

The delivery system developed by Pillay and his team releases a specific amount of the drug during certain periods of the day. The drug is released over a period of

two hours after which it stops temporarily. The cycle is repeated later in the day or evening.

■ **SpheriXites**

This technology is used to effectively treat diseases that require fixed dose regimens or drugs that are used in combination to treat illnesses such as tuberculosis and HIV.

One of the major stumbling blocks in the effective treatment of these diseases is the fact that drugs often interact with each other and form an insoluble product that cannot be absorbed by the body.

The new technology separates the two drugs, which allows them to be released in different areas of the gastrointestinal tract at a constant rate. This not only increases the bioavailability of the drugs, but also the rate and extent to which the drug is absorbed and made available.

■ **Gastroretentive systems**

Some drugs are only absorbed in a very small, specific site of the gastrointestinal tract such as the duodenum. The absorption site might be very small and if the drug passes that region without being absorbed, it is excreted.

"With our novel mechanisms of gastro retention the delivery system is retained within the stomach and the drug is slowly released and filtered through the pyloric sphincter into the duodenum. Because the drug is filtered in such small quantities it passes through the region at a very slow pace, which means that the drug can be absorbed much more efficiently," says Pillay.

■ **Doughnut-shaped minitablets**

Pillay and his team worked closely with the Department of Ophthalmology to develop an intraocular implant. The platform was initially developed to treat patients in the advanced stages of HIV/AIDS who develop cytomegalovirus retinitis which ultimately leads to blindness.

"Conventional forms of treatment, which include intravenous medication, eye drops, oral medication and posterior injections into the eye have been proven to be ineffective because either they cannot cross the blood-ocular barrier or they are associated with extreme side-effects such as endophthalmitis," says Pillay.

If a drug cannot cross the blood-ocular barrier of the eye, it cannot function effectively. The new implant, in the form of a monolithic doughnut-shaped minitablet, is inserted into the eye. The tablet degrades and is able to release the drug over a period of one year.

The next step

The majority of technologies have already undergone *in vitro* and *ex vivo* testing as well as *in vivo* preclinical animal studies. The next phase is to undertake Pilot Human Bio-Studies.

In addition, a number of technologies have already been patented, while others are in the process of being patented. Applications have been made in South Africa, the United States, Europe and Japan.



Coping with

CLIMATE

Climate models predict physiologically significant changes in ambient temperature and precipitation over the next few decades. For many vertebrate species, this will mean significant changes in their environment within a lifespan. In the School of Physiology, a group of researchers, led by **Prof. Andrea Fuller**, Director of the Brain Function Research Group, is investigating the physiological capacity of large African mammals to cope with the predicted effects of climate change.

"Long-living mammals are not going to adapt fast enough genetically, hence we are left with phenotypic plasticity and the issue of how quickly animals can adapt their physiology, notably thermoregulation, water balance and their immunology, as well as their behaviour, which we regard as part of physiology, to cope with a changing environment," explains Fuller.

A known behavioural change is for animals to migrate to higher ground or other suitable areas, which they did in past climate change events. This is no longer possible for larger mammals fenced into reserves, which puts enormous stress on them, particularly when water availability diminishes.

Immunological adaptability

Immunological adaptability, adds Fuller, is about how animals cope with the spread of diseases as insect vectors that accompany a rise in air temperature will increase.

In 2010 Fuller and her team, including Dr Robyn Hetem, Dr Leith Meyer and

Prof. Duncan Mitchell at Wits, Prof. Shane Maloney at the University of Western Australia, and several doctoral and masters degree students participated in various research projects to investigate to what degree wild or free-living animals are able to adapt their physiology.

"In order to investigate the physiological responses of wild or free-roaming animals, my colleagues and I use remote measurement techniques to measure physiological and behavioural variables of free-living animals in their natural habitats," she says.

A miniature thermometer is attached to a collar on an animal to measure black globe temperature – a single measure that integrates the effects of air temperature, wind speed and radiation. If, for example, an animal seeks shade, the globe temperature will be lower than that on a weather station out in the open.

"In this way we are able to determine which microclimates animals seek,

which is important for understanding climate change adaptability. Climate change models generally look at macroclimates, but don't take into account the microclimates available to free-living animals," says Fuller.

Interrelated stressors

Because of this and other complex interrelated stressors, the response of free-living animals versus animals in laboratory conditions or habituated/tamed wild animals showed significant differences.

"We know from collaborative research conducted by our research group with Prof. Claus Jessen, a leading German thermal physiologist, on wildebeest in the mid-1990s, that the physiological responses of the animals to climate variations under natural conditions showed the opposite results to what is described in the text books of animal physiology, where research is based on domestic or tamed animals," explains Fuller who did her doctorate on selective brain cooling (SBC) in mammals.

CHANGE

Following further studies in other antelope, Fuller and her team have confirmed that free-living animals switch off selective brain cooling when they are under stress, such as when they are being chased, and switch it on when they are at ease or grazing to lower the temperature of the hypothalamus and conserve body water. The text books cited the opposite.

"This is critical for southern African antelope as SBC is a mechanism that will buffer some of the effects of climate change. While mammals will potentially cope with the higher temperatures associated with climate change, they will nevertheless not be able to cope with little water. Take away their available water – whether in liquid or food form – and they are in trouble."

Key research

Key research has been conducted on the Arabian oryx and several other antelope, as well as livestock, particularly the Angora goat. The team has also explored the adaptations of Soay sheep in Scotland.

The results were published in several papers in 2010, including a review



Prof. Andrea Fuller

paper emanating from a special symposium at the International Meeting on Comparative Physiology and Biochemistry, held in Africa in 2008.

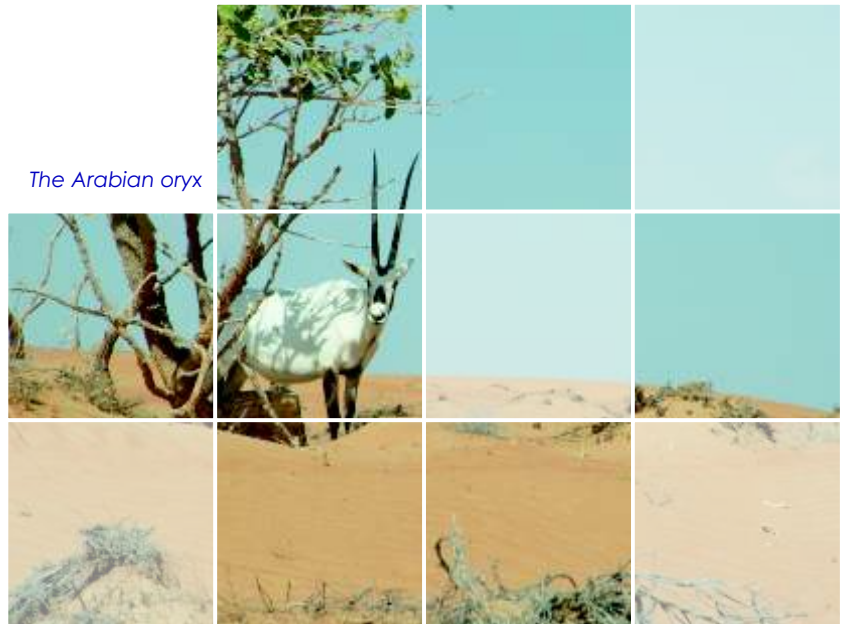
This paper, entitled *Physiological mechanisms in coping with climate*

change was published in *Physiological and Biochemical Zoology*.

The Arabian oryx

The Arabian oryx is exposed to the extreme heat and aridity of the

The Arabian oryx



Arabian desert, so represents an animal already exposed to the kind of conditions we can expect with climate change. It does not have access to any water for many months, other than through its diet," Fuller explains.

As part of her doctoral studies under Fuller's supervision, Robyn Hetem investigated how oryx survive in this harsh environment.

"We showed that in the hottest, driest periods, the oryx experienced wide daily fluctuations in body temperature (heterothermy), which is unusual in large mammals. Two of the oryx's body temperatures fluctuated by 7.7 degrees Celsius in a day, in air temperatures exceeding 40 degrees Celsius, which is the greatest body temperature fluctuation recorded in a day for any large animal."

The big body temperature fluctuations indicate that the animals were under considerable stress and, while they survived the year in which the team studied their physiology, they may not survive with further aridity.

This physiological change was combined with behavioural change. The oryx shifted from a more diurnal activity in the cooler months to a more nocturnal rhythm in summer, while maintaining the same amount

of total activity over 24 hours.

Most antelope species are active at dawn and at dusk but the Arabian oryx shifted from conducting half of their activities in the day and half at night during the warm, wet periods, until the hot dry season when they became completely nocturnal, says Fuller.

"What this tells us is that they are able to buffer themselves against the environment by becoming more nocturnal. What needs to be noted is that they don't have predators, whereas southern African antelope are subject to high predation, which could inhibit nocturnal activity."

The result of this research project was published in the *Journal of Comparative Physiology B* and the article was entitled *Variation in the daily rhythm of body temperature of free-living Arabian oryx (Oryx*

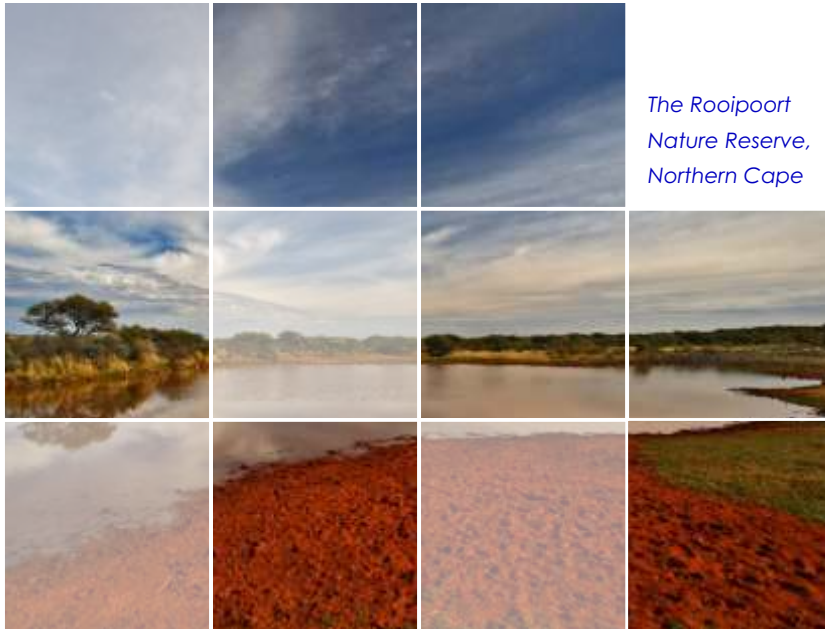
leucoryx): does water limitation drive heterothermy?

Angora goats

For her doctorate, Hetem and the team also looked at Angora goats in South Africa's Eastern Cape, which are important to the national mohair industry. A collaborative paper based on this research was published in 2011.

"We showed that animals inhabiting an overgrazed, transformed habitat, similar to that which is likely to occur with climate change, were more water dependent and more susceptible to thermal stressors in their environment than were goats inhabiting an intact environment with natural flora in the same region," explains Fuller.

They also observed that the animals in the transformed environment use



*The Rooipoort
Nature Reserve,
Northern Cape*

more microclimate selection – such as seeking out bushes for shade in the heat of the day – to control their body water and temperature.

This compromised other functions as they had to use other times of the day to find food and spend more hours seeking food, which meant they needed to take in more water to maintain themselves.

Soay sheep

Over the past 15 years in the outer Hebrides north of Scotland the darker, larger Soay sheep have been dying off, while their lighter, smaller counterparts are thriving.

“We looked at this and thought about the well known effects of solar radiation on dark colours, which absorb more solar radiation,” Fuller explains.

As a result dark-coloured animals

expend less energy to keep warm than lighter animals, but with the climate warming it could be reducing the advantage of dark coloured sheep. The decrease in dark Soay sheep shows a strong correlation with recorded weather data over this period.

Their paper entitled *A warming climate remains a plausible hypothesis for the decrease in dark Soay sheep* was published in *Biology Letters* in 2010.

Further research

It takes years and innovative technology to research animals in their natural environment and many other projects are underway, including one at the Rooipoort Nature Reserve in the Northern Cape where three different species of antelope, similar in size but with different water

dependencies are being studied by another of Fuller's doctoral students, Maartin Strauss.

The aim of this research is to determine whether the more water dependent species are less efficient at SBC. The team will also investigate how vervet monkeys, exposed to harsh environments in the Karoo, and camels, the animals believed to be best adapted to deserts, respond physiologically to changing environments.

Fuller and her team's research will become increasingly critical over the next couple of years as the effects of climate change are felt.

“We won't be able to predict accurately how animals will respond without much more knowledge about their physiological plasticity. It might be possible, for example, to move species that we know will face extinction to new, more suitable environments. Unfortunately, this global climate change event has not been mitigated, and many of our mammals are committed to extinction.”



KNOWLEDGE CREATION

Witnessing **Prof. Anna Kramvis**, Leader of the Hepatitis Virus Diversity Research Programme (HVD RP), working with and developing her team of postgraduates is testimony to the importance of Wits' strategic plan to develop its reputation as a research-driven institution.

The team comprises two postdoctoral fellows, six doctoral and two masters degree students, participating in cutting edge research in the field of molecular biology, which has been identified as a scarce skill by the National Research Foundation of South Africa (SA).

Kramvis has worked in the field of viral hepatitis for the past 15 years and has gone more than the extra mile to secure funding for her programme. While chronic hepatitis B (HBV) is listed in the top ten diseases in the world, funding is often limited because AIDS, malaria and tuberculosis overshadow it in Africa.

Sequence variation of hepatitis viruses

Her team's focus is the study of sequence variation of hepatitis viruses, their functional characterisation and their role in the clinical manifestation of liver disease.

"The hepatitis B virus is incredibly sophisticated and classified into nine genotypes and at least 32 subgenotypes," Kramvis explains.

"In Africa we get genotypes A, D and E, with subgenotype A1 predominating in SA, while A2 is found outside Africa. Subgenotype A1 develops certain mutations that A2 does not and A1 has been shown to be more prone to causing liver cancer."

"Therefore results generated from other regions of the world cannot be extrapolated to Africa," Kramvis continues.

One percent of the world's chronic carriers of HBV resides in southern Africa and while there is a successful vaccine against HBV, which was introduced in SA in 1995, those already infected, can go on to develop liver cancer.

students Chien-Yu Chen and Raquel Viana, showed that the mutant virus can produce a protein that accumulates in liver cells and leads to programmed cell death, which may contribute to the development of liver cancer.

As part of an 18-month study funded by the Medical Research Council of SA and the Cancer Association, doctoral student Trevor Bell established a cohort in Shongwe, Mpumalanga in order to study HBV-HIV co-infection.

Together with masters student Euphodia Makondo, they identified 72 individuals out of 300, who had markers for HBV before the start of antiretroviral treatment (ART) and sequenced the HBV strains.

"As far as we know, in Africa the HBV precedes HIV. HBV appears to be transmitted horizontally, usually between siblings and playmates, as opposed to the mother-to-child and sexually related transmission of HIV," Kramvis explains.

The programme's two postdoctoral fellows, Drs Shobna Chauhan and Deepak Gopalakrishnan, both from India, are continuing the study by following the evolution of the virus in the co-infected patients after the initiation of treatment.

"Of the 72 participants who had HBV markers only 26, or 9% had HBs antigen (a viral protein), indicating overt infection. This is an average statistic for SA where HBV is

and a neglected INFECTION

"In order to combat HBV infection and the end result of this infection, that is, liver cancer, using antiviral and antitumour treatment modalities, respectively, one has to study the virus and the mechanisms of tumourigenesis in depth," Kramvis explains.

Subgenotype A1 clones

To this end, doctoral student Nimisha Bhoola, has constructed subgenotype A1 clones in order to follow viral replication in tissue culture, as well as in the transgenic mouse model. This, after work carried out by doctoral

hyperendemic (more than 8% infection)," says Kramvis.

Silent infection

"What was revealing is that 15% tested negative for HBsAg but positive for HBV DNA (nucleic acid testing, which is the best and most sensitive form of testing). This is what we call an occult or silent infection."

Doctoral student Caroline Dickens characterised such an infection in baboons. What this means is that none of these infections would have been conventionally detected. HBV DNA testing is too expensive to be universally used in SA.

"This information is critical in the treatment of HBV-HIV co-infected patients because the introduction of ART can lead to the promotion of resistant viral strains, to reactivation of disease and hepatotoxicity. Therefore, it is important that the HBV strains in HIV-infected individuals are closely studied," adds Kramvis.

The fact that these patients were about to start ART is significant in other ways. Kramvis explains:

"Approximately 20% of HBV infected patients develop drug-resistance mutations every year, and they are on Lamivudine, which is used for HIV treatment. Hence the call by clinicians to change to other treatment drugs, such as the newer Tenofovir when this occurs."

Bioinformatic tools

In 2010, Bell started developing in-house bioinformatic tools – programmes geared to analyse the sequences the team is working on – in order to automate the processing of sequences instead of doing it manually, which will considerably speed up the process. This project is scheduled for completion in 2012 and has assisted in characterising HBV strains from cancer patients sequenced by masters student Mark Keyter.

Major grant

In May 2010 the HVDRP received a large grant, including bursaries, equipment and running expenses from the German Research Foundation (DFG) to look at HBV strains in Sudan and the rest of Africa.

It is a tripartite partnership between Wits, the University of Khartoum in Sudan and the Justus Liebig University Giessen in Germany.

Work started in July 2010. Called the Africa Initiative, it is aimed at capacity development in the study of neglected diseases in Africa.

"We chose Sudan because nothing is known about the genotypes in that region," Kramvis explains.

"Sudan provides an interesting crossroad in Africa. The genotypes prevailing there could be related to the spread of the Islamic Empires and/or the slave trade. In fact, we

have recently identified differences between subgenotype A1 strains that may be used to trace human migrations," she says.

"We have a doctoral student from the Sudan, Mukhlid Yousif, working on the project and we are looking at overt and occult HBV infections in relation to liver disease. Apart from finding genotypes D and E, we have found our first subgenotype A1 strain in Sudan."

The programme's output is extensive and includes collaborations between SA and Australia, Belgium, Germany, Greece, Kenya, Japan and Sudan.

Kramvis thoroughly enjoys working with students and partners from all over the world.

"The teamwork and the capacity to develop students is incredibly rewarding," she concludes.





Prof. Glenda Gray

Passionate about understanding HIV

The Wits-affiliated Perinatal HIV Research Unit (PHRU) at Chris Hani Baragwanath Hospital in Soweto has achieved international recognition for its research and results in the care, treatment and prevention of HIV in the mother-to-infant, adolescent and adult.

As a result of the work of the PHRU, antenatal clinics in Soweto offer optimised interventions to prevent mother to child transmission of HIV. The PHRU, with funding from USAID/US President's Emergency Plan for AIDS Relief over an eight year period, screened 250 000 pregnant women for HIV, and made anti-retroviral interventions available to reduce perinatal transmission.

From 2002 to 2010 transmission rates of women in Soweto who give birth to children every year have dropped from 14% to less than 5%. In 2002, the PHRU estimated that approximately 1400 babies became infected, but now with the effective roll out of Prevention of Mother to Child Transmission (PMTCT) interventions and optimising antiretroviral prophylaxis, less than 500 babies acquire HIV from their mothers in Soweto per annum.

Strong leader

Every unit is only as strong as its leader, and the PHRU Director and founding member, **Prof. Glenda Gray**, has demonstrated an exceptional ability to collaborate with other investigators in multicentre trials.

"Our unit is strong because our scientists are passionate about understanding HIV, sharing our findings and about making a difference in the world."

People from all over want to come and study here because Gray and her team are open-minded and collaborative, and they encourage people to use their data.

"We are beginning to understand the natural history of HIV sub-type C and the critical issues in HIV care and prevention. As a result we have developed capacity on

how to design HIV studies optimally, which is critical to the research process and towards achieving greater insights into HIV that may lead to breakthroughs," says Gray.

She cites the example of the *Children with HIV Early Antiretroviral Therapy (CHER) trial*, led by Auye Violari, a paediatrician in the unit who showed that two-thirds of infant mortality in HIV infected infants can be reduced through early exposure to anti-retroviral therapy (lopinavir-ritonavir, zidovudine, and lamivudine).

The results of this trial, published in 2008, changed the guidelines for early treatment worldwide. Additional research into assessing the efficacy of anti-retroviral regimens in children exposed to nevirapine as part of a PMTCT intervention led to a publication titled *Antiretroviral treatment for children with peripartum nevirapine exposure*, published in 2010.

This research investigated the efficacy of single-dose nevirapine, which is the cornerstone of the regimen for prevention of mother-to-child transmission of HIV in resource-limited settings.

A randomised trial was conducted on 164 HIV-infected children, 6 to 36 months of age in six African countries who qualified for treatment according to World Health Organization (WHO) criteria.

Among children with prior exposure to single-dose nevirapine for perinatal prevention of HIV transmission, anti-retroviral treatment consisting of zidovudine and lamivudine plus ritonavir-boosted lopinavir resulted in better outcomes than did treatment

with zidovudine and lamivudine plus nevirapine.

"Given that nevirapine is used for both treatment and perinatal prevention of HIV infection in resource-limited settings, alternative strategies for the prevention of HIV transmission from mother to child, as well as for the treatment of HIV infection, are urgently required," Gray explains.

The PHRU is committed to making a difference in resource-limited settings and it is fitting that it is situated in Soweto where the unit has a dynamic interaction with the community and a range of Community Advisory Boards (CABs). The CABs comprise members of the community involved in PHRU trials with whom the PHRU scientists enjoy a mutual learning and sharing relationship.

The members of each CAB reflect the participant study of each trial. Hence, if a trial is focused on adolescents, then the CAB related to that trial will comprise adolescent members.

"Several of our trials are the result of community members approaching us and asking us to conduct them," says Gray. "Women from the community ask us to include them in trials on HIV prevention from mother to child, or to put them on treatment trials if they are infected. This kind of treatment was not part of our agenda, so we adjusted our research agenda and introduced a huge treatment portfolio to meet the community's needs. The same applies to male circumcision; we now run a male circumcision clinic as a service to the youth in Soweto."

Gray says the most exciting breakthroughs in the unit's ongoing

research occur when their efforts start rolling out into practice, and reducing infection rates.

"In the 2009-2010 period we have been involved in several exciting research projects and collaborations."

One such trial conducted in South Africa by the PHRU is titled *Efficacy of short-course AZT plus 3TC to reduce nevirapine resistance in the prevention of mother-to-child HIV transmission: a randomized clinical trial*. The publication of the results from this research involving 406 pregnant women showed that a short course of zidovudine (AZT) and lamivudine (3TC) given with single dose nevirapine (sdNVP) at the onset of labour for four to seven days could reduce the nevirapine resistance associated with single doses. Newborns received the same regimen.

Nevirapine prevents mother-to-child transmission of HIV but differences between nevirapine-only and the combined NVP/CBV arms were significant ($p < 0.0001$). The estimated efficacy of the combined CBV arms was 85.6%. Similar resistance reductions were seen in infants who were HIV-infected by their 6-week visit.

This intervention is now part of PMTCT programmes worldwide.

Another challenging issue is the cost of drugs in resource-limited communities, but the unit is working on sourcing sponsors.

"Another significant collaboration between our unit and Caroline Tiemessen at the National Institute for Communicable Diseases (NICD) looks at the mechanisms of protection in the gene profiles of 76 women in South

Africa who are HIV-1 infected women,” Gray continues.

“There are babies with HIV-infected mothers who escape HIV infection and we need to understand what protects them by better understanding the mechanism of infection and transmission. We understand so much more about the immune mechanism associated with transmission now, but we still need to understand how this can help us with the development of the HIV vaccine.

Each and every trial reveals something important that leads to further trials and scientific findings that bring us closer to solutions that will have huge impacts on the lives of children, men and women in South Africa and globally,” explains Gray whose unit has assisted the following 2010 Masters and PhD students from the United States and Canada:

- **Kartick Ventakash** from Brown University in the United States received his PhD based on data from the PHRU. He has published several collaborative papers based on research undertaken with the PHRU in the 2010 period, including: *Who gets tested for HIV in a South African urban township? Implications for test and treat and gender-based prevention interventions.*

He explains this research: “With increasing calls for linking HIV-infected individuals to treatment and care via expanded testing, we examined sociodemographic and behavioural characteristics associated with HIV testing among men and women in Soweto.

“We conducted a cross-sectional

household survey involving 1539 men and 1 877 women as part of the community-randomised prevention trial. Most women (64.8%) and 28.9% of men reported ever having been tested for HIV, among whom 57.9% reported repeated HIV testing. In multivariable analyses, youth and students had a lower odds of HIV testing. The low uptake of HIV testing among men and youth, further targeted interventions could facilitate a test and treat strategy among urban South Africans.”

- PhD student **Angela Kaida** from the Simon Fraser Medical School in Canada based her research on work done at the PHRU.

The title of her published paper is *Contraceptive use and method preference among women in Soweto, South Africa: the influence of expanding access to HIV care and treatment services.*

“Preventing unintended pregnancy among HIV-positive women constitutes a critical and cost-effective approach to primary prevention of mother-to-child transmission of HIV and is a global public health priority for addressing the desperate state of maternal and child health in HIV hyper-endemic settings,” she explains.

“We sought to investigate whether the prevalence of contraceptive use and method preferences varied by HIV status and receipt of highly active anti-retroviral therapy (HAART) among women in Soweto, South Africa.

“The conclusion is that among HIV-positive women receiving HAART, the observed higher prevalence of

contraceptive use overall and condoms in particular, promises to yield fewer unintended pregnancies and reduced risks of vertical and sexual HIV transmission. These findings highlight the potential of integrated HIV and reproductive health services to positively impact maternal, partner and child health.”

- Masters student, also from Simon Fraser University **Angela Cescon** based her research on PHRU data, entitled *Conversations With Mothers: Exploring Reasons for Prevention of Mother-to-Child Transmission (PMTCT) Failures in the Era of Programmatic Scale-Up in Soweto, South Africa.*

Reasons for incident cases of vertical HIV transmission in the era of free access to PMTCT in South Africa were investigated. This mixed-methods study was conducted in Soweto from June-August, 2009. Birth mothers of HIV-infected infants born after 1 December 2008 were eligible. All participants completed an interviewer-administered questionnaire.

Major findings included the failure of per-guideline prescription of ARV strategies for infants and/or mothers, maternal refusal of treatment, fear of stigma, maternal difficulty with administering infant AZT and maternal confusion about infant feeding.

The conclusion was that a variety of individual, social and structural factors must be addressed to optimise PMTCT service delivery in South Africa.

HUMANITIES

Message from the Dean



The Faculty of Humanities continues to lead the University's quest to rise in the academic league tables. In 2010, the Arts and Humanities and Social Sciences received the highest ratings on the tables.

In 2009, there was a major increase in the Faculty's publication record with over 220 accredited publications – the highest ever for the Faculty. With the internally accredited creative research publications added to the list for the first time, the absolute record of the Faculty in 2009 more or less matched the records of the Faculties of Health Science and Science for the first time.

The estimates for 2010 suggest that the publication record should be reasonably close to the 2009 figure indicating a consolidation of the publication record at a new level. This is particularly impressive as the 2010 publications would have been produced for the most part during the period 2009-2010, when the surge in undergraduate numbers necessitated the provision of more classes and teaching.

An important feature of the contribution to research productivity is that all demographic categories across age, race and gender make a contribution. In 2009, there was also a major increase in graduate completions in the Faculty, with the Faculty clearly leading the rest of the University on this measure. Preliminary figures suggest that the performance in 2010 should be reasonably close to that of 2009.

The Faculty, through a grant by the AW Mellon Foundation, continued to broaden and deepen its intellectual and academic culture by hosting a

number of distinguished professors who have invigorated academic debate, mentored young academic staff and stimulated new research ideas and projects.

Emerging researchers

A related AW Mellon grant has also supported more emerging researchers, some of whom have attained promotion to higher academic ranks including that of Associate Professor. In this regard the Faculty is making a contribution to the project of nurturing a new generation of academics who will replace the aging cohort of academics in the next five to ten years.

The Faculty has acquired the reputation of being not only the most intellectually and culturally vibrant and engaged faculty on campus, but also in the country. As the following record will indicate, on most days there are any number of public talks, debates, seminars, conferences or performances to choose from.

The third Wits Arts and Literature Experience (WALE), a celebration of the artistic and literary talent of Wits alumni, staff and students, was not only a very popular event on the University calendar, but was also bigger and better organised.

The event showcased the enormous artistic talent possessed by staff and students at the University. The festival is beginning to add value to students'

repertoire of benefits that they get from studying at the University by giving them the cultural and social capital which will make them rounded graduates and citizens.

Wits School of Education

The Wits School of Education (WSoE) continues to focus on growing and broadening its research output. Strategies to this end in 2010 include the launch of a public seminar series and a quarterly undergraduate seminar programme.

Alongside this focus, the Research Committee worked to get ethical clearance for practice-based research examining higher education teaching and learning, with a view to supporting the development of both research, and research-based practice.

A number of papers were published in the high impact journals, *British Journal of Educational Studies* and the *Journal of Education Policy* by Prof. Ruksana Osman and a number of important books were published including *Literacy and Power* by Prof. Hilary Janks, *Teaching Mathematical Reasoning in Secondary School Classrooms* by Professor Karin Brodie and *The Moral Status and Rights of Animals* by Prof. Kai Horsthemke. Read more about Osman's work on page 121.

Several members of staff presented papers at international conferences in 2010. Prof. Jill Adler presented a plenary paper at the International Congress of Mathematicians in India. Janks presented a plenary paper at the *Conference for Culturally Responsive Research and Pedagogy* at the University of Waikato (New Zealand) in November.

Major awards and honours included the award of another First Rand Foundation South African Mathematics Education Chair to Prof. Hamsa Venkatakrisnan. The award includes five years of funding for a targeted research and development intervention that hopes to impact on mathematics teacher education and learner performance in certain schools (2010- 2014).

Adler, who was awarded a First Rand Foundation/National Research Foundation Chair in Mathematics Education in 2009, launched a research and development focused project in 2010. This project aims to improve the teaching and learning of mathematics across 10 secondary schools over a five year period.

The publication of *Primary Education in Crisis* by Prof. Brahm Fleisch was followed by a significant shift in policy towards primary education and a new focus on literacy and numeracy at that level.

Included in this new focus is a stronger emphasis on the national nutrition programme and the implementation of the new Health Screening Programme for Foundation Phase learners in quintile 1 schools. Both were issues highlighted in the book.

A wide range of public events were hosted by the WSoE in 2010. Key events which attracted significant academic and public interest were a joint seminar hosted by the School of Education, the Centre for Education Policy Development and Umalusi, and another joint seminar between the Manufacturing, Engineering and Related Services Sector Education and Training Authority and the European Peace University with Prof. Oumar Bouare.

The Mathematics Education Division hosted a series of public seminars on the proposed Curriculum and Assessment Policy Statements curricula for all phases, incorporating presentations by curriculum writers and debate that brought together academics from a range of disciplines interested in changes in school exit examinations and teachers.

Wits School of Arts

In 2010, the Wits School of Arts (WSOA) concentrated on strengthening its reputation as a centre of excellence in performance and exhibition.

The School's overall research performance has improved substantially with the internal recognition of creative works.

Creative research was officially recognised by the University for the first time in 2009 with over 25 accredited units being assigned. A similar figure is expected in 2010. While the Department of Higher Education and Training has accepted that there must be formal recognition of such works nationally, unfortunately the system of recognition has yet to be implemented. There is every reason however to think that the system will be of major benefit to the School given the large number of excellent artists across the disciplines in the School.

The School started to participate in cross-continental debates as a member of the *Centre International de*

Liaison des Ecoles de Cinéma et de Télévision, a prestigious international organisation for film and television schools.

In partnership with *The Institut Français d'Afrique du Sud*, the School contributed to a major street theatre performance during the 2010 Soccer World Cup, which showcased young artists from community initiatives together with Wits art students. A collective two month workshop was undertaken by the French Theatre group the *Les Grandes Personnes*.

The School also contributed actively to and participated in WALE, showcasing the best it has to offer in dramatic arts, film, music, dance and fine arts.

School of Human and Community Development

The School of Human and Community Development (SHCD) performed particularly well in 2010 achieving its highest number of publication outputs. In 2010, the SHCD produced a total of 109 journal articles, editorials, book chapters and books – up from a total of 101 in 2009.

Some 73% of publication outputs were journal articles, 25% were book chapters and 2% were books. The number of staff who published was increased from 56% in 2009 to 72% in 2010. The proportion of journal articles in accredited journals increased from 72% in 2009 to 78% in 2010.

Research articles were published in some of the leading academic journals in the School's respective disciplines. These included *Social Issues*, *Patient Education and Counseling*, *Information Processing and Human Management*, *Ergonomics*, *International Journal of Audiology*, *International Journal of Social Research Methodology* and a host of others. In addition, one staff member co-authored an article which was published in *The Lancet*.

In addition to journal articles, staff members also produced a number of books. Prof. Eleonore Ross co-authored the second edition of the book *Health, Illness and Disability* with Andee Deverell. Additionally, Prof. Edwell Kaseke of Social Work co-authored a book on colonialism and social policy with colleagues at the London School of Economics and the University of California. Prof. Gillian Eagle co-authored the book *Traumatic Stress in South Africa* with Dr Debra Kaminer from the University of Cape Town.

A number of staff members were invited to deliver keynote addresses at conferences internationally and in Africa. Prof. Norman Duncan gave an invited address to the *Third International Conference of Community Psychology* hosted at the Universidad Iberoamericana in Mexico and one as part of the opening ceremony of the 13th Chinese Congress of Psychology in China. Read more about his work on page 127.

Prof. Claire Penn was an invited plenary speaker at the *Paediatric Aids Treatment for Africa Congress in Uganda* and presented a paper at the 9th *Asia Pacific Conference on Human Genetics* in Hong Kong.

Prof. Garth Stevens delivered a keynote address at the 11th *Annual Social Psychology Graduate Conference* at the London School of Economics and at the symposium on *Continuous Traumatic Stress* in Kirstenbosch in SA. Dr Mzikzi Nduna gave an invited plenary address at the 4th *Africa Conference on Sexual Health and Rights* in Ethiopia.

The SHCD hosted a number of distinguished scholars during 2010 who contributed to the intellectual life of the School through public lectures, seminars and colloquia. These included: Oliver Turnbull (University of Bangor, Wales), Derek Hook (London School of Economics), Julian Barling (Queens University, Canada), Brandon Hamber (University of Ulster, Ireland), Gill Straker

(University of Sydney, Australia), Juliet Mitchell (Cambridge University, England), Christopher Sonn (Victoria University, Australia) and Zimitri Erasmus (University of Cape Town).

The SHCD also hosted a colloquium by Erasmus on *Revisiting Apartheid Race Categories* and proudly hosted pre-eminent scholar Prof. Mitchell who facilitated a workshop on *Psychoanalytic Thoughts and Theorizing*. Prof. Charles Potter also hosted the *Virtual Evaluation Conference* (Internet based discussion) that attracted the participation of some of the world's leading evaluation experts.

School of Literature and Language Studies

The School of Literature and Language Studies had a very good year in 2010, substantially improving its publication record over 2009 and demonstrating its social and public intellectual engagement through its public events and talks.

With regards to research, members of the School continued their tradition of publishing books, editing journals and special journal editions. Some of the highlights of these were the publication of *Loin de mon père* (*Away from my father*) written by Dr Véronique Tadjo, *Bodyhood*, a volume of poetry by Prof. Leon de Kock, former head of the School,

Trying Vasilis, a short story by Jo-Anne Richards, *Eyes Across the Water: Navigating the Indian Ocean*, a collection of essays edited by, amongst others, A-rated scholar Prof. Isabel Hofmeyr, *Guy Butler: Reassessing a South African Literary Life*, and a monograph by Dr Chris Thurman entitled *What is Slavery to Me? Postcolonial/Slave Memory in Post-Apartheid South Africa*, to name a few. All of these publications were over and above the School's continued and prolific output in terms of book chapters and published articles.

Members of the School were also the recipients of a number of grants and awards. Chief among these were the prestigious *Literary Lifetime Achievement Award* awarded to Prof. Peter Horn at the South African Literary Awards and the Friedel Sellschop Research Award awarded to Dr Chris Thurman.

In terms of ongoing activities and events within the School, Journalism led a special World Cup newsroom where the

Wits students were joined by fellow journalism students from the United Kingdom and China in producing multimedia content for a special website.

The theme of the annual Ruth First Memorial Lecture, commemorating the work of journalist, activist, feminist and Wits graduate Ruth First, was *The Politics of Poverty* and showcased the work of two Ruth First Fellows, Christa Kuljian and Crystal Orderson.

The annual Taco Kuiper Awards were held in April. The very first grant went to Antony Altbeker to support the writing of his book *Fruit of a Poisoned Tree - A True Story of Murder and the Miscarriage of Justice*.

David Beresford also received a grant to write *Truth is a Strange Fruit: A Personal Journey through the Apartheid War*. Alon Skuy, a third but more recent grant recipient, published the first part of his multimedia investigation into Hillbrow on *The Times* website.

The second Annual Es'kia Mphahlele Postgraduate Colloquium and Arts Forum was held in September and drew students from around the country, demonstrating that it has become an important event in the academic calendar. The sixth Power Reporting Conference was held in November and was a great success. Altogether 275 people attended 78 sessions, with many attendees coming from other African countries.

Media Studies secured a large grant from the International Development and Research Centre and Carleton University Centre for Media and Transnational Societies to undertake research on *Radio, Convergence and Development* investigating how public, private and community radio stations in southern Africa are using new information and communication technologies such as the internet and mobile phones to promote bottom-up, interactive, and participatory cultures.

School of Social Sciences

The School of Social Sciences (SOSS) made a substantial contribution to the Faculty's publication record as usual, publishing over 40 submissible journal articles, 28 book chapters, and five edited books in 2010, adding to its stellar performance of 2009 when it was the second best school in terms of the number of accredited publications produced in the University.

The edited book by members of the SOSS covered subjects that are at the heart of contemporary public policy debates in South Africa and Africa: Leah Gilbert, Terry Selikow, and E Walker edited *Society, Health, and Disease in a Time of AIDS*.

Professors Roger Southall and Devan Pillay as well as Dr Prishani Naidoo edited the *New South African Review*. Read more about the project on page 125.

Prof. Gilbert M Khadiagala, Khabele Matlosa and Victor Shale edited *When Elephants Fight: Preventing and Resolving Electoral-Related Conflicts in Africa*, while Prof. Daryl Glaser was responsible for the editing of *Mbeki and After: Reflections on the legacy of Thabo Mbeki* and Prof. Anthony Butler took on *Paying for Politics: Party Funding and Political Change in South Africa and the Global South*.

Members of the SOSS were also involved in the editorship of special journals such as the *New South Africa Review*, *Journal of Borderlands Studies*, *Journal of Southern African Studies*, and *Journal of Comparative Family Studies*.

Members of the School remained engaged in many public fora and the media, contributing to wide-ranging debates and issues including policy relevant research on for example, migration policy.

Wits Institute for Social and Economic Research

The Wits Institute for Social and Economic Research's (WISER) publication record in 2010 included over 10 accredited articles and four accredited book chapters. In addition, most importantly, Senior Researcher, Achille Mbembe, completed his latest book, entitled *Sortir de la grande nuit: Essai sur l'Afrique décolonisée*.

Another WISER researcher, Ashlee Neser, won the University Research Committee award to

have her book entitled *Stranger at Home: The Praise Poet in Apartheid South Africa* published with Wits University Press.

Two distinguished writing fellows worked at the WISER in 2010. They are Boris Boubacar Diop, the prolific Senegalese author, who worked on his upcoming documentary novel entitled *Capitaine Mbaye Diagne*, and Johannesburg photographer, Jo Ractliffe, who produced an extended photographic essay entitled *As Terras do Fim do Mundo*.

The Society, Work and Development Institute

The Society, Work and Development Institute (SWOP) produced 10 accredited articles and book chapters in 2010. Amongst the highlights of 2010 was the series of public seminars presented by Michael Buroway, Professor of Sociology at the University of California and President of the International Sociological Association.

Entitled *Conversations with Pierre Bourdieu*, the seminars attracted wide interest within the University and wider academic community. The SWOP breakfasts hosted once a month, presented insights into the research conducted by staff and postgraduate students to an audience composed variously of academics, students, trade unionists members of civil society and community activists.

Prof. Tawana Kupe Dean

Understanding students'
experience of

LEARNING



Prof. Ruksana Osman, head of the Wits School of Education (WSoE) (standing) and colleague, Prof. Hamsa Venkatakrishnan, WSoE SA Numeracy Chair

One of the key ways out of the education crisis is to identify teachers as key agents of change and reform, and to equip them with approaches to enable them. *The Phenomenographic Horizons Project* is one such approach. It sets out to understand and explore students' conceptions and experiences of learning, says Prof. **Ruksana Osman**, who took over as Head of the Wits School of Education (WSoE) in January 2010.

Phenomenographic Horizons is a collaborative research project, which she leads in South Africa with Prof. Hamsa Venkat, who holds a South African Numeracy Chair. Prof. Shirley Booth from the Faculty of Education at Gothenburg University leads the project in Sweden with Jonkoping University colleague Prof. Elsie Anderberg from the School of Education and Communication.

"The project brings together researchers from different universities in different parts of the world to critically consider and understand the phenomenographic research approach and its associated theories in the South African context," Osman explains.

Collective experience of learning

Phenomenography is a research methodology that explores the different ways that students experience or think about what they are learning, and how teachers are experiencing what the students are learning.

An ethical point of the phenomenographic research approach is that the results are not related to individuals at all – the results are rather an analysis of the collective experience of the phenomenon in question. In other words, it is about foregrounding the students' experiences of learning.

The full title of the project spells it out: *Phenomenographic Horizons – A collaborative study of empirical, theoretical and practical approaches to research on the issues of learning and teaching in higher education with the students' experience of learning in focus.*

Long-term spinoffs

The long-term spinoff is to improve the quality of teaching and learning by educating teachers to take a scholarly gaze at their work, and to become more empathetic with what their students know and understand about specific objects of learning.

The approach emphasises a 'relational' view of learning – learning as a relation between the student and what is to be learnt, and as such, tends to shift away from deficit views of students and normatively attuned views of learning.

"The year 2010 was a key one for the project and its network of researchers. We spent time disseminating some of our findings in symposia here and in Sweden and the work coming out of this collaboration was published in a special issue of *Education and Change*, an International Science Index journal, edited by Booth and I," says Osman.

Quality education and quality teacher education

Osman first directly encountered phenomenography in 2007 when Booth, who did her doctorate in phenomenography, came to Wits as a visiting professor and shared the ideas of this approach in a staff seminar.

"It turned on a light for me because I was concerned that while a greater number of students were gaining access to universities, they were not managing to complete the programmes for which they registered. To my mind this was not only an issue of poor schooling, it was also an issue of how universities were prepared for students from such diverse schooling backgrounds," explains Osman.

In a country where multiple social inequalities prevail, quality higher education and quality teacher education are the challenges we face and to which we must raise questions and find answers, she adds.

"I was looking for ways to approach this conundrum and phenomenography, with its relational orientation towards student learning, giving me some promising insights for the South African context."

While it is not widely known in South Africa, phenomenography is well known in other parts of the world, especially in the United Kingdom, Australia and parts of Asia.

In 2010 the WSoE hosted two Mellon Distinguished Scholars, prominent teaching and learning academics who have researched this field of phenomenography. They are Prof. Keith Trigwell, Director of the Institute for Teaching and Learning at the University of Sydney and Prof. Mike Prosser, Executive Director, Centre for the Enhancement of Teaching and Learning at the University of Hong Kong.

At the inception of the research project the WSoE also

hosted Ference Marton, Professor Emeritus at Gothenburg University and the founding father of phenomenography.

Bracketing the socio-economic context

“What SA can learn from the phenomenographical work being done in other parts of the world is to begin to look closely inside the classroom and instructional dynamic,” continues Osman.

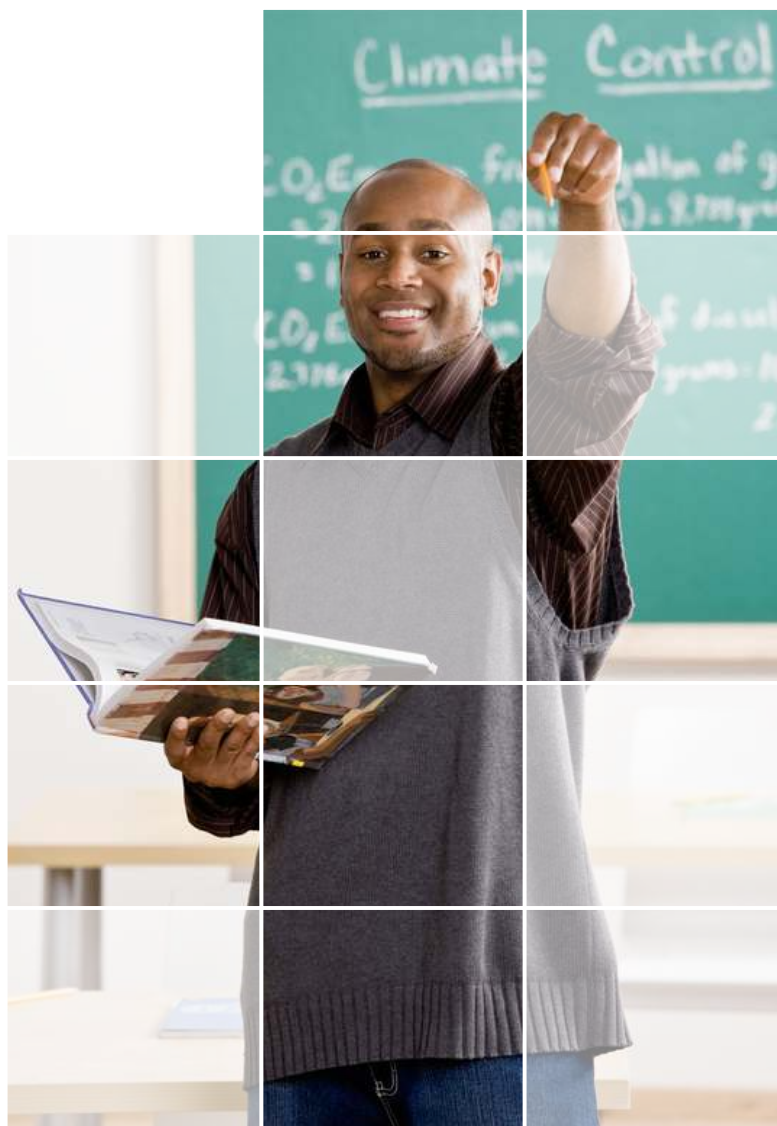
“While recognising the importance of socio-economic aspects, what phenomenography helps us to do is to bracket the socio-economic context for a moment and focus on the object of learning. This is not to suggest that the socio-economic context of learning is unimportant to the academic or teaching context of learning.”

While the project is focusing on higher education, the phenomenographical approach helps teachers at all levels to think more fully about student learning and to re-look their teaching from the perspective of the learner.

“What we did was to look at our teacher education students' conceptions of research because they all have to do a research project at the end of their fourth year,” says Osman.

“I noticed that students responded to the challenge of the research project very differently. Some enjoyed it, while others hated it. Based on this we set up a study focused on our first year teacher education students and explored what they understood by research. The responses ranged, from 'going to the library' to 'something people do in a lab' to 'cutting and pasting information' to 'finding out something for myself' to 'developing myself'.

This variation in understandings of research among undergraduate students is not unique to South African higher education. Several international studies have studied



the research project and how it is being experienced by undergraduate teacher education students and found similar responses.

Several symposia here and in Sweden have tackled the question of phenomenography and its application in higher education. At present the phenomenography network is working on an anthology of papers which will cover contributions from the various members of the research team.

The anthology has the working title of *Teaching for Learning and Learning for Teaching*. It is being produced in collaboration with Prof. Ake Ingerman from the Faculty of Education at Gothenburg University and Prof. Brandon Collier-Reed, Director of the Centre for Research in Engineering Education at the University of Cape Town.



DEVELOP or decline

Dr Prishani Naidoo (left) and Professors Roger Southall (centre) and Devan Pillay (right)

Since 1994 the successive South African governments headed by ANC presidents Nelson Mandela, Thabo Mbeki, Kgalema Motlanthe and Jacob Zuma have not only had to assume the normal burdens of state, but also to confront massive challenges of transformation across the political, economic, social and international spheres. In retrospect there have been considerable achievements. Yet, again, there have been many wrong moves, many downright failures and many disappointments. The objective of the *New South African Review* is to provide a forum for reflection upon achievements, problems and challenges, and to stimulate debate between divergent positions held upon a wide range of issues.

*Published by Wits University Press in October 2010 this excerpt from the preface of the New South African Review (NSAR) 2010: **Development or Decline** succinctly summarises the exciting, progressive content of what promises to become an annual volume.*

"We started the NSAR in the Department of Sociology with the aim of making it highly accessible, not only to students and academics, but to a wider public. Our aim is to convey how people on the ground view South Africa, instead of simply portraying it through the eyes of the government or the media," explains Prof. Roger Southall.

Southall, Head of the Department of Sociology, edited the book with colleagues Prof. Devan Pillay and Dr Prishani Naidoo, and Prof. John Daniel of the School of International Training in Durban.

Development or Decline follows the enquiring tradition of critical scholarship established by the seven volumes of the *South African Review*, published in the 1980s and 1990s.

It is written in a readable writing style by a wide range of authors on current South African issues including politics and the problems with state engagement, the environment, land reform, crime and sex, the economy and poverty.

The 20 chapters in this edition appeal to a broad audience and it has attracted plenty of interest from the diplomatic community and universities around the world.

Each editor has written an introduction to one of the four parts of the edition and/or contributed a chapter in critically relevant discussions about where SA and its people find themselves today.

Similarity of problems faced by the apartheid and ANC governments

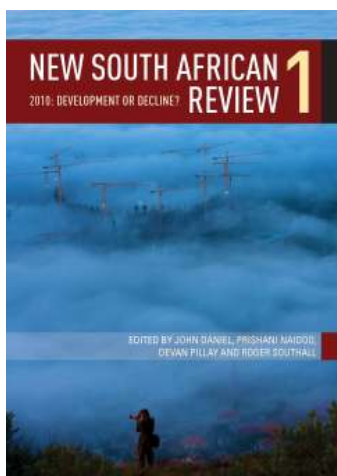
"We see the book as a space to encourage debate," explains Naidoo who, in a chapter she contributed entitled *Indigent Management: A strategic response to the struggles of the poor in post-apartheid South Africa*, addresses the similarity of problems faced by both the apartheid and the ANC governments; namely how to cater to the needs of the growing urban black poor and fulfil the promise made by the ANC of a better life for all.

She re-addresses this in the introduction to Part Four on *Crime and Sex* where she talks about crime, prisons, child trafficking and transactional sex as signs of social decline in our highly commodified yet economically deprived society.

Social equity

In Southall's introduction to the book entitled *From short-term success to long-term decline*, he discusses the disappointingly low level of economic growth achieved since the opening up of the economy to the global market post-1994.

"It has had highly contradictory outcomes and proved grossly insufficient in providing for the employment needs of the country while being accompanied by high levels of inequality," says Southall, arguing that SA could be on the verge of long-term descent towards mediocrity,



largely because of issues of governance (political and economic) and human development.

Achieving social equity, he argues, will require a move away from the political economy of 'entitlement' and easy money in both business and in politics where 'numerous politicians have

exhibited their sense of entitlement by the plundering of public funds compounded by displays of arrogance to the people who have elected them'.

He adds that achieving social equity will also require a reappraisal of the careless disregard with which the active legacy of the minerals-energy complex and the present growth pattern has on the economy.

"Just as the present existing form of global capitalism is rapidly reaching its ecological limits, so SA's failure to reign in the mining industry's abuse of the environment (notably the country's limited water resources) and to commit seriously to moving away from dirty energy, points to a developing crisis of survival whose parameters are almost unimaginable to the present generation."

Global financial crisis

Presenting an equally hard-hitting appraisal of SA and the eco-logic of the global capitalist crisis, Pillay discusses the severe effect of the global financial crisis on SA and argues that it will come back if the fundamental roots are not addressed.

"At a fundamental level, there are increasing indications that the country's growth trajectory faces a crisis of 'sustainability' in both senses of the word – sustainable growth that creates decent jobs and rising living standards for all, as well as sustainable growth that protects the natural environment and

leaves the earth with sufficient resources for future generations."

This crisis, he explains, is rooted in the structure of the South African economy, which was inherited from racial capitalism that emerged as a result of the historical synergy between the mining industry and fossil energy systems that sustain it, as well as a financial sector that grew out of it.

"This minerals-energy-financial complex remains central to South African capitalism, subordinating all other economic activities, including manufacturing," he says, adding that efforts to move out of this dependence have been half-hearted.

He questions whether the answer is a 'green capitalism' or some form of 'green new deal' or whether capitalism needs to be completely transcended.

The titles of other chapters speak on other pressing concerns affecting SA, for instance:

- *The African National Congress under Jacob Zuma* by Anthony Butler;
- *The politics and challenges of delivery* by John Daniel;
- *Reform and redress in higher education, health and land* by Southall;
- *Our burden of pain: Murder and the major forms of violence in South Africa* by David Bruce; and
- *Relationships of exchange amongst South African youth in an age of conspicuous consumption* by Terry-Ann Selikow and Graham Gibbon.

The debates raised in the NSAR about the kind of creative thinking, strong leadership and political will needed to push start a new order are critical to our future.

The Apartheid Archive Project



Prof. Norman Duncan

Narrative drawn from the Apartheid Archive

"When I was still quite young, I don't remember how old, but in the 70s, I was walking in the main shopping area, past a number of shops, including Clicks and Shoprite. It was busy. I lost sight of my mother and looked out ahead. Then, suddenly, I had to move sideways to get out of the way of another pedestrian.

But I couldn't avoid brushing against a big white man. I apologised for making contact with him. He stared accusingly and bellowed: "Kyk waar jy stap jou donder ... Wie dink jy is jy?" (Watch your step you bastard ... Who do you think you are?...)

As with everybody in the country, 'race' shaped my everyday lived experiences. It was and is part of my life world, and while it is difficult to name the implications of these experiences ... racism did register.

It has influenced my friendship choices and identification and I know I have to prepare my children for it. The experiences and memories also provide insight into the power that people are afforded or denied because of their assigned racial group membership.

They made me realise the psychological, material, and political implications of race.

Challenging racism has become central to my work – understanding, challenging, and transforming racism. I am not interested in only the overt and horrible forms of racism, but the insidiousness of everyday racism, its effects, and the social, cultural and other symbolic means through which racism is produced and legitimised.

This is how it has impacted upon my life. It provides the focus for my work: The effort to disrupt racism, to create a space for the stories of those left out, denied, silenced. But as Laubscher and Powell (2003) have written, “dealing with racism on a daily basis is tiring.”

So reads part of one of the personal narratives about life under apartheid, collected by the Apartheid Archive Project launched in 2009. The aim of the five-year project is to collect approximately 5 000 narrative experiences of 'ordinary' South Africans born before 1988 from every sector of our society, but particularly from marginalised groups, such as the poor and the socially vulnerable, whose life stories are rarely incorporated into dominant historical accounts of the past.

The narratives explore how earlier experiences under the old apartheid order may currently mediate individual and group responses to the 'other' and the 'self'.

The project was initiated by Professors Norman Duncan, Garth Stevens and Brett Bowman, together with Hugo Canham from the Wits Transformation Office and Thandi Buso in the School of Human and Community Development (SHCD).

“It is 17 short years since the curtain was finally drawn on the system of institutionalised racism that the world knew as apartheid. Yet, our everyday personal accounts of apartheid are rapidly fading into a forgotten past,” says Duncan, who heads the SHCD.

This, he argues, is problematic because it is our individual narratives, rather than the grand political accounts of our history, that also give meaning to and construct our lives. The Apartheid Archive Project is aimed at remembering this personal and personalised past.

“We are interested in the process of memory retrieval and in the value of giving a voice to people who have not always had a voice. This approach is used in research on other social and psychological phenomena, so it is not unique to our study, but it has less frequently been used to record the personal histories of South Africans about their past.

Stevens, co-leader of the Apartheid Archive Project and an associate professor in the Department of Psychology and Assistant Dean in the Faculty of Humanities, explains that it embodies several key thematic thrusts, including:

- A social-psychological exploration of the trans-generational transmission of experiences related to apartheid racism;
- Memory, remembering and remembrance as a function of identity, subjectivity, self-presentation and self-preservation.

To date the project has published some 22 articles in international journals including *Psychoanalysis, Culture and Society* (United Kingdom), *The South African Journal of Psychology* and *Psychology in Society*. The team has also been invited by the *Journal of Peace and Conflict Studies*, to produce a special issue on the project for 2011/2012.

In an article that appeared in the *South African Journal of Psychology* in 2010, Duncan and Bowman describe the project as 'a repository for people's experiences premised on the understanding that although 1994 saw the demise of formal apartheid and the transfer of political power from 'white hands' to 'black hands', the pernicious effects of this ideology on our inner- and outer-worlds on memory, identity, subjectivity, intergroup relations and social inequities, continue to constrain the promise of a truly post-apartheid, non-racial South Africa'.

Furthermore, the project was based on the assumption that the traumatic experiences from South Africa's past will constantly attempt to re-inscribe themselves – often in masked form – in the present, if they are not

appropriately acknowledged and dealt with.

Quoting Karl Marx in the paper, Duncan writes:

"Men [and women] make their own history, but they do not make it just as they please; they do not make it under circumstances chosen by them, but under circumstances directly found, given and transmitted from the past. The tradition of all the dead generations weighs like a nightmare on the brain of the living." (Marx, 1869/1977, p. 398).

The project now involves 30 principal researchers from a range of universities in South Africa including Wits, the Universities of Cape Town, the Northwest and the Western Cape, the London School of Economics, Duquesne University in the United States and the Universities of Sydney and Victoria in Australia.

Eighteen Honours degree students participating in the project graduated in the 2009/2010 period. Five Masters degree students also participated, three of whom graduated at the end of 2010 and two are ongoing, as are ten Honours degree students and one Doctoral student.

The reason for the overwhelming interest in the project, says Duncan, is quite simply that 'its time has come'.

"People are psychologically more ready to engage with the issues and trauma of the pre-1994 period in all its permutations," he explains.

The issue of race and racism and its continued, complex presence in our lives makes it a more topical issue than ever before. Enough time has passed for us to reflect on the trauma and to try to understand the hurt, confusion, mixed memories and the healing that accompanies post conflict societies, he adds.

"When we first flighted the idea we had such a strong response from South African researchers and researchers from all over the world who are South African by origin."

This response has continued without a single researcher dropping out of the project, and with every one of them coming from all over the world to attend the three-day conferences they have held in SA in 2009 and 2010. The 2010 conference, hosted by the UWC, was entitled *Working with the Archive*.

The narratives are limited to two to four pages. They are either submitted anonymously online or they are conducted as person to person interviews, particularly in the rural areas where people have no access to the internet.

Respondents are asked to recount their earliest and/or most significant experience of racism during the apartheid era, where and when it happened, who the major role players were, and how they think this may have contributed to shaping them today.

"The narratives describe our different

ways of experiencing our whiteness and blackness and how this has changed over time," Stevens explains.

"The narratives speak of anger, shame, guilt, activism and mastery – where despite the challenges of apartheid, we have persevered and emerged from it, although with differing outcomes. The narratives also speak of reconciliation and of the ambivalence and the complexity of living in contemporary SA."

As psychologists, Duncan and Stevens believe the potential healing that people experience when they engage with their past histories, helps to conquer a difficult part of their lives with words.

All the narratives are archived at the Cullen Library, with the data embargoed for 12 months at a time so that the researchers can work with the narratives. The data then becomes available to all and the team is looking at ways in which they can translate it into a popular format for civil society.



Prof. Sarah Nuttall

REALITY: HUNGER

The cultural shifts in the 'compelling, volatile and complicated life of contemporary Johannesburg' forms the basis of the work that **Prof. Sarah Nuttall** of the Wits Institute for Social and Economic Research (WISER), has been conducting over the past ten years. Much of her work has been published in a series of books that straddle fiction, non-fiction, journalism and history. In 2010 she published several journal articles and book chapters on 'the way we read now', which will contribute to her next book of essays.



on the rise worldwide

"In attempting to write the history of the present from the vantage point of contemporary Johannesburg, I have wanted to understand the often unpredictable ways in which the city itself as an urban form has begun to shift in response to the complex legacy of political and generational change in this country. At the same

time I examine what has stayed the same because one of the felt dramas of living in South Africa is the shadow of a past that can seem inert and immovable," Nuttall explains.

Included in her definition of 'urban form' is the life of the 'bodies' or people who inhabit the city (how they inhabit ordinary life or style themselves or suffer) and the structures of the intimate self (including capacities for caring, self-reflection and sexual life).

As an extension of this she is looking at the global 21st Century phenomenon of 'reality hunger' that is showing signs of rising in the world today. This includes people's interest, even obsession with reality shows, celebrity culture, cable news and Facebook pages, she explains.

"Each of these mediums, of course, winds together aspects of fact and fiction, reality and artifice, and I am working on drawing out a South African perspective on these."

In her book entitled *Entanglement: Literary and Cultural Reflections on Post-apartheid*, for example, she examines a range of Johannesburg cultural forms: novels, paintings, radio and fashion.

"One of the central investigations of the book relates to the unexpected and striking co-incidence of the end of apartheid and the rise of consumerism as a potent, at times damaging and at the same time often creative vector of self-making and of a form

of worldliness for young urban people in particular," continues Nuttall.

In the mid-1990s the Truth and Reconciliation Commission and its processes of witnessing, confessing and attempting to understand a national process of healing were central to so much cultural thinking in these years, she explains.

"At the same time, in ways that we only really caught up with in the 2000s, young people in particular were finding different kinds of identities for themselves, often inspired by new media and internet cultures and by a global explosion in a 'culture of things', drawing on modes of global citizenship that had been less available to them during the years of political struggle."

The forms of re-invention, breaking with the codes of the parental generation which were evident in the rise of loxion culture and in vernacularised hip hop culture opened up questions about the meanings of being South African in the 21st Century.

In her work, Nuttall investigates forms of youth culture emerging inside of market forces, and investigates the capacity of young Africans in Johannesburg to manipulate (rather than just be manipulated by) and to creatively interpret the numerous 'surfaces' across which market driven images work.

"It has become clear that young people in particular read across many more screens and kinds of texts than they used to, and this must change

how we teach and how we imagine ourselves in the world and in relation to others," she says.

Nuttall also analyses the history of unofficial whiteness through autobiographies and memoirs by white South Africans who have broken with inherited forms of whiteness: either through joining political struggles, living in cross-racial marriages long before the end of apartheid, or using the experience of living with AIDS to rethink their own race and class positions.

In another of Nuttall's books called *Johannesburg: The Elusive Metropolis*, which she edited with Achille Mbembe, also from WISER, they attempt to substantially reconceptualise Johannesburg.

The argument is that while Johannesburg had been largely confined to a scholarly lens of 'urbanisation' on the one hand and 'the rise, fall and re-emergence of the segregated city' on the other, it had yet to be conceived of in its citiness, she explains.

"The book tries to produce an imaginative portrait of the city as city, bringing into focus its street life, its suburban formations, its self-stylisations, its built forms, fiction, and its visual art, conceptualising all of this in terms of a major intellectual and cultural metropolis in the global South."

It includes chapters on the impact of formations like Melrose Arch and Montecasino, on the inner city, Rosebank and Yeoville and includes a

reconsideration of the relationship between the city and townships, changing perceptions of each through the eyes of young people navigating both spaces on a daily basis.

In the midst of all this academic activity, she decided she wanted to drop the academic voice and try to get at a sense of what it felt like, being alive but not always well in Johannesburg. This led to her collaboration with Liz McGregor, a South African journalist who had been based at *The Guardian* in London for many years, but who returned to South Africa.

The result was two collections, *At Risk* and *Load Shedding* published respectively in 2007 and 2009.

"As we wrote in the foreword to *At Risk*, 'the non-fiction stories gathered here are written by academics and journalists, but they collapse the distance that academic writing and journalism often impose. In academia or news writing, writers are expected to discount their personal reactions and to offer few, or no, private opinions. What is offered here, by contrast, are candid, intimate voices,'" explains Nuttall.

The idea behind the book was to embrace the idea of risk and uncertainty and to accept the possibility of danger, distress or disaster.

"It is also an inherently creative act," she explains, "because without taking a risk, there is no prospect of surprise, change or unexpected gain. Risk-

taking is a way of taking on the unknown."

The point of these two collections of non-fiction, written by Nuttall, McGregor and ten other academics and journalists, was to build on and open a groundswell of personal stories emerging in SA after apartheid, written in a wider range of registers than political struggle and its imperatives.

The writers question and explore issues including: What are the fruits of freedom? What is it to live in a context in which we are subliminally primed for major loss (including growing poverty, violent crime, AIDS, road accidents)? Relationships between people across race, culture and history, xenophobia and corruption.

"It is very pleasurable to me to be able to reach a wider audience than academic texts generally can," says Nuttall, concluding with a wonderful anecdote about a woman named Josephine Mashaba who cleaned the offices at WISER for many years.

"She told me that she had been borrowing my copy of *At Risk* and reading one story a night on the bus on her way home. She would then return it to its spot on my shelf the next morning. She said that she loved to be able to read the work we did in our offices all day. She now has copies of both volumes and I know she has read all the stories in them."

A photograph of a woman with short dark hair, looking out of a window with horizontal blinds. The scene is dimly lit, with light coming from the window. To the right of the woman, there are large, elegant, light-colored decorative swirls that curve upwards and to the right.

Legacies of

VIOLENCE

live on in prisons

As a recipient of the prestigious Friedel Sellschop Award for young researchers at Wits,

Dr Kelly Gillespie, a social anthropologist in the School of Social Sciences, spends much of her time worrying about the worth of South Africa's prisons. In her view, prisons are institutions that rarely live up to the task we set for them, and we ignore them at our peril.

Drawing on several years of fieldwork in the prisons of the Western Cape, as well as the critical prisons literature emerging primarily from the United States (US), Gillespie is attempting to make an argument in SA against the roll-out of prisons as a solution to crime.

As government discusses the building of five large new prisons (likely to be built and managed by the private sector), and as the South African public seems little concerned with the meting out of harsh punishment (either by minimum sentencing laws or 'popular justice'), a critique of punishment is not easy to make.

"Ours is not a social climate conducive to demonstrating the complexities of criminality and punishment. We want quick fixes to crime and we want to believe (despite evidence) that they work," says Gillespie.

Demonstrating complexity

But demonstrating complexity is precisely what Gillespie seeks to do, as she works over the next two years to turn her Doctorate from the

University of Chicago, into a book about the politics of incarceration in SA.

She wants to understand the social and political logic of a 60% increase in incarceration rates after the country's transition out of apartheid, a statistic that belies any easy claim that SA has transitioned from a security state to a democracy.

"This is a conundrum that I really thought was important to try and figure out. In all of the rhetoric about democracy and freedom, this seems to me to be an important place to look for what forms of 'un-freedom' and control were being rolled out or generalised in the name of democracy," explains Gillespie.

As an anthropologist, she is part of a small group of international scholars who use ethnographic methods to study prisons. She spends her research time in prison courtyards and offices, living with warders on prison compounds and talking to prisoners about their lives and their experiences of prison space.

Lavender Hill

She is currently busy with research on how evidence is managed by magistrates in courts in Cape Town. She is also working with a women's activist group in Lavender Hill to assess the relationship between gender-based violence and incarceration.

Gillespie became interested in prisons during a visit to Pollsmoor Prison in the Western Cape during



Dr Kelly Gillespie

her Honours year at the University of Cape Town. The more she began to think about the social lives of prisons, the more she began to recognise their importance in reflecting and shaping the history of South African society.

And the more she began to realise how deeply prisons structure the sociality of many of the most violent neighbourhoods in our country.

Research focus

Gillespie's doctoral dissertation, entitled *Criminal Abstractions and the Post-Apartheid Prison*, was a first attempt at trying to read the



ethnography of prisons as a critique of incarceration.

"I started to read quite widely about prisons," she explains. "Ex-colonial prisons in the colonial-era, prisons in the US and critiques of a carceral agenda. A lot of prison criticism has come from academics and intellectuals in California, a region with massively high rates of incarceration, who accuse the US government and private interests of investing far too much in incarceration, to the detriment of funding for education and social security. The fact that the US prison system is primarily skewed towards the incarceration of poor

people and people of colour, has earned prisons the descriptors 'warehouses for the poor' and the legacy of slavery," says Gillespie.

Although the South African prison system and society is of course very different from the US, what is strikingly similar, says Gillespie, is how the long and deep legacies of social violence that were encouraged and produced by the apartheid state in poor black communities have not been effectively resolved by post-apartheid governance. The reliance on practices of punishment to fix deeply entrenched violence is problematic, not least because prisons as institutions

are hardly places where violence is diminished. If anything, they are spaces that promote and entrench violence.

"Do they do what they claim to do – which is to rehabilitate, to persuade people to abandon criminality? Or are they institutions that are producing things that we do not really want to acknowledge, in this case a kind of hyper-criminality and a deepening of violence?" she asks.

Just society

Although it is extremely difficult to work against life histories of violence, Gillespie added that there are definitely some prisons that fare better than others. The reason for this is that in some instances the prison leadership and wardens take rehabilitation, education, and restorative justice projects seriously. But on the whole, South African prisons are not places that can serve the advancement of a more just society.

"It is not easy for people to look at, because we like to imagine prisons at least as places of containment and justice. I am interested in the fact that people continue to see prisons in this way, and thereby give them credibility. This has resulted in a lack of imagination about looking for other solutions to the problem of justice," says Gillespie.

SCIENCE

Message from the Dean



The Faculty of Science is committed to producing highly qualified graduate students and research of international standard reported in the leading peer-reviewed literature. The Faculty comprises some 240 full time academic staff, approximately 175 support staff and some 2 500 undergraduate and postgraduate students in ten schools clustered in four groupings.

These are Mathematical Sciences, Physical Sciences, Earth Sciences and Biological Sciences. The Faculty also hosts five SA Research Chairs and have secured two more for 2011. The aim is to secure more in the 2011/2012 Department of Science and Technology-National Research Foundation (NRF) call.

2010 was a very good year for the Faculty. Researchers participated in collaborative programmes with their peers at statutory bodies, private sector companies, and many South African universities, as well as universities in Western Europe, Eastern Europe, North America, Australia, Japan, China, the Middle East and Africa.

Increase in publications

The Faculty has seen a steady increase in the number of research publications between 2004 and 2010. In 2010 there was a notable increase in publications from academics in the Schools of Computational and Applied Mathematics, Geography, Archaeology and Environmental Sciences, Mathematics, Physics, and, most notably, Geosciences.

During 2010 Prof. Fazal Mahomed from the School of Computational and Applied Mathematics was the top producer of research publications and produced 18 articles. He was followed by Prof. Neil Coville from the School of Chemistry and Prof. Abdul Kara from the School of Mathematics with 14 publications each.

Work by the Faculty's researchers appeared in some of the highest impact journals in their field, including *Nature*, *Science*, the *Proceedings of the National Academy of Sciences of the United States of America*, *Nature Geosciences*, the *Journal of High Energy Physics*, the *Journal of Medicinal Chemistry* and *Inorganic Chemistry*. A sample of these articles appears on page 47.

Our research continues to attract considerable international attention. Based on the number of citations to

work from this University, the Faculty are ranked in the top 1% of institutions internationally in Geosciences, Chemistry, Environment and Ecology, and Plant and Animal Science.

Increase in higher degrees awarded

The steady decline between 2007 and 2009 in higher degrees awarded was reversed in 2010, with an increase of 48% in higher degree output units, largely due to a doubling of the number of masters degree (dissertation) graduations.

NRF-ratings

There are 96 researchers in the Faculty with a current NRF rating, of which 24 were awarded or re-awarded in 2010. Most notable was the award of an A2-rating to Prof. Lyn Wadley from the Institute for Human Evolution and a P-rating to Dr Trevor Vickey from the School of Physics. Read more about his work on page 141.

Postdoctoral fellows and funding

The Faculty hosted 35 post-doctoral fellows in 2010 from Western Europe (9), Eastern Europe (3), North America (3), the Indian subcontinent (9), China (3), the rest of Asia (2), South Africa (1) and the rest of Africa (5).

Researchers in the Faculty secured a good level of funding in 2010. Funding was increased by 55.6% from R60.4 million in 2009 to R94.1 million in 2010.

Research highlights and achievements

There were many research highlights and achievements in the Faculty and we would like to congratulate our researchers for their contributions to helping us progress towards achieving our vision of being an internationally competitive faculty of science.

Among the notable achievements were the publication in *Science* of reports on Prof. Lee Berger's discovery of the early hominid remains of *Australopithecus sediba* in the Cradle of Humankind. Read more about his work on page 153.

Prof. Kara published some exciting work on the modelling of a variety of physical phenomenon such as fluid flow. Read more about his work on page 139.

Dr Vickey is a member of the research team working on the Large Hadron Collider project at the European Organization for Nuclear Research searching for the elusive 'God Particle', the Higgs boson.

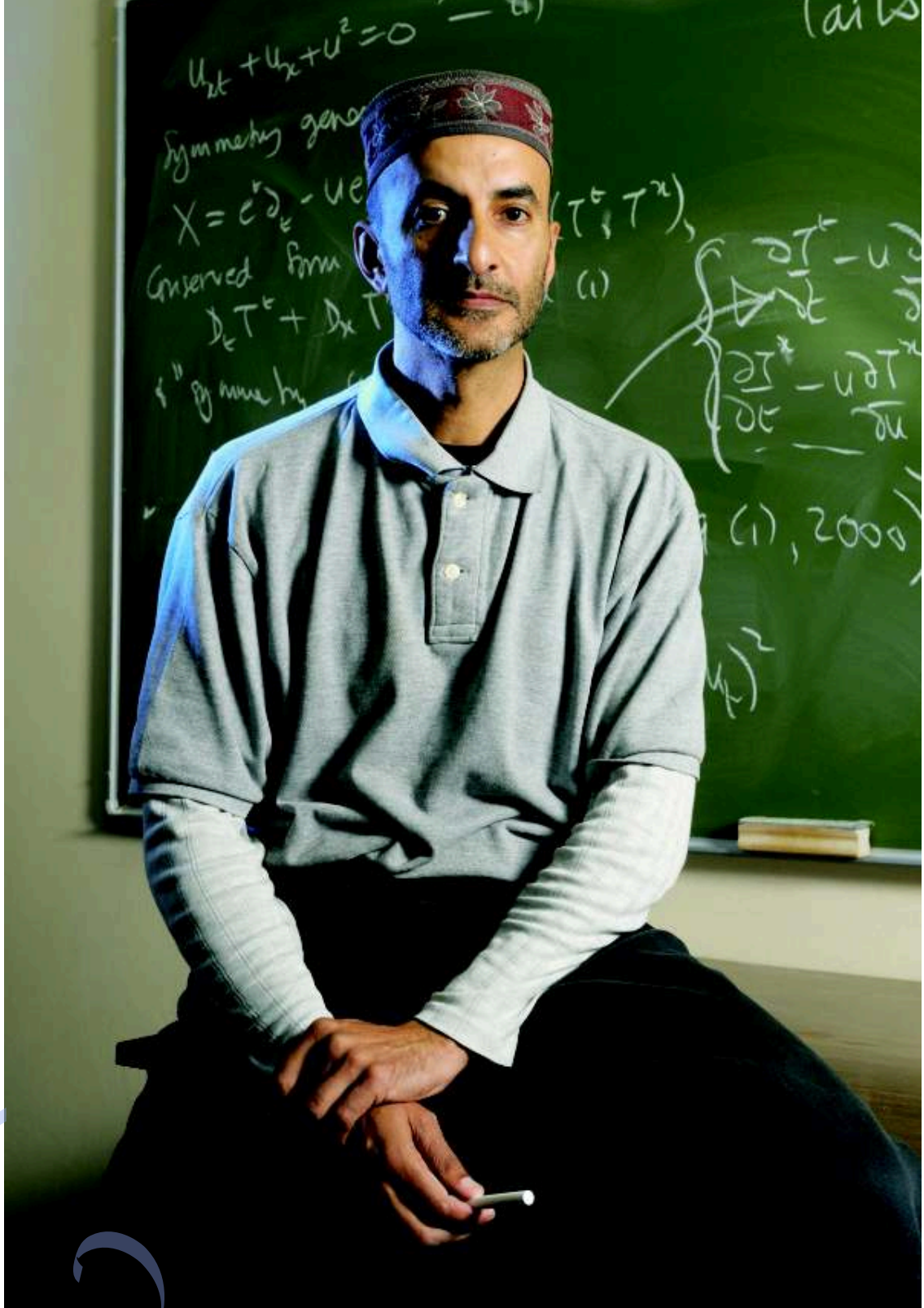
Prof. Neville Pillay from the School of

Animal, Plant and Environmental Studies has reported work which has gained widespread international attention on the semi-desert-dwelling African striped mouse *Rhabdomys*, which has proved to be a critical species behaviour indicator in this era of climate change. Read more about this project on page 143.

Dr Susan Webb from the School of Geosciences has been developing a new model of the inner workings of the earth in collaboration with leading international scientists from South Africa, Norway, the US and Germany. Read more about her work on page 150.

The team led by Prof. Stefan Weiss in the School of Molecular and Cell Biology could be on the brink of a major breakthrough in the treatment of Alzheimer's disease and metastatic cancer. Read more about their work on page 147.

Prof. Andrew Crouch Dean



Prof. Abdul Kara

Mathematics:

The ultimate chicken-egg
discipline

There is healthy co-operation rather than competition between academics with different areas of expertise in the field of pure and applied mathematics, says **Prof. Abdul Kara** in the School of Mathematics for whom 2010 – his 25th year at Wits - proved a peak public output period. He joined the department as a junior lecturer in 1985.

In 2010 his research was published in 15 publications, of which 14 are on the International Science Index (ISI) list with top international status.

The publications include several renowned United States (US) journals, including *Nonlinear Analysis*, the *Journal of Physics A*, *Nonlinear Dynamics*, *Applied Mathematics and Computation* and a leading Chinese journal, *Chinese Physics Letters*.

"It is always collaborative research," he explains, "because when we are dealing with research in a particular problem, such as equations that come up in physics and engineering, one person will develop a model for the equation, another will adopt a certain approach to deal with the equation, another will deal with the computing side, and so it goes."

Based on research conducted in 2010, he is also the co-author of a chapter on Navier-Stokes equations that arise in fluid phenomena in a book entitled *Navier-Stokes Equations: Properties, Descriptions and Applications* to be published in the near future.

The co-author of this chapter, Dr Kamran Fakahr from Malaysia, is one of several key collaborators with whom he has worked.

Other key collaborators are Professors Anjan Biswas from the US, Ashfaq Bokhari and Fiazudin Zaman from Saudi Arabia and Stephen Anco from Canada.

"In almost all cases I visit their universities and they visit Wits. In some cases we start a discussion at a conference and then collaborate by telephone and email."

Kara is also extremely proud of the two Masters and two Doctoral students that he is supervising. Several papers produced by his students were also published in 2010.

"Apart from giving each student good grounding and guidance in the subject, I feel it is paramount for a supervisor to carefully direct each student because without this, even a good student can produce no results," says Kara, who positions himself on the border of pure mathematics and applied mathematics.

His area of expertise, broadly defined, is 'the symmetries of equations and the underlying conservation laws'.

To explain this, he says: "I will first speak about the physical aspect. If you look at the natural phenomena in the world, things behave in a very regular way, and this kind of regularity deals with symmetry. However, there can also be patterns in physical behaviour, such as, for example, the motion of a wave. Hence, if you mathematically model a wave then that pattern behaviour must also be modelled.

"As for the conservation laws: As a consequence of the symmetry you get energy or momenta and this also needs to be reflected in the mathematics. This can vary enormously according to certain conditions, and sometimes certain models won't save the energy or momenta, for example, behaviour that changes according to time or as a consequence of time."

The class of problems Kara and his collaborators dealt with in 2010 addressed various models in fluid mechanics and mathematical physics.

"We looked at equations that arise in the modelling of a physical phenomenon such as fluid flow," he explains. The best known fluid phenomenon is the flow of waves, but you get fluid flow in a range of phenomena – from blood to oil, and glaciers to rock falls.

Problems investigated during 2010

Two of several classes of problems were investigated by Kara and his team in 2010. These are:

Problems with wave equations on curved (non-flat) manifolds

"By understanding this particular set of problems, it gives you more insight into the problems and makes your solving of the problems easier. If, for example, you understand how waves in water behave, you can deal with objects on the water in a particular way, including designing boats better," he explains. On this particular set of problems these equations display a large number of symmetries and conservation laws, which are of interest to physicists.

"We need to see fluid objects like waves, not as being on a flat object but on a ball, which is the earth. So you have to adapt your model so that your waves are on a curved object," says Kara.

He adds that the concept of waves and fluid can be pushed very far, to include glaciers as fluid objects because they behave in the same way over long periods and can therefore be explained using fluid phenomenon.

"It's all about understanding the essence of life, which is why physics used to be called natural philosophy."

Ostrovsky equations

Well-known Russian mathematician Alexey Ostrovsky's broad field of study is the physics of internal waves. His interest was to come up with a model and a set of equations that are of interest to oceanographers and oceanologists.

"If you understand waves and how badly they behave on certain occasions, then you can set up barriers in areas that are, for example, prone to tsunamis and hurricanes," Kara explains.

His set of equations is of interest to Kara who uses his field of expertise to analyse and hopefully refine the model, which is the nature of mathematics. The Zakharov-Kuznetsov equation is the perfect example of this. Another class of problems Kara dealt with in 2010 has been analysed by hundreds of people, and continues to be analysed.

Ultimate chicken-egg discipline

Mathematics is the ultimate chicken-egg discipline. Sometimes mathematicians are approached by, for example, a physicist or an engineer who describes a certain physical phenomenon and the mathematicians use their knowledge to set up the equations.

Sometimes the mathematicians set up equations which other professionals then test in the physical setting up of an experiment in the academic or industrial world. And sometimes the equations remain in the realm of pure mathematics, never to be applied.



Dr Trevor Vickey, a senior lecturer in the School of Physics, was one of the recipients of the National Research Foundation's President's Award

Chasing the elusive HIGGS BOSON

The idea that he might be able to see something that nobody has ever observed before or even suspect existed makes his search for the elusive Higgs boson even more exhilarating, says **Dr Trevor Vickey**. Vickey, a senior lecturer in the School of Physics and a member of the research team working on the Large Hadron Collider (LHC) project, the world's largest elementary particle physics experiment, was recently awarded the National Research Foundation's President's Award and a P-rating for his research.

The aim of this project is to unlock the secrets of the Universe by simulating the events of the so-called Big Bang. The LHC project comprises two general purpose experiments, namely the Compact Muon Solenoid (CMS) and the ATLAS experiment, the one on which Vickey and 3 000 other collaborators from across the globe are working.

The LHC is a particle accelerator used by physicists to study the fundamental building blocks or particles of all the things around us, explains Vickey, and researchers hope that it will answer questions such as what the invisible 95% of the Universe is made of, why nature prefers matter to antimatter and how matter evolved from the first instance of the Universe's existence.

Standard Model of Particle Physics

Ordinary matter consists of elementary particles in two basic groups, namely quarks and leptons. In the early

1970s physicists started developing a theory, known as the Standard Model of Particle Physics, which they used to explain the role of quarks and leptons in nature.

The model, which is still used today, focuses on the electromagnetic, weak and strong nuclear interactions of known subatomic particles. Its formulation was finalised in the mid and late 1970s when the existence of two previously unobserved quarks were confirmed.

Studying the top quark

Vickey, who has always been interested in science and mathematics, but only gave serious consideration to studying physics shortly before graduating from high school, started studying some of the properties of the top quark during his doctoral studies at Fermilab in Illinois, US, where the top quark was discovered in 1995.

"In my research I tested one of the predictions of the Standard Model that dealt with the decay of the top quark to see if there was a deviation. If we had found a deviation, that would have indicated some new physics beyond what is described in the Standard Model," explains Vickey.

His experiment, however, measured a result that was consistent with that of the Standard Model. Researchers at Fermilab and other laboratories across the globe are still investigating this prediction to higher levels of precision.

Chasing the Higgs boson

In 2005 Vickey joined the LHC project and shifted his attention from the top quark to the search for the Higgs boson, the last unobserved particle predicted by the Standard Model.

According to theorists an experimental discovery of the Higgs boson will shed light on the electroweak symmetry breaking mechanism, believed to be the mechanism through which the Standard Model particles acquire their mass.

"The Standard Model predicts the existence of the Higgs boson, which is responsible for the mass of all the particles and matter around us. The exact weight of the hypothetical Higgs particle however is not predicted by theory and when we conduct experiments we do a broad search across a range of possible masses in the hope of finding it," explains Vickey.

Scientists at Fermilab and CERN have been searching for the elusive Higgs boson for roughly 25 years, but have only been able to rule out some areas where they believed it could

reside. Further experiments continuing this work are now being carried out at the LHC project, which is run at a much higher energy.

Vickey explains that data analysis is refined using computers to simulate the collisions of particles in the LHC. The Standard Model is coded into computer language and physicists generate – to the best of their ability – those collisions and the subsequent decay of the collision by-products. In addition, they also simulate the interaction of those particles with the ATLAS detector thereby mimicking signal that they expect to see in the real data.

This information is simulated for millions of particle collision events in an effort to refine the Higgs search strategy and to maximise the number of signal events observed over the background events. This is extremely important because the number of background events is huge and experimentalists are looking for something very rare.

It is extremely important that you cherry-pick the events to eliminate very common things that pop-up in the data that are already well understood by physicists. By exploiting the computer simulation study you have a very good chance of observing a new particle - if it is there, adds Vickey.

If a new particle is discovered, the data will be scrutinised meticulously by ATLAS experimenters and peer-reviewed by experts around the world to be certain that the discovery is genuine. A real confirmation may only come when both the ATLAS and CMS experiments are able to announce that they have each made very similar observations.

Awards and Honours

Apart from his P-rating, Vickey, who joined Wits at the start of 2010, has also won a number of other awards for his research. Some of these include for example the Friedel Sellschop Award, Wits' most prestigious award given annually to exceptional young researchers and two prestigious awards from his alma mater; namely the Outstanding Teacher and the Giulio Ascoli Awards. The latter is awarded to researchers who demonstrate excellence and originality in the study of high energy physics. Vickey is also a Visiting Lecturer at the University of Oxford, UK.

The future

Although Vickey has not yet caught sight of the elusive Higgs boson, he hopes to do so soon. In the mean time, the search is still on...



a MIGHTY revealing mouse

Ten years ago, when **Prof. Neville Pillay** first started investigating the semi-desert-dwelling African striped mouse or *Rhabdomys* in the Goegap Nature Reserve near Springbok, in the Northern Cape, he did not anticipate how important and groundbreaking this research would be. This mouse is emerging as a critical species behaviour indicator in this era of climate change.

"The striped mouse exhibits particularly interesting sociality and social flexibility that may be important indicators as to how species can cope with unpredictable and rapid environmental change," explains Pillay, the former Chair of Biological Sciences in the School of Animal, Plant and Environmental Sciences (APES) and an animal behaviourist who specialises in mammal behaviour.

Collaborating with four masters students, four doctoral students and one postdoctoral associate, his team's intensive research has generated enormous international interest to the extent that the striped mouse is widely recognised today as the best model to test social flexibility and stereotypical or abnormal behaviour.

Their work has been published in several major journals in 2010, including the *Journal of Animal Ecology* (cover story), *American Naturalist* and *Behaviour* (cover story).

The striped mouse research is based at the field station in the Goegap Nature Reserve and is co-funded by Wits and the University of Zürich. Pillay collaborates with Dr Carsten Schradin from the University of Zürich on this project. Schradin is a former post-doctoral student of Pillay's.

At Goegap they are researching several colonies of striped mice in two major field sites. They have collared four individuals per colony to radio-track them and they have marked all the others by numbering them on their sides with hair-dye which does not harm them in any way.

They naturally have to catch the mice to do this, and they have found peanut butter and bran flakes to be the most successful lures. The Goegap striped mouse has an average lifespan of one year and is reproductively mature at two months.

Key biological questions

The striped mouse's sociality and social flexibility ranks amongst several fascinating behavioural manifestations that have enabled Pillay to ask key biological questions, which ultimately address issues of biodiversity.



Prof. Neville Pillay and his students in the veld

Pillay has used the striped mouse to test questions in three areas:

- **Evolutionary change**

"Our studies on long-term evolutionary change show that the striped mouse is an opportunist that can successfully exploit a range of environments," he explains. "There is also marked divergence in mating behaviour and the olfactory signals used for assessing potential mates between different types of striped mice, which is linked to speciation of the group in southern Africa."

- **Sociality and social flexibility**

The team's studies on the sociality and social flexibility have generated a range of extraordinary findings.

"One amazing behavioural finding that really caught our attention

initially is that it is the only small mammal in Africa to show paternal care where the fathers look after the young to the same degree as the mother, apart from producing milk," says Pillay.

The mothers will forage more than the fathers and the fathers will return sooner to look after the young.

"We have also been able to show that the young raised without fathers show poor physical growth and impaired behavioural development."

Dr Tasmin Rymer, one of Pillay's doctoral

students who is now working for him as a research assistant, is looking at whether paternal care is inherited by the sons.

"The striped mouse is very good at surprising us, and this time round, we discovered that the sons pick up their paternal care from their mothers – and are even more paternal where the father is absent," Pillay explains.

This was discovered in laboratory research, which can be manipulated to include or exclude the father. Similarly, research has shown that female striped mice pick up their maternal care from their fathers, and research that will be published in 2011 shows that daughters genetically inherit their maternal abilities from their fathers.

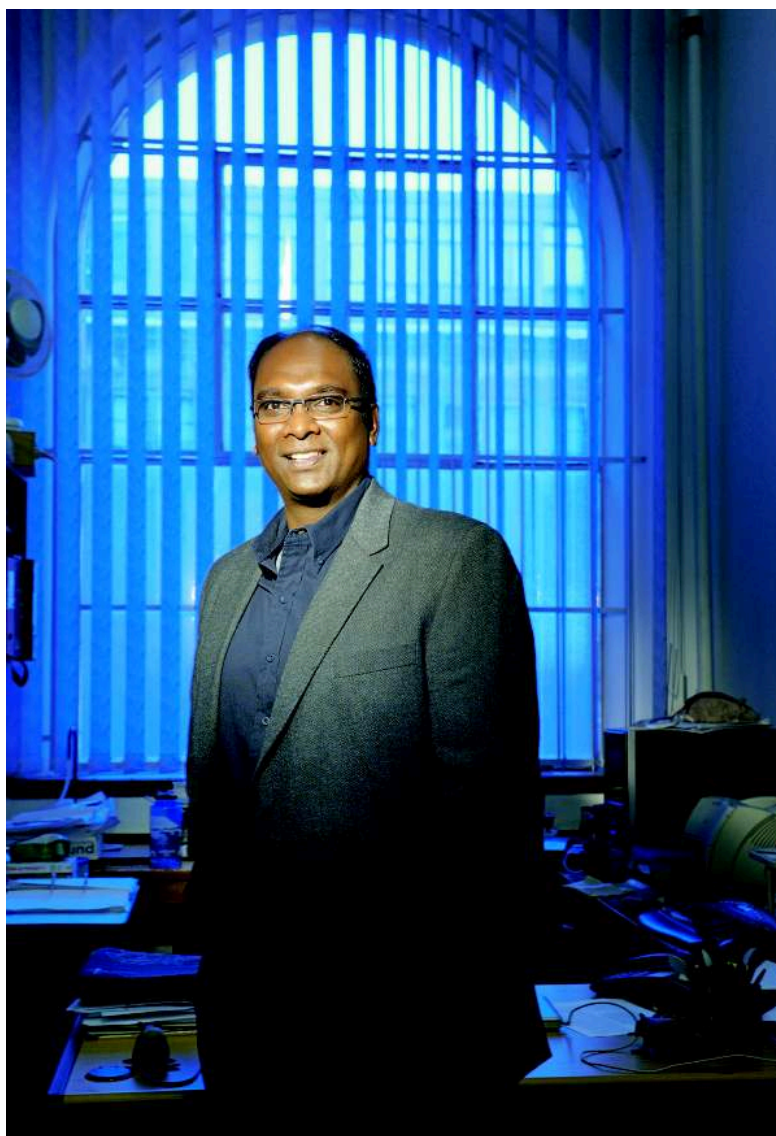
This and other groundbreaking discoveries led to intensive research in 2010 into the behavioural adaptation and opportunism of striped mouse families and groups, which showed the following:

■ **Living in groups versus living alone**

When conditions are unfavourable at Goegap, in other words, food and water are scarce, which is common in this rain-stressed region, the offspring of the striped mice at Goegap remain in the group and become 'helpers' to look after the next generation of babies.

One of the reasons for this is that good territories are at a premium, as opposed to other habitats such as the highveld grasslands where good territories are plentiful and where striped field mice are customarily solitary.

"We have further researched how the Goegap striped mouse copes with environmental change in its own environment," he continues. "At Goegap conditions vary between short periods of rain



Prof. Neville Pillay

with favourable conditions and long, harsh, dry periods with unfavourable conditions. We found that their sociality or social-group structure changes according to conditions and that when conditions at Goegap are favourable they prefer to be solitary."

This goes against theory, which suggests that animals favour group living. Their preference for living alone is largely attributed to reproductive competition as individuals in a group compete with each other to reproduce.

One of Pillay's post-doctoral students, Dr Davina Hill, is looking at alternative female reproductive strategies. She is studying the trigger mechanisms that bring about the female striped mouse's decision to move from living in the group to living alone. She has picked up a change in progesterone in the females that live alone.

■ **Male behavioural change**

Led by the females, the males must change their tactics to respond to the females' behavioural changes. Instead of staying in the group and associating with the females in the group and showing paternal care, the males, particularly the younger males, become roamers and solicit as many females as possible to mate with them and do not show paternal care.

Pillay and his team were the first to show that this happens in any animal, which was only predicted by theoretical models previously. What is interesting is that a dominant male with a whole group of females in his 'care' has lower testosterone than the roamers.

"We call it the 'bungee-jumping' strategy because they engage in risky behaviour, sneaking into dominant males' territory to mate with their females. In striped mice the dominant male does not kill off the roaming males' offspring," explains Pillay.

■ **Flexible behavioural strategies**

Pillay's group has shown that these flexible behavioural strategies are coupled with hormonal changes and perhaps even brain function, but not genetic changes.

The field research combined with the laboratory research was another significant marker of the striped mouse's remarkable ability to adapt and demonstrated that its sociality is facultative, and can change.

"It shows how responsive these animals are to unpredictable environmental and climate change. We have opened the door for this kind of work and would like to replicate it in the grassland regions."

■ **Stereotypical or abnormal behaviour**

"Finally, my research of stereotypical behaviour (abnormal behaviour) in captive

striped mice has highlighted the potent effects that captivity imposes on animals," says Pillay.

Stereotypical behaviour is defined as 'repetitive behaviour with no function', which does not happen in the wild. Pacing is a typical form of stereotypy. Stereotypical behaviour in striped mice is accompanied by potential changes in brain function without underlying stress hormone responses, and can be habit forming.

"Our major finding here is that, contrary to expectation, stereotypic animals have enhanced reproductive output, which goes against the theory that stressed animals in captivity have lower reproductive levels. One rationale for this is that pacing is exercise-based, where the female is losing body weight to reproduce better."

A paper on this, which included the work of another of Pillay's students, Megan Jones, was published in 2010 in *Applied Animal Behaviour Science*. Pillay and his team believe this has implications for all animals in captivity.

■ **Bold or shy**

Sneha Joshi, who started her doctorate degree in 2010, is looking at another aspect of stereotypical behaviour – whether striped mice with different personality types (namely bold or shy) are more or less prone to stereotypical behaviour. The data to date show that the bolder animals are more likely to display stereotypy and that stereotypical behaviour is genetically transmitted.

Pillay presented this research on the striped mouse at the International Conference on the African Small Mammals Symposium in Swaziland in July 2011 and other conferences and symposia in Europe.

■ **Invited reviews**

Following their 2010 research on the striped mouse Pillay and his team have also been asked to write three invited reviews in three internationally renowned publications: *Molecular Ecology*, *The Philosophical Transaction of the Royal Society* and *Behavioural Processes*.

"I think luck has a lot to do with me coming across the striped mouse 15 years ago when I was looking for an animal model with a short lifespan which breeds easily in captivity, that I could use for student projects," says Pillay.

"The first five years we studied the striped mouse in the laboratory and then we moved into the field. It's been a fascinating journey, and as we continue, so much more is revealed."





Prof. Stefan Weiss

Potential **BREAKTHROUGH** in Alzheimer's disease and metastatic cancer

Stefan Weiss, a professor of biochemistry at Wits, and his team might be on the brink of a major breakthrough in the treatment of Alzheimer's disease and metastatic cancer. Formerly from the Ludwig-Maximilians University in Germany, Weiss and his team in the School of Molecular and Cell Biology published a groundbreaking review article in *Frontiers in Bioscience* in 2010 on the association of the Laminin receptor (LRP/LR) with Alzheimer's disease and also with prions diseases and cancer.

Alzheimer's disease

Alzheimer's disease has a high incidence rate in South Africa. In collaboration with two of his masters students, Katarina Jovanovic and Danielle Gonsalves, and an honours student, Bianca da Costa Dias, Weiss's research on Alzheimer's disease, which started in 2010, might be the key to what the medical world has been searching for, for so many decades.

"We are trying to find an alternative therapy for the treatment of Alzheimer's disease, focusing on therapeutic antibodies directed against a cell surface receptor or 37kDa/67kDa/Laminin receptor," he explains.

"This research is very important for South Africa because we have 730 000 cases of Alzheimer's disease patients in the country, mostly elderly people above the age of 65 and increasing into the 70s and 80s."

One in five South Africans who is 80 years or above is suffering from this disease, which constitutes a very high incidence rate, comparable to other countries such as the United Kingdom (UK) or Germany where there is a one in 68 incidence rate.

In their cell biology laboratory at Wits they cultured human kidney cells, which the team unexpectedly discovered have high amounts of A-Beta Peptide.

"It so happens that A-Beta Peptide is also one of the causative agents of Alzheimer's disease – when it aggregates in Alzheimer patients it causes the disease," Weiss explains.

"What we have discovered is that when we treat the kidney cells with an antibody against the receptor, the levels of A-Beta Peptide go down. This could be a breakthrough in Alzheimer's disease."

Weiss and his team are looking at publishing their findings in 2011.

Prions diseases

Prions are infectious proteinaceous particles that cause a group of invariably fatal neurodegenerative diseases. Prion diseases

involve the modification of the prion protein (PrP) and may present as genetic or infectious disorders. Bovine spongiform encephalopathy (BSE) in cattle, scrapie in sheep, and Creutzfeldt–Jakob disease (CJD) in humans are some of the most notable prion diseases.

In 2010 Weiss and his team published a paper in the *Journal of Molecular Biology* about prions and their transmissibility from animals to humans, entitled *Prion interaction with the 37 kDa/67 kDa Laminin receptor on enterocytes as a cellular model for intestinal uptake of prions*.

"We found that by using human enterocytes as a model system that prions from elk and deer, and from sheep and cattle might be transmissible to humans who may then develop a human prion disorder such as variant CJD," says Weiss.

Fortunately the infection risk to humans in SA is almost zero, but in other countries worldwide, including Europe, the UK and the United States (US), prion disorders pose a far greater problem.

"We found that by blocking the Laminin receptor in the intestine we may be able to block the transmissibility because the intestine is the entry port for prions in both human and animal bodies. It's like blocking the bouncer at the entrance to the intestine which allows prions to enter the human body," Weiss explains.

The transmissibility factor is new research and no one else has looked at it in such detail.

The team published an editorial commentary on oral transmissibility of prion disorders in the *Journal of Infectious Diseases* in 2010.

Cancer

In 2010 Weiss and his team continued their research on five major cancer cell types in SA; namely cervical, breast, prostate, lung and colon cancer cells.

This team comprises two of his masters students, Aadilah Omar and Kiashanee Moodley, and one of this honours students, Raksha Khusal.

"Cancer is a major disease in southern Africa where we currently have 80 000 – 90 000 cases of many types of cancer, especially lung, cervical, breast, prostate, colon and oesophageal cancer."

Once again the Laminin receptor plays a crucial role, this time in metastatic cancer – in other words, when the cancer type moves from the primary site via the bloodstream to a secondary site, which is a major problem as from here the cancer spreads all over.

"What we found back in 2008 is that antibodies directed against the receptor are able to block adhesion and invasion – key events in metastatic cancer analysed by using fibrosarcoma or skin cancer cells as a model system. In other words, by blocking the receptor you block the invasion."

This time the Laminin receptor or 'bouncer' is working on the basement membrane of the extracellular matrix, explains Weiss.

"For metastasis to occur the cancer cells must break through the basal lamina in the extracellular matrix to enter the bloodstream," Weiss explains.

"If you block the receptor then the cells cannot break through and enter the bloodstream and so the tumour stays on the

primary site, and can easily be removed with surgery."

Weiss will publish his significant results on blocking invasion and adhesion on cervical, colon, lung and prostate cancer cells by using antibodies directed against the receptor in 2011.

Apoptosis

Research on apoptosis or 'programmed cell death' was initiated by Weiss and his team in 2010.

Cancer does not like apoptosis because it wants to proliferate, hence apoptosis is blocked by the cancer cells, says Weiss.

In collaboration with Moodley, Weiss is working on inducing apoptosis.

"The receptor is pro-cancer by two means, so when you block this bouncer with an antibody you firstly block metastasis and secondly you induce apoptosis and target the primary tumour," he explains.

Key collaborations

Weiss and his team collaborate with a company in Germany called Affimed Therapeutics AG in Heidelberg. Together they are working on the development of antibodies directed against the Laminin receptor for the treatment of cancer and neurodegenerative diseases.

Other collaborations are with the Medical Research Council in the UK, the Scripps Institute of Infectiology in the US and the University of Sydney in Australia.

How the earth works

It's important to develop new models of how the earth works – this is pure science – and it changes people's thinking in so many different ways, says **Dr Susan Webb** of the School of Geosciences and the Society of Exploration Geophysicists' Second Vice-President. Developing a new model of the inner workings of the earth is precisely what she is doing, in collaboration with leading international scientists whose names populate the who's who of modern geoscience and geology.

They are Professors Trond Torsvik, a palaeomagnetist from Norway, Lewis Ashwal, a geologist from South Africa, Kevin Burke, a geologist from the United States and Bernhard Steinberger, a geoscientist from Germany. Such is the prominence of their research entitled *Diamonds sampled by plumes from the core-mantle boundary* that it was published in *Nature* in 2010.

Internationally it has received an incredible response with interviews in many publications. It was also presented at the South African Geophysical Association-Geostatistical Association of South Africa Geosynthesis Conference, hosted in Cape Town in 2011.

"This is one of the most exciting pieces of research in which I have been involved, and working with these outstanding scientists is inspiring," says Webb, for whom kimberlites have reinvented her understanding of the earth's lower mantle, taking her back over 500 million years.

"Our work is not about finding diamonds, it's about looking for the missing pieces in the kimberlite puzzle," explains Webb.

At the same time, the possibility of potential new sites is obviously of great interest to the mining industry. Diamonds, she explains, are formed under high pressure at a depth of about 150 km within the earth's mantle and are brought to the surface by volcanic eruptions in rocks called kimberlites.

Tectonic-plate reconstructions

Drawing on their diverse expertise, the team combined tectonic-plate reconstructions and seismic tomography images of the interior of the earth over the past 540 million years. This is the first time a team has put together such a long geological history of the deep mantle.

Their study links the location of diamond-bearing volcanic kimberlites to the edges of unusual expanses of rock in the lower mantle, called Large Low Shearwave Velocity Provinces (LLSVP) which have low seismic velocity, and which extend thousands of kilometres across.

One LLSVP is situated underneath Africa and another under the Pacific. Both are extremely thick – approximately 1 000 kilometres thick – and appear as 'large humps' on the

core mantle boundary, which is approximately 2 700 kilometres down, Webb explains.

The LLSVPs are traditionally associated with temperature, but new research is showing that they may have a different, iron-enriched mineral composition to the rest of the mantle.

"When we look back 500 million years in time, we notice that the position of the kimberlites when they erupted is directly over the edge of the LLSVP below Africa," says Webb.

"What we are saying therefore is that the kimberlite plumes that capture the diamonds are coming from what we call the Plume Generation Zone on the outer edge of these LLSVPs and not from the top of the LLSVPs, which is what has traditionally been thought. We also believe the LLSVPs are stable and have been there for at least 500 million years or longer."

Their model offers a strong explanation for the gap in the kimberlite age record and why there are so few kimberlites between 300 and 500 million years ago.

The answer is that during this time Gondwanaland was near the South

Pole and nowhere near any of the LLSVPs, says Webb.

"It's very new thinking and it's difficult to change people's minds, but it is extremely exciting to be able to strongly challenge the widely accepted current kimberlite model. Known as the Tectonic Triggers Model, it says that changes in the relative plate motion seem to be associated with kimberlite generation. However, while they have a correlation in time, they don't have a good explanation for the locations of the kimberlites or the gap in the age record."

Webb and her collaborators could perhaps finally place those missing pieces in the kimberlite puzzle after all these years.

Geoscientists without borders

Officially launched in 2010, the Geoscientists without Borders programme in SA is led by Webb and her Wits team of two doctoral and four masters degree students and several honours degree students.

"This international programme is about geoscientists and students using their skills for humanitarian projects," explains Webb, who submitted a proposal to help a school for disadvantaged children in the Magaliesberg resolve their water problems.

"They have two boreholes. One is very deep, but the water is contaminated and the other has good water, but it runs out every year in about August. This means they have no drinking water and it also means they cannot cultivate or develop the land owned by the school."



Dr Susan Webb

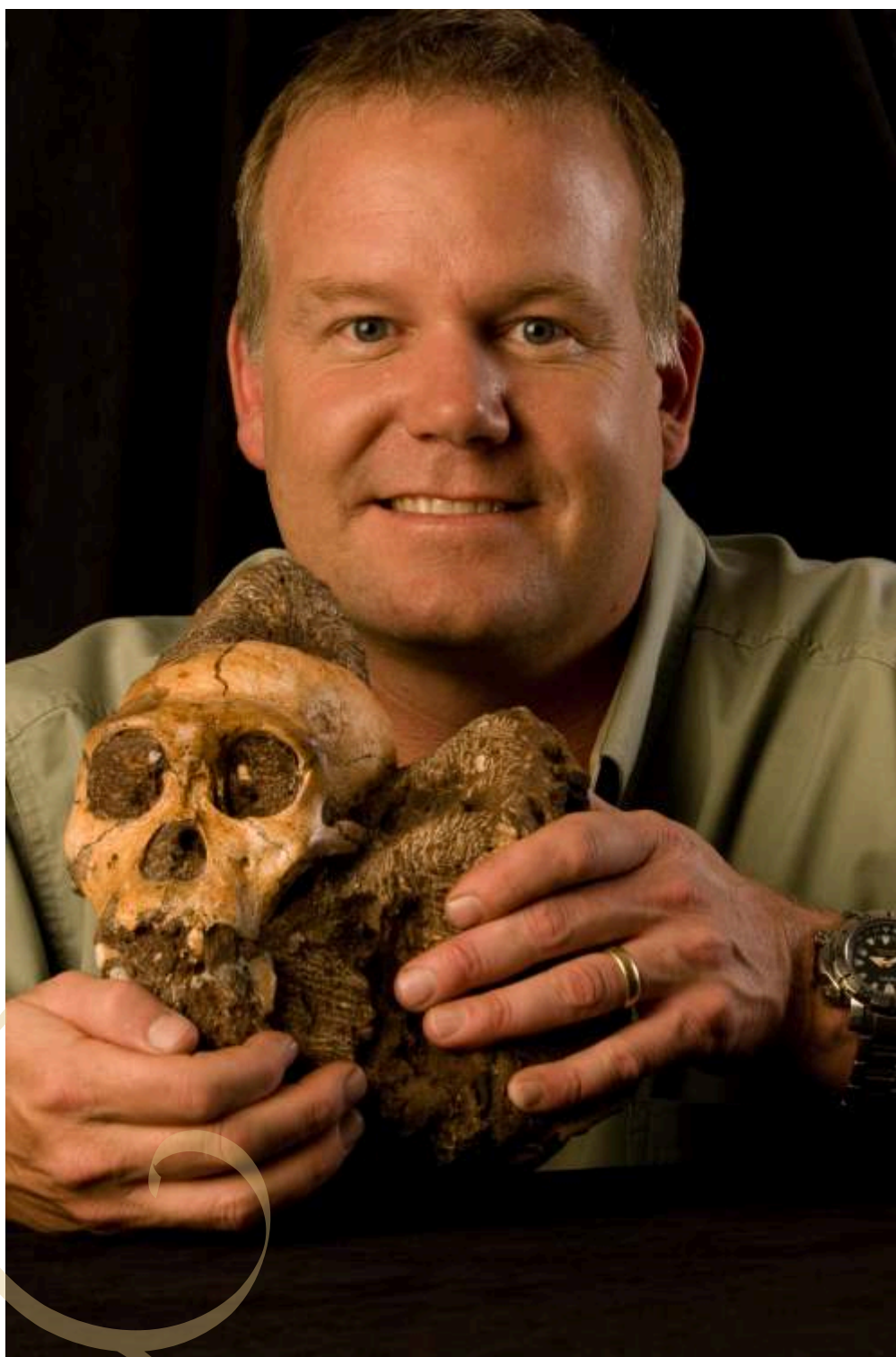
Assisted by her students, including masters degree student David Ngobeni, who returned from a high-paying job to further his studies and help develop this project that he started working on while doing his honours degree, they are looking at various aspects contributing to the water issue. One is the amount of ground water taken up by the large grove of blue gum and wattle trees on the property.

"Working for Water has been clearing alien trees to increase the surface water in rivers and streams throughout SA, but so far the impact on ground

water has not been assessed," says Webb.

Various geophysical techniques are used to assess ground water, which simultaneously exposes the students to geophysics, hydrogeophysics and volunteerism.

"The beauty of geophysics is that we use it to study water, oil, anything below the earth, so it has a huge range of applications," says Webb. "One of my goals is to make students aware of the many different uses of geophysics for studying and a better understanding of how the earth works."



*Prof. Lee Berger with the cranium of *Australopithecus sediba**

Australopithecus sediba:

A significant palaeoarchaeology find

Prof. Lee Berger's discovery of early hominid remains in the Cradle of Humankind World Heritage site in 2008 has been hailed as one of the most significant finds in palaeoarchaeology in recent times. Berger, a Reader in Human Evolution and the Public Understanding of Science in the Institute for Human Evolution, made the discovery one morning while looking for fossils with his son, Matthew (9), their dog Tau, and Berger's colleague, Dr Job Kibii.

Matthew discovered the first remains - a clavicle or collarbone. On the opposite side of the block, Berger discovered a jawbone with a canine tooth of a hominid. The find would later be identified as part of a partial skeleton of a juvenile hominid, around 10 to 13 years of age.

Berger returned to the site two weeks later with more than a dozen colleagues in tow, expecting to recover more fossils. After a four and a half hour search, the team had not discovered a single element that they could conclusively be identified as hominid.

As the group took a break, Berger went to the edge of the small pit in the middle of the site and noted a bone sticking out of the rock. It was clearly the humerus of a hominid. Astounded, he went down into the pit and realised that it articulated with a scapula and as he put his hand against the wall, two hominid teeth literally fell into his hand.

Remarkably this second find was not the same individual that Matthew had found, but a second skeleton of an adult female.

Most complete skeletons of early ancestors ever found

In the months to follow the site has produced arguably the most remarkable assemblage of early human ancestors ever found, including what are probably the most complete skeletons of early hominids ever discovered and by far the most complete remains of any hominid dating to around two million years ago.

The sex of the fossils can be determined from the morphology of the jaws and hips, whilst the age of the juvenile has been determined from its dentition. In contrast, the



Mathew Berger with a fossil from the juvenile hominid



adult female has strongly worn teeth suggesting an age in her late twenties or perhaps even older. Both individuals are about 1.27m tall.

Australopithecus sediba

The fossils have been classified as a new species of early human ancestor called *Australopithecus* (southern ape) *sediba* (natural spring or wellspring in Sotho). The species has long arms, like an ape, short powerful hands, a very advanced pelvis (hip bone) and long legs capable of striding and possibly running like a human.

"I believe that this is a good candidate for being the transitional species between the southern African ape-man *Australopithecus africanus* (like the Taung Child and Mrs Ples) and either *Homo habilis* or even a direct ancestor of *Homo erectus* (like Turkana Boy, Java man or Peking man)," says Berger.

Cosmogenic dating

The site where the fossils were discovered is technically the infill of a de-roofed cave that was about 50 metres underground 1.9 million years ago. The individuals appear to have fallen, along with other animals, into a deep cave, landing on the floor for a few days or weeks. The bodies were then washed into an underground lake or pool, probably pushed there by a large rainstorm.

They were preserved in a hard, concrete-like substance known as calcified clastic sediments that





Left: Prof. Lee Berger leads the team onto the Malapa site

Below: Prof. Lee Berger and Dr Job Kibii at the Malapa site

Bottom of page: Prof. Lee Berger and his dog Tau enter a cave at the site



formed at the bottom of what appears to be a shallow underground lake or pool that was possibly as much as 30 to 50 meters underground at the time. It seems as though they died at, or around the same time as each other, and thus would almost certainly have known each other in life and may very well have been related.

"Cosmogenic dating was used to interpret the landscape formation and to determine the depth of the cave at the time," explains Berger.

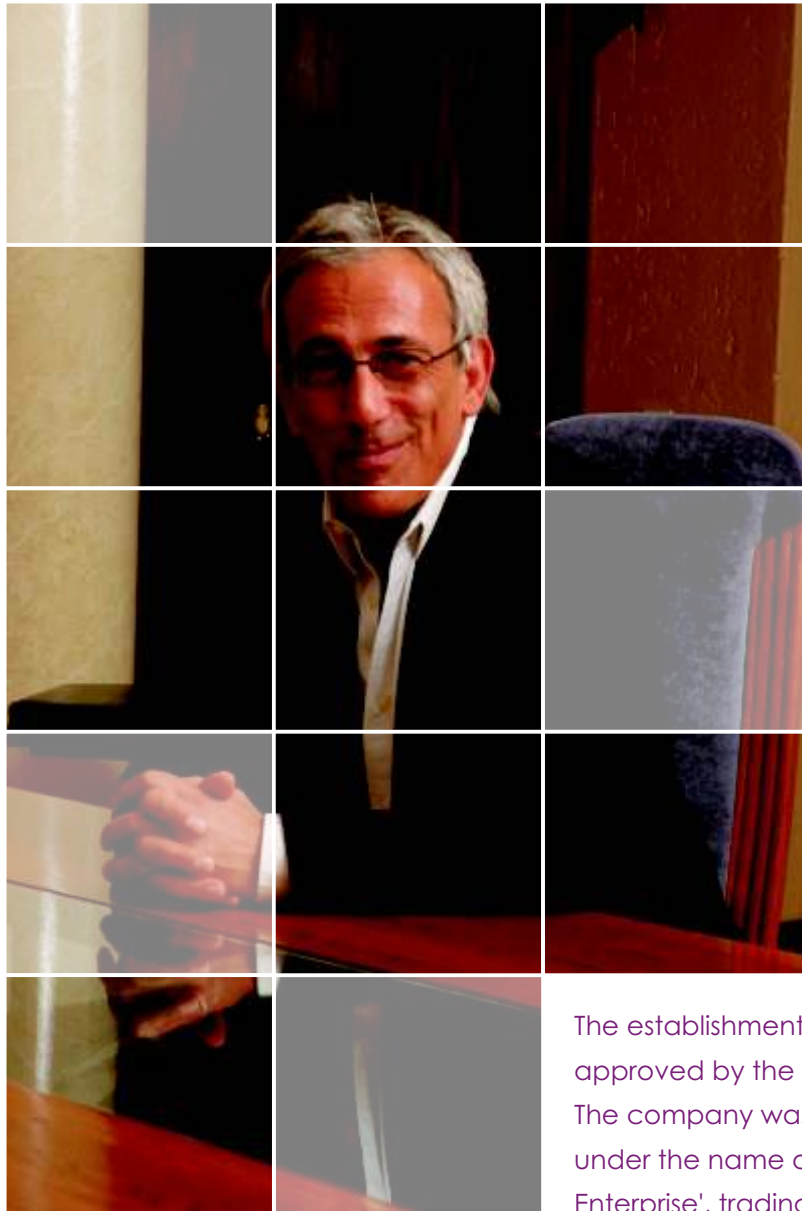
A double blind U-Pb date was conducted independently in laboratories in Bern, Switzerland and Melbourne, Australia. This is a first in the dating of flowstone deposits in the Cradle of Humankind. The fossils were dated using a combination of faunal, U-Pb (Uranium – Lead) and palaeomagnetic dating techniques putting the age of the rocks encasing the fossils at 1.95 -1.78 Ma.

Once an absolute date had been obtained, palaeomagnetic analysis was used to constrain the age of the debris flow encasing the fossils. Over 130 elements have been recovered to date, and more are emerging.

Science

Two papers related to this find, authored by Berger and Prof. Paul Dirks, former head of the Wits School of Geosciences, and now from James Cooke University, were published in the journal *Science*.

Wits ENTERPRISE (Pty) Ltd



*Dr Charles Marais,
Chief Executive
Officer of Wits
Enterprise*

The establishment of Wits Enterprise was approved by the Wits Council in April 2001. The company was formally registered under the name of 'Wits Commercial Enterprise', trading as 'Wits Enterprise' in mid-2002. Wits Enterprise thus operates as an autonomous, self-funded, commercial company reporting to a Board chaired by the Deputy Vice-Chancellor: Research. During 2010, a Shareholders' Compact was agreed between the University and the Company.

The mandate of the Company is:

- To commercialise the intellectual property of the University so as to:
 - Fulfil the specialist roles of an intellectual property management office and a technology transfer office for the University;
 - Be the facilitating channel between the University and the external commercial world that contributes to the sustainable long-term future of the University through income generation and value creation; and
 - Ensure that the intellectual property of the University is utilised effectively to generate income for the University through effective commercial exploitation of present and future intellectual property assets of the University.
- To operate a short course unit for commercial gain, utilising the intellectual property and course material of the University and its academic staff; and
- To manage the University's contract research and consulting functions, ensuring that the University and its staff derive appropriate benefits from these activities, while protecting the University and its staff.

Wits Enterprise's mission is thus to broaden and deepen the University's impact in society through providing a range of professionally delivered, fit-for-purpose, needed services that catalyse, facilitate, grow and execute a diverse range of University activities, including research, short courses, consulting, intellectual property management, patenting and technology transfer. Many of the services are aimed at growing third stream income for the University, with surplus funds generated by Wits Enterprise to be available as unencumbered funds for the University.

Wits Enterprise is structured into three business units and one support unit: Short Courses, Research Support and Consulting, Technology Transfer and the Finance unit. Each business unit provides a set of services customised for its particular markets. During 2010, the company's activities contributed approximately R 57.8 million to University operations.

2010 marked a year of change at Wits Enterprise. One of the more exciting changes was the Company's move to the Wits Professional Development Hub (PDH). The PDH is the premier address for continuing professional development and training excellence. It is centrally situated on the University campus. The PDH was developed by the University to provide a state of the art, professionally equipped, Wits venue. The PDH offers a professional service to clients wishing to host events - from short courses, business breakfasts, training sessions and meetings, through to cocktail parties and launches. The PDH is owned by the University and Wits Enterprise is the anchor tenant.

Research support

Wits Enterprise acts as an easily accessible, one-stop channel that links Wits academics from various disciplines with external stakeholders and funders to help resolve complex, multidisciplinary problems.

The Research Support Business Unit responds to both Wits' and prospective funders' requirements in respect of:

- needs identification: matching opportunities with resources;
- proposal development and contractual conclusion;
- information on project progress, project execution; and
- professional delivery to required standards through ensuring professionalism and accountability in the delivery of research and consulting commitments. Wits Enterprise has a team of specialist full-time employees providing the requisite business, financial and administrative support base.

Research Support creates value through providing:

- high quality, well budgeted fundable proposals;
- better coordinated / managed projects, that are typically complex, IP-intensive, consortium-based and multidisciplinary in nature;
- superior reporting to academic / researcher and funder; and
- reputational enhancement.

The Research Support Business Unit managed 126 active research and consulting projects that amounted to R43.6 million during 2010. Research Support engaged and assisted 60 academics / researchers as project owners / principal investigators across all five faculties of the University. Funding for these projects emanated from both international and national sources, with funders from the public, private and non-governmental domains.

The research project portfolio coordinated by Research Support demonstrates the diversity of research conducted by Wits academics, addressing national and global societal challenges, with examples of projects such as:

- Improving Algal Oil Synthesis for Biodiesel, a project conducted in collaboration with the University of Cape Town, funded by the South African National Energy Research Institute (SANERI);
- Development environment and demonstrators for resonant power conversion facilitating high voltage test systems using very low frequency and DC-sources, a project being undertaken by an international consortium of research organisations and SMEs, funded by the European Union's Seventh Framework Programme, under its "Research for SMEs" programme;
- Development of novel, advanced drug delivery applications, an initiative funded by the BioPAD BRIC, now incorporated in the Technology Innovation Agency (TIA);
- Consumer Rights in the ICT Sector in Eastern and southern Africa, a multi-country research initiative funded by the International Development Research Centre (IDRC);
- Gold Mining: Pollution to Value (Converting Waste to Resources - Ecological Engineering and Phytotechnology Programme) an initiative funded by AngloGold Ashanti, with co-funding provided by THRIP; and
- A random experiment investigating the impact and implementation of a wage subsidy for South Africa's youth, funded under the Programme to Support Pro-Poor Policy Development (PSPPD), a partnership between the Presidency of South Africa and the European Union (EU).

Research Support, in 2010, thus continued to assist Wits' research community to contribute to the University's standing and reputation as a research driven university, and to making Wits an active, committed, creative, innovative force that advances the public good.

Technology transfer

The University's patent portfolio has continued to grow and comprised 109 active patent suites at the end of 2010. This year was a very active year in which 26 provisional patent applications were filed. Also, 15 South African Complete Patent Applications and eight Patent Co-operation Treaty (PCT) applications were filed, the first step to international filing and protection.

In addition, four PCT applications filed in previous years proceeded to the national filing phase. During 2010, 12 SA Patents and three other

national patents were granted, including a US Patent. As the patent portfolio matures, more national applications are being granted, and the rate of grant has increased in early 2011, including a further US Patent in the first quarter.

The Intellectual Property from Publicly Financed Research and Development Act was proclaimed in August 2010, with the acceptance by the Minister of the Regulations for the Act. This means that, from this date, universities are bound to operate under the provisions of the Act and its Regulations.

In 2010, Wits Enterprise took the initiative to inform the University community of the existence and provisions of the Act. Several University, Faculty and School workshops were held. The most important aspect is that the University now has an obligation to consider all new intellectual property developed at the University, and to investigate if such intellectual property can be protected in terms of law if it is deemed to be of socio-economic benefit to the country.

In terms of patent applications, the usual form of legal protection for new and novel ideas, the University now has the obligation to consider all such new ideas or inventions, determine if they are capable of being protected by patent law in terms of the idea's novelty, inventiveness and utility, and decide if there is a potential of socio-economic benefit to be derived for South Africa from the new development.

Wits has taken the stance that the creators of such potential patent applications should make a disclosure to the Technology Transfer division of Wits Enterprise, rather than evaluate all potential public disclosures in the form of publications and the like. Wits Enterprise will then carry out the above

evaluation and, if determined to be the route to follow, prepare provisional patent specifications and applications for filing at the South African Companies and Intellectual Property Commission (CIPC, formerly CIPRO).

South Africa belongs to several international conventions, which result in a South African Provisional Patent Application giving an internationally recognised priority date for such an Application and further complete applications derived from it.

Inventions made at the University tend to fall into one of two categories, namely those with a local South African or southern African application, and those for which there could be an international worldwide market. In the case of the former developments, the patent application would generally be completed one year after filing the Provisional Application by the filing of a South African Complete Patent Application and possibly also an ARIPO Convention application, which covers most southern African states. The costs of following this route are relatively modest, especially if only a South African application is filed.

However, if it is required to file patent applications internationally, the PCT route is the most preferred route, as it allows the expenses to be spread over a period of time, while international evaluation through the World Intellectual Property Organization (WIPO) takes place on the patentability of the idea, and a market evaluation takes place concurrently.

The costs of obtaining an international patent suite or family for a novel and inventive idea are high and it is often stated that the costs for obtaining a wide international spread of patent protection can be in the order of R1 million.

In recent years the Department of Science and Technology, through the Innovation Fund and the Technology Innovation Agency (for 2009 expenses) has supported universities with the expenses of filing, prosecuting and maintaining patent applications and patents derived from such applications by carrying 40% to 50% of such costs.

For 2010/2011 and in future years Intellectual Property registration costs are to be supported by the newly formed National Intellectual Property Management Office (NIPMO) established in terms of the Act.

The Innovation Fund also initiated a Patent Incentive Award for university inventors named in granted South African Patents which could be demonstrated to be novel. Early in 2011, 24 Wits inventors received Awards totalling nearly R0.5 million.

The University Patent Portfolio is very broad in its scientific and technological content. The biggest area of patent application activity is in the field of drug delivery, originating from the Department of Pharmacy and Pharmacology. This is also an area of focus for technology transfer.

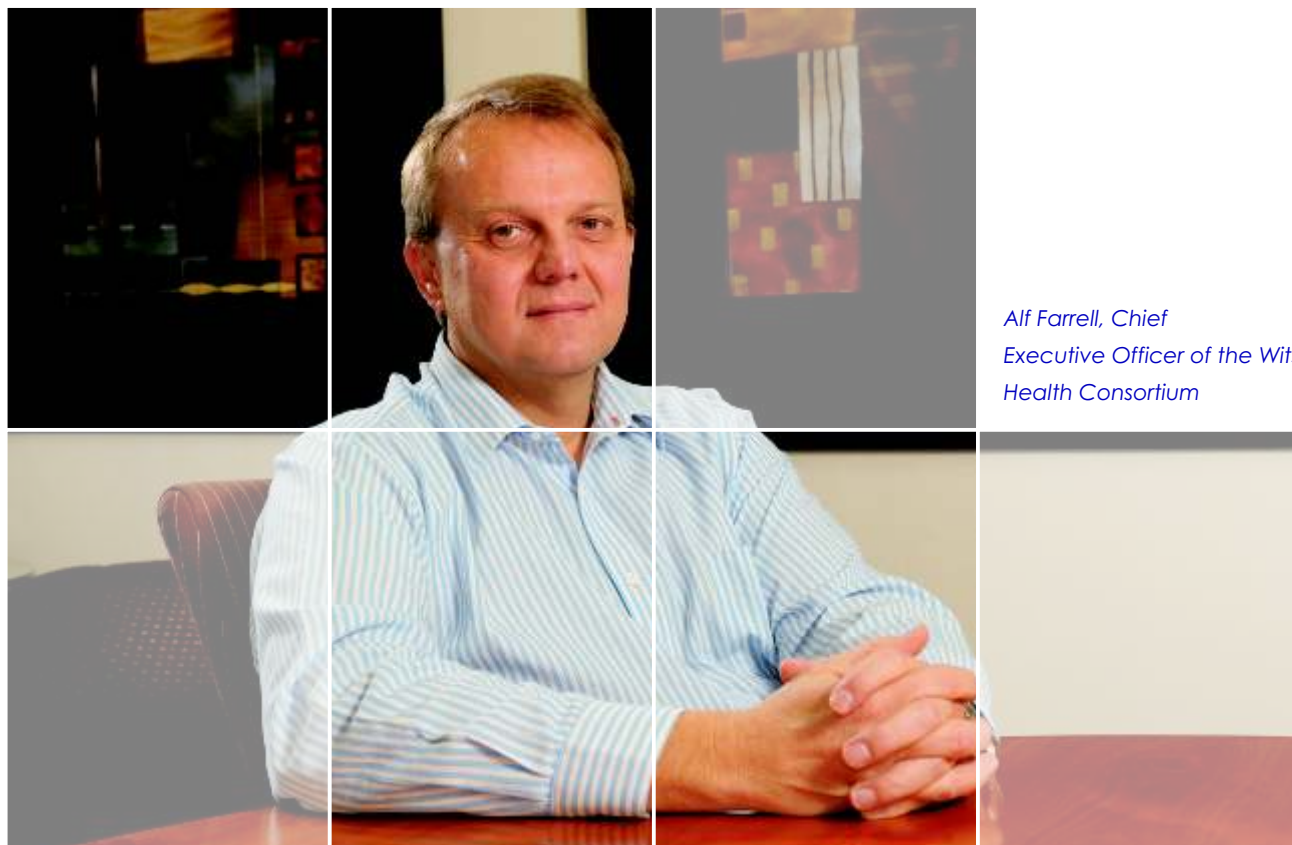
Other areas which warrant mention are gene silencing, where the grant of European Patents is imminent, the sorting of diamond-bearing kimberlite, where several national patents have been granted and industrial support has been received for research and development, bone research, high voltage protection (for which a US Patent has been granted), coded apertures for nuclear medicine (also a granted US Patent), solar water heating systems, bioreactors for hydrogen generation and water treatment, and even a granted South African Patent for a novel submarine design!

Wits Enterprise is gearing up to complement the growth in the patent portfolio by taking Wits' patented ideas into society in 2012.

Dr Charles Marais
CEO

Wits

Health Consortium



*Alf Farrell, Chief
Executive Officer of the Wits
Health Consortium*

The Wits Health Consortium (WHC) is a subsidiary of the University of the Witwatersrand and operates under the Faculty of Health Sciences. The Consortium – comprising several research sites and large donor funded units – was established in 1998 with the aim of providing commercial and administrative services to research units operating under its legal umbrella as well as to provide an additional income stream for the University.

The WHC comprises four divisions. They are:

- The Wits Clinical Research (WCR) Division;
- The Shared Services Centre;
- Contract Laboratory Services (CLS); and
- Research units and syndicates.

This report highlights some of the research activities carried out in 2010 by the WCR, the CLS and the four syndicates.

The syndicates are:

- The Perinatal HIV Research Unit;
- The Respiratory and Meningeal Pathogens Research Unit;
- The Clinical HIV Research Unit; and
- The Soweto Cardiovascular Research Unit.

Clinical Research

The WCR Division provides a range of support services to the Faculty of Health Sciences' investigator sites that conduct Phase II and Phase III clinical trials, sponsored by the pharmaceutical industry. Their research focus includes oncology, rheumatology, diabetes, hypertension and cardiovascular risk factors, neurology, respiratory medicine, HIV/AIDS, vaccine studies and studies suitable for general practice.

The Division established the Wits Donald Gordon Clinical Trial Site in 2006 and in 2008 launched a similar site at the Chris Hani Baragwanath Hospital in Soweto. It has now expanded its activities to Mthatha and collaborates with various other hospitals and primary healthcare facilities.

In 2010, WCR expanded its training division by updating its Good Clinical Practice basic and update courses and introducing a quality control course for the trial sites in collaboration with Prof. Lesley Burgess from TREAD Medical Research. It also initiated the Association for Clinical Research Sites of Africa. The Head of WCR, Dr Maureen Joffe, serves on the executive committee of this organisation.

Shared Services

WHC's Shared Services continues to provide a vehicle for the effective and professional management of research grants. It comprises leading functional experts committed to providing support services to the grant-funded sector specialists thereby enabling them to focus on their core expertise.

The following are support solutions offered by the WHC Shared Services:

- Human resource administration and management;
- Payroll;
- Financial administration and management;
- Site and project support;
- Contract support;
- Regulatory application; and
- IT Support.

Contract Laboratory Services (CLS)

Over the past 10 years CLS has acquired the experience, facilities, staff and developed the right people in the right place in order to deliver what they believe is now an expert clinical trial laboratory service.

In addition, the close link to the academic heads and experts in the different pathology disciplines allows the CLS to offer expert advice on setting up laboratory services. All profits generated by CLS are directed back into research and the School of Pathology.

CLS has a distinct advantage over any other organisation providing these services for Africa based on its strategic location within the African continent. They are the recognised leaders in this field because of their ability to troubleshoot for remote clinical areas, their established international collaboration, their demonstrated training ability and understanding of the difficulties encountered with the development of laboratory support systems within

the environments of developing countries.

To date CLS has established a network of more than 50 laboratories spanning 13 countries in east, west and southern Africa and Asia.

CLS has also developed state-of-the-art diagnostic facilities catering for the needs of the clinical trial industry. Features of the facility include the BSL 3 TB lab, Peripheral Blood Mononuclear Cell laboratory as well as the Biorepository.

CLS are currently involved in more than a 150 active clinical trials. The lab services the major research units that fall under the WHC like the PHRU, CHRU, HIV and Related Diseases and others.

CLS has close collaborations with many major clinical trial networks such as:

- Gates funded project: HSV-HIV co-transmission study;
- International HIV/AIDS Vaccine Initiative;
- Adult AIDS Clinical Trials Group;
- Paediatric AIDS Clinical Trial Group;
- Comprehensive International Programme of Research on AIDS (CIPRA) project: Central laboratory status for all CIPRA related activities;
- Microbicide Development Programme;
- Microbicide Trial Network;
- HIV Prevention Trial Network Studies;
- International Program for Microbicides; and the
- Short Pulse Anti Retroviral Therapy at HIV Seroconversion.

Research units and syndicates

The Perinatal HIV Research Unit

The research focus of the Perinatal HIV Research Unit (PHRU), under directorship of Prof. Glenda Gray, is on HIV prevention, antiretroviral treatment and adolescents' clinical and behavioural research. The research scope of the Unit further stretches to examine factors that contribute to HIV and treatment adherence, important socio-behavioural interventions and co-infections most notably tuberculosis. Read more about this Unit on page 113.

The Respiratory and Meningeal Pathogens Research Unit

Prof. Shabir Madhi, Director of the Respiratory and Meningeal Pathogens Research Unit, and his team have been involved in a number of significant local and international collaborations during 2010.

Locally they were involved in the National Institute for Communicable Diseases' Severe Acute Respiratory Surveillance and Rotavirus Surveillance Programmes and research projects with the Red Cross Hospital in Cape Town and the Ngwelezane Hospital in Richard's Bay.

Internationally they are collaborating with the Centre for Disease Control and Prevention. The Unit is currently involved in several studies including:

- A case-control study on the effectiveness of pneumococcal conjugate vaccine against pneumonia in HIV-infected and HIV non-infected children in South Africa;
- A case-Control Study to Assess the Effectiveness of Rotarix® Vaccine in HIV-infected and HIV-uninfected children in SA;
- Pneumonia Etiology Research for Child Health Project. Apart from SA, other countries that are involved in the study include Bangladesh, The Gambia, Mali, Zambia, Kenya and Thailand; and
- The maternal influenza trial.

The Clinical HIV Research Unit

The Clinical HIV Research Unit (CHRU), with Prof. Ian Sanne as the Clinical Director and Principal Investigator, is an HIV/AIDS research syndicate affiliated to the Wits Health Consortium. The unit is also affiliated to the South African Institute of Medical Research. The Unit provides primary healthcare to more than 800 patients.

During 2010 the CHRU has continued to positively contribute to the global scientific research surge in the field of HIV. Some of the trials in which they were involved, include:

- **AIDS Clinical Trials Group**

Thirteen Adult Aids Clinical Trial Groups (AACTG)

continue to be the focal point of the AIDS Clinical Trials Group (ACTG). Eight of these studies are interventional studies with the remaining five observational studies. In addition, 241 new patients for four of the trials were recruited during the year under review. This brings the total number of ACTG patients to 618.

■ **Commercial Drug Research**

During 2010 the CHRU conducted 14 commercial studies, some of which are ongoing and others which have been completed. These studies have been conducted in partnership with an array of stakeholders from the pharmaceutical industry. Nearly 200 patients participate in these studies, and have been published in high ranking journals. These articles have been widely cited to provide support for the early initiation of antiretroviral therapy to prevent TB infections and Nurse Monitored Antiretroviral Therapy.

The Soweto Cardiovascular Research Unit

The Soweto Cardiovascular Research Unit (SOCRU) was established in 2006 and in 2008 the University approved the Chronic Diseases of Lifestyle Thrust co-founded by Professors Karen Sliwa and Nigel Crowther. Many of the activities of the Thrust including for example awareness days and educational programmes were performed and funded via the SOCRU.

The Unit is involved in two major research projects; namely The Heart of Soweto Study and an investigation entitled *Peripartum Cardiomyopathy*.

■ **The Heart of Soweto Study**

The Heart of Soweto Study is a collaborative project that examines the emergence of heart disease in Soweto and other African communities in epidemiological transition. In 2006 a prospective registry of more than 9 000 men and women from Soweto, presenting to the Chris Hani Baragwanath Hospital with heart disease, was initiated. To date the Unit has collected information on 8 000 patients.

■ **Peripartum Cardiomyopathy**

Peripartum Cardiomyopathy (PPCM) is a condition common in African women. The aim of this study is to investigate the pathogenesis, etiology, epidemiology and management of the condition.

The team of researchers from SA, the United States and Germany, found that a 'broken' Prolactin causes the activation of a pro-apoptotic signalling pathways in the heart, leading to left ventricular dilatation and a failing heart.

They have investigated the effect of medication inhibiting Prolactin (Bromocryptine) in a randomised study of newly diagnosed patients with PPCM. The positive results of this proof-of-concept pilot have been published in *Circulation* in March 2010.

Chronic Diseases of Lifestyle Research Thrust

The main aims of the Chronic Diseases of Lifestyle Research Thrust are to study the metabolic and genetic aetiology of cardiovascular disease, obesity and related disorders in African subjects; to provide efficient health service delivery to subjects with chronic diseases, which can only be accomplished if more is known about the epidemiology of these diseases; to investigate disease epidemiology and the delivery of health services in rural and urban areas; and to increase public and government awareness of the severe impact of diseases of lifestyle on the health of the nation.

This worldwide epidemic has received much public and scientific interrogation in the developed world but has been largely ignored in the developing world where communicable diseases such as HIV and TB have taken centre stage. However, in low and middle income countries over half of the prevailing disease burden is actually due to non-communicable diseases.

The Research Thrust includes a number of senior researchers and clinicians, who have experience in a broad field of research areas and techniques, working in the fields of cardiovascular disease, diabetes and obesity.

The wide range of expertise is vital to the ability of the Thrust to investigate all aspects of diseases of lifestyle in Africa and to broaden the knowledge and provide appropriate research training and resources to new investigators.

The Thrust includes two Medical Research Council units, four University-recognised research units or programmes, and six research groups.

■ **Educational and Community Awareness Projects**

During 2010 the SOCRU undertook a number of educational and community awareness projects. They were:

Evaluation of a heart failure management programme

Following the development of a heart failure management programme, the SOCRU needed to evaluate its effectiveness and apply it to the wider Soweto setting. The effectiveness of state-of-the art heart failure management in the African context is unknown without a culturally-specific programme and evaluation via an appropriately powered randomised trial.

The team developed a culturally specific programme and resources for optimal heart failure management for the large number of patients seeking expert medical care at the Chris Hani Baragwanath Hospital.

They also implemented this programme in the wider Soweto community set-up. Team members held weekly lectures about various aspects of chronic diseases including heart failure in various clinics in Soweto, for example, at the Pimville and Mandela Sisulu clinics.

The lectures were always attended by between 40 and 50 nurses and patients. They also organised a Chronic Diseases of Lifestyle Symposium, which was held at the Chris Hani Baragwanath Hospital. The aim of the Symposium was to create awareness about the importance of chronic disease management.

Apart from the Symposium, the SOCRU also hosted four Chronic Diseases of Lifestyle Awareness Days. These were held at the Chris Hani Baragwanath Hospital as well as at a number of taxi ranks, shopping centres and primary healthcare clinics in Soweto.

The purpose of these days is to create awareness amongst the public, patients and health professionals about the causes, treatment and prevention of chronic diseases of lifestyle. Here they receive education on causes, treatment and prevention of chronic diseases of lifestyle, as well as screening for risk factors such as weight, height, Body Mass Index, cholesterol, glucose and blood pressure.

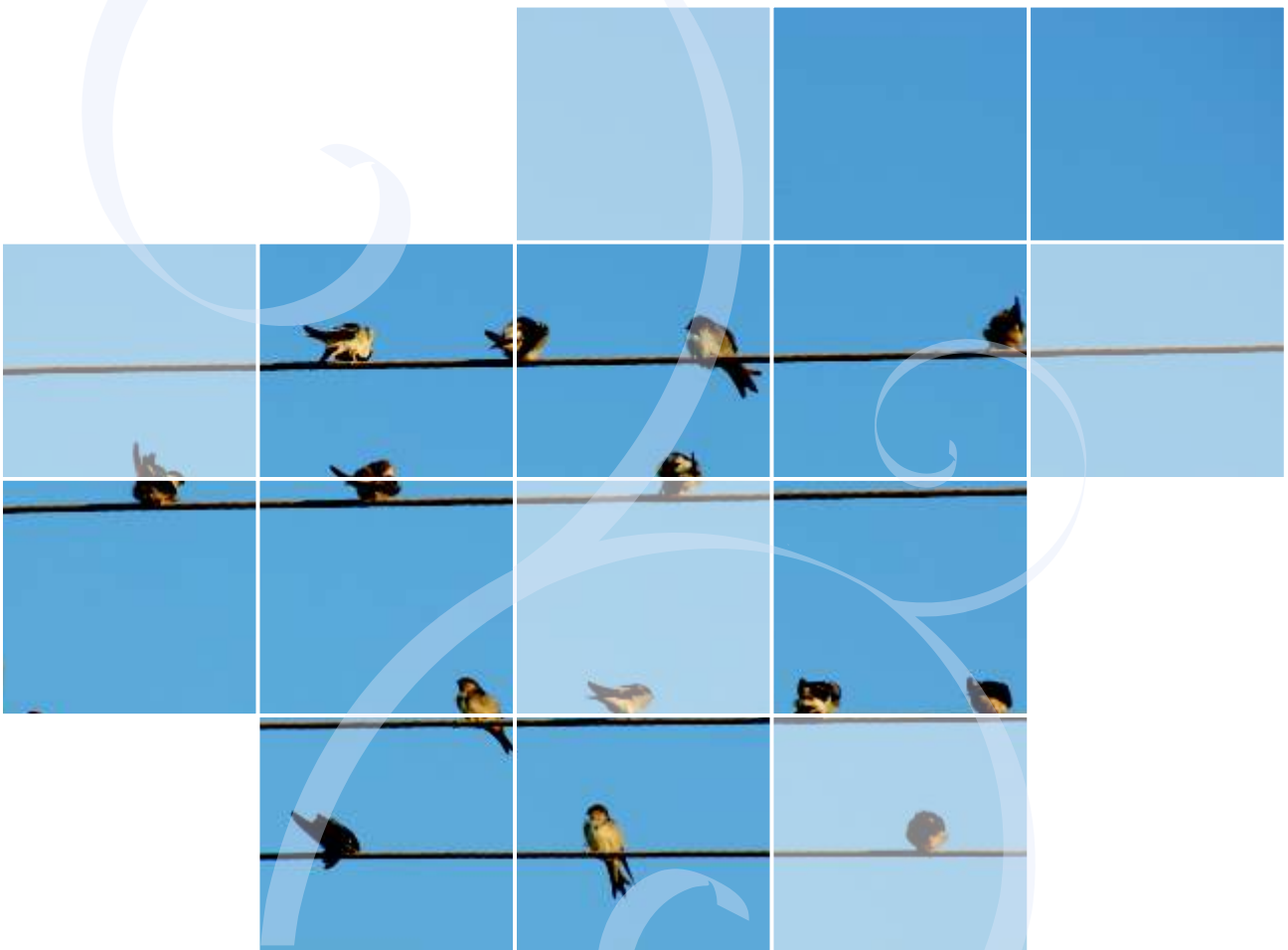
Nurse-Facilitated Hypertension Management Programme

The SOCRU developed a long-term programme to monitor the evolution of affluent forms of heart disease in the community and to develop African-specific programmes designed to address its major risk factors including for example high blood pressure linked to obesity and poor food choices. One of the most significant outcomes has been training local and national doctors and nurses to respond to this new epidemic in Africa.

They developed and distributed a *Hypertension Awareness Brochure* to the patients attending the cardiac clinic and dedicated Hypertension Clinic at Chris Hani Baragwanath Hospital and the primary care clinics in Soweto. This includes critical information on the role of dietary intake and other lifestyle changes needed to prevent hypertension as well as to encourage early detection and treatment. The SOCRU also initiated a *Nurse-Facilitated Hypertension Management Programme* that harmonises care between the primary and tertiary care clinics in Soweto and examines the efficacy of doing so.

Alf Farrell
Director

Research, public lectures, conferences and events



Wits academics, well known leaders, researchers and social commentators have shared the podium and have presented a wide array of lectures, conferences and seminars at Wits. The following pages contain a list of some of the events, a mere drop in the ocean considering that Wits hosts hundreds of visitors and events annually.



Research, public lectures, conferences and events

Key events

The annual lectures held to pay homage to influential people who have had an impact on the understanding of their chosen subject while at Wits, took place during 2010 covering interesting topics such as the 2010 FIFA World Cup, literature, health, HIV/AIDS and education. Launches of new programmes also took place, set to influence research at the University.

The Faculty of Health Sciences hosted the AJ Orenstein Memorial Lecture 2010 entitled *Is football healthy and can health be improved by playing football? FIFA medial legacy for Africa* delivered by Prof. Jirí Dvůrák, senior consultant, Department of Neurology, Spine Unit, Schultess Clinic and FIFA Chief Medical Officer and Chairman: FIFA Medical Assessment and Research Centre.

The School of Literature and Language Studies hosted the 2nd Es'kia Mphahlele Postgraduate Colloquium and Arts Forum, addressed by acclaimed writer and scholar Prof. Imraan Coovadia from the English Department at the University of Cape Town.

The International Year of Biodiversity was celebrated by the School of Animal, Plant and Environmental Sciences with lectures by Prof. Norman Owen-Smith entitled *Declining rare antelope in the Kruger National Park* and Prof. Graham Alexander entitled *The Reptiles of Southern Africa: Richness on a New Scale*.

The Faculty of Health Sciences hosted its biennial Health Sciences Research Day in September, showcasing new and groundbreaking research produced by staff and students of the Faculty under the slogan *Improving Health Through Research*. About 100 oral presentations and 220 poster presentations were selected to highlight research in *HIV/AIDS, Infectious Diseases, Chronic Disease and Diseases of Lifestyle, Molecular and Comparative Biosciences and Healthcare Delivery, Education and Management*.

The *Researching Education and the Labour Market (REAL)*, a new research programme of the Wits.

Education Policy Unit (EPU) headed by well known educationalist Prof. Peliwe Lolwana, was launched with a conference involving top national and international experts who raised different perspectives and questions on issues relating to education, the economy and the labour market experts. Hugh Lauder, Professor of Education and Political Economy at the University of Bath was one of the guest speakers, speaking on his new book, *The Global Auction: The broken promises of education, jobs, and incomes*.

The Alex du Toit Memorial Lecture was delivered by Prof. Terence McCarthy entitled *The Okavango Delta and its Place in the Geomorphological*

Evolution of Southern Africa.

Prof. Shelley Buffenstein from the Department of Physiology at the University of Texas Health Science Centre was the speaker at the Paul Levy Memorial Lecture entitled *Abrogated aging and increased cancer resistance; insights from the longest-lived rodent, the naked mole-rat.*

The Annual ST Lee Lecture was entitled *Discrimination and Justice: Beyond Affirmative Action*, delivered by Deepak Nayyar, Professor in Economics at Jawaharlal Nehru University in Delhi and the former Vice-Chancellor of the University of Delhi.

The 3rd Postgraduate Cross Faculty Symposium was held on 26 and 27 October 2010 showcasing oral and poster presentations from postgraduate students in all faculties and disciplines.

The Forced Migration Studies Programmes, Sisonke Sex Worker Movement and the Market Photo Workshop held a collaborative exhibition based on the lives of migrant women, a culmination of a participatory photography project which worked with migrant women involved in sex work in the inner city of Johannesburg. The project, which ran for ten days, worked in collaboration with ongoing research that is being undertaken with women involved in sex-work in inner-city Johannesburg.

The Wits Institute for Social and Economic Research and the School of Literature and Language Studies co-hosted a lecture by Dr Richard Zenith,

in conversation with guests David Bunyan and Stephen Gray, entitled *Fernando Pessoa, Poet of Two Languages and Many Masks.*

The Education Policy Unit and the Department of Sociology hosted a talk by Prof. Michael Young from the Institute of Education at the University of London entitled '*Powerful knowledge*': *the radical case for recovering a disciplinary tradition.*

The Graduate School of Public and Development Management together with *Business Day* hosted a public lecture by Advocate Menzi Simelane, National Director: National Prosecuting Authority of South Africa entitled *Institutional or prosecutorial independence: the South African National Prosecuting Authority* as well as a public lecture by Nathi Mthethwa, Minister of Police entitled *Keeping South Africa Safe Beyond 2010: Preventing, Detecting and Combating Crime.*

The Faculty of Health Sciences Research Office announced an exciting new initiative, the Alumni Diaspora Programme, to boost the strength of this network, stimulating dialogue and helping to establish further collaborative and exchange partnerships with international institutions.

The annual Ethics Alive week was hosted by the Faculty of Health Sciences and the Steve Biko Centre for Bioethics from 15 – 19 March 2010.

The Wits Centre for Ethics and the Philosophy Department co-hosted an interdisciplinary conference from

under the theme *Poverty; Charity; Justice.*

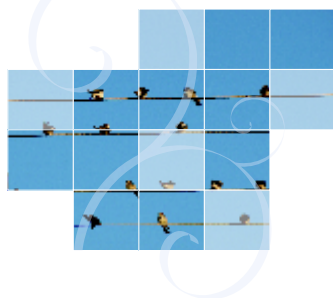
Faculty of Commerce, Law and Management

The Wits Business School hosted Dr Brian Brink, Chief Medical Officer for Anglo American delivering a lecture entitled *HIV – The Practical Approach.* The School of Law presented a seminar by Prof. Mark Kende, the James Madison Chair in Constitutional Law and Director of the Drake Constitutional Law Center at the Drake Law School entitled *Constitutional Rights in Two Worlds* as well as Prof. Daniel Bradlow, SARCHI Professor of International Development Law and African Economic Relations in the Faculty of Law at the University of Pretoria.

The African Programme on Rethinking Development Economics (APORDE) in association with the School of Economics and Business Science's based Corporate Strategy and Industrial Development Research Programme hosted a public lecture seminar series by internationally acclaimed development economists Prof. K S Jomo and Dr Jonathan Di John entitled *Impact of the Financial Crisis in Developing Countries and From Windfall to Curse? Oil and Industrialisation In Venezuela: 1920 to the present.*

The School of Law held *Conventions, Constituent Assemblies and Round Tables: From Models to Principles of Democratic Constitution making*, a public lecture delivered by Andrew Arato, Honorary Professor and Bram

Research, public lectures, conferences and events



Fischer Visiting Scholar, Wits School of Law and Dorothy Hirshon Professor in Political and Social Theory, New School for Social Research, New York.

Faculty of Engineering and the Built Environment

The School of Mechanical, Industrial and Aeronautical Engineering held a Research Colloquium presentation by Prof. Claudia Polese, describing an innovative metal joining process called Friction Stir Welding. The School also hosted a Research Colloquium presentation by Kreeelan Padayachee, describing how systems identification techniques were utilised to model the lateral and longitudinal dynamic characteristics of an unmanned aerial system.

The School of Architecture and Planning presented a *Memory in the City* seminar by Sue Krige, independent History and Heritage Consultant and Senior Tutor in the Wits School of Education entitled *The Power of Power: The Electrical Precinct in Newtown, Industrial Heritage and the Conversion of the old Jeppe Street Power Station into the Headquarters of Anglo-Gold Ashanti, 1906 to 2008* and a seminar by Oren Yiftachel entitled *Gray Cities: The coming of Urban Apartheid* at which Prof. Alan Mabin was the discussant. Visual artist Brenden Gray spoke on his work done in Yeoville as part of his MA at the Wits School of the Arts on invitation from the School of Architecture and Planning. His paper was entitled *Conversations Between the Social and the Aesthetic: Drawing and Proliferation in Informal Places. 'Speak English To Me', Yeoville, Johannesburg 2007- 2008.*

The School also hosted the Canada Research Chair professor in City Politics at INRS University in Montreal, Canada, Prof. Julie-Anne Boudreau during a series of lectures on *Developing knowledges of cities in decade two of the twenty-first century.*

Faculty of Health Sciences

Tali Nates, Director of the Johannesburg Holocaust and Genocide Centre delivered the 2010 Steve Biko Lecture entitled *Health and Human Rights: Perpetrators, Bystanders and Rescuers – Portraits in Moral Choices* hosted by the Steve Biko Centre for Bioethics.

The Faculty's Research Office hosted the third and fourth Prestigious Research Lectures entitled *Mandela's Children: Securing the health and wellbeing of future generations* and *Should we be giving antiretroviral drugs to HIV negative people?* respectively.

The School of Physiology hosted a seminar entitled *Are all T cells created equal? – Impact on infectious disease diagnosis and monitoring* by Dr Melinda Suchard from the Department of Molecular Medicine and Haematology at the National Health Laboratory Service.

Dr Ivan May, former President of Convocation and Wits stalwart who passed away at the end of 2010, delivered a lecture entitled *Your Secret Weapon: The King 3 Report on Governance in South Africa and its Relevance to You as a Health Care Professional*, hosted by the Steve Biko Centre for Bioethics.

Faculty of Humanities

Prof. Gillian Straker, a Clinical Professor at the University of Sydney and a visiting Professor of Psychology at Wits spoke on *Unsettling Whiteness* during a lecture hosted by the School of Human and Community Development.

The Department of Philosophy presented a seminar entitled *Ought To Be vs. Ought to do* by Matthew Chrisman from Edinburgh University, wherein Chrisman argued that the word 'ought' is not ambiguous in the way many ethicists and metaethicists have assumed.

The Centre for Indian Studies in Africa held a talk entitled *The Politics of Ecology in India today* by Prof. Mahesh Rangarajan, a leading environmental and wildlife historian from the University of Delhi.

The Department of Philosophy in the School of Social Sciences held a Hoernlé Research Seminar in Philosophy entitled *The Unity of Consciousness* by Prof. Paul Snowdon from University College, London.

The School of Human and Community Development presented a lecture entitled *Anxiety Disorder: A Transdiagnostic Model and Cognitive-*

Behavioural Therapy: Recent Advances in CBT for Anxiety by Dr Peter J. Norton, a recognised expert in the field of Cognitive-Behavioural Therapy, Associate Professor of Psychology at the University of Houston and Director of the Anxiety Disorder Clinic.

The School of Education hosted Dr Federico Settler, post-doctoral fellow at the University of Cape Town delivering a seminar entitled *Frantz Fanon, Religion and Black Self Definition*.

The School of Literature and Language Studies hosted Mellon Distinguished Fellow Prof. Rita Barnard from the University of Pennsylvania in August as part of its Transnational Legacies Research Thrust. Barnard, Professor of English and Director of the Women's Studies Program and the Alice Paul Centre for Research on Women, Gender, and Sexuality at the University of Pennsylvania, delivered two lectures and three seminars.

The lectures were respectively entitled *On World Literature, World Music and the Encyclopaedic Novel: Marlene van Niekerk's Agaat*; and *On Public and Private in a Neoliberal World: JM Coetzee's Diary of a Bad Year*.

Faculty of Science

A rush of visitors swarmed to Wits when it was announced that the rare Coelacanth (*Latimeria chalumnae*) otherwise known as Old Four Legs, could be seen for a few days at the Life Sciences Museum in the Oppenheimer Life Sciences Building, the first time the museum specimen

was in Gauteng. A rare species, Coelacanths (Greek for 'hollow spine') were believed to be extinct since the end of the Cretaceous period, until the first *Latimeria* specimen was found off the east coast of South Africa in 1938.

Dr Vivienne Williams, ethnobotanist and indigenous plant use specialist spoke at a lecture hosted by the School of Animal, Plant and Environmental Sciences and Alumni Relations entitled *Unravelling Threats to Medicinal Plants*. In her PhD she unravelled the complex chain of suppliers, wholesalers and retailers in the Witwatersrand traditional medicine trade.

The Materials Physics Research Institute and the Centre of Excellence in Strong Materials co-hosted a seminar by Kaushik Mallick from the Advanced Materials Division at Mintek in Randburg entitled *In situ Polymerization and Composite Formation' (IPCF): A Smart Route for the Synthesis of Polymer Based Nanocomposite Materials*. The School of Mathematics held a series of Research Seminars under the theme *The Poincare Conjecture – In Search of the Shape of Space*.

The School of Chemistry presented a lecture by Prof. Richard Ernst (ETH Zürich), 1991 Nobel Laureate in Chemistry entitled *My Pathway into Science and Beyond*. Prof. Ernst narrated parts of his life story which was guided by a long sequence of lucky events that led to historical developments in Nuclear Magnetic Resonance (NMR). A seminar was also



delivered by Dr Mandy Rousseau from the CSIR entitled *Antimalarial antifolates: Teaching old drugs new tricks*.

Books

Several academics authored or co-authored books that were launched during 2010 by Wits University Press and other publishing houses, drawing in more people to learn about their work on a wide range of topics.

- Prof. Pumla Dineo Gqola authored *What is Slavery to me? Postcolonial/Slave Memory in Post-apartheid South Africa*
- *Sport vs. Art, a South African Contest* was edited by Dr Chris Thurman
- *Mbeki and After Reflections on the legacy of Thabo Mbeki* edited by Prof. Daryl Glaser
- *Changing the Course on AIDS* was written by Prof. David Dickinson
- Prof. Gillian Eagle co-authored *Traumatic Stress in South Africa*
- *New South African Review: 2010; Development or Decline?* edited by John Daniel, Dr Prishani Naidoo, Prof. Devan Pillay and Prof. Roger Southall
- Prof. Liz Gunner contributed a chapter to *Mediation of Violence in Africa*
- Prof. Ronald J. Clarke and Prof. Timothy C. Partridge authored *Caves of the Ape-Men* with contributions by Dr Kathleen Kuman
- *Seeing and Knowing; Rock Art with and without Ethnography* was edited by Prof. Geoffrey Blundell, Prof. Christopher Chippindale and Prof. Benjamin Smith
- Dr Veronique Tadjou authored *Loin de Mon Père – Away from my Father*
- Prof. Heinz Klug authored *The Constitution of South Africa: A Contextual Analysis*

Inaugural and Senate Lectures

Wits academics delivered a wide range of inaugural and senate lectures during 2010.

Prof. Ebrahim Momoniat from the School of Computational and Applied Mathematics in the Faculty of Science delivered an inaugural lecture entitled *The mathematical modelling and applications of thin film flows*, Prof. Kevin Balkwill from the School of Animal, Plant and Environmental Sciences in the Faculty of Science spoke about *Is conservation of biodiversity an optional luxury or an evolutionary imperative for humans?* Professor Sunny Iyuke from the School of Chemical and Metallurgical Engineering, in the Faculty of Engineering and the Built Environment's inaugural lecture was entitled *Nanotechnology in Integrated Science and Engineering Education*.

Prof. Eleanor Ross from the Department of Social Work in the School of Human and Community Development delivered an inaugural lecture entitled *African spirituality, ethics and traditional healing: Implications for indigenous South African social work education and practice*, while Prof. SFT Weiss from the School of Molecular and Cell Biology in the Faculty of Science spoke on *Shot on target:*

Scoring against cancer, neurodegenerative diseases and viral infections by eliminating the goal-keeper LRP/LR. Prof. Roger Southall from the School of Social Sciences in the Faculty of Humanities delivered his inaugural lecture entitled *South Africa 2010: From Short Term Success to Long Term Decline?* Prof. Rasoava Rijamampianina from the School of Business Administration delivered a lecture on *Towards a holistic approach to managing diversity.*

Prof. Gilbert Khadiagala from the Department of International Relations, in the School of Social Sciences, delivered an inaugural lecture entitled *Ideas in African International Relations*; Prof. Lynn Morris from the School of Pathology in the Faculty of Health Sciences' National Institute for Communicable Diseases delivered an inaugural lecture entitled *Are we any closer to developing a vaccine against HIV?* while Prof. Lesley Cornish from the Centre for Strong Materials in the Faculty of Engineering and the Built Environment delivered a lecture entitled *Developing Novel Alloys Using Phase Diagrams.* An inaugural lecture entitled *50 Years After the Coalbrook Mine Disaster: Did We Really Learn?* was delivered by Prof. Nielen van der Merwe from the School of Mining Engineering, while Prof. James Ogude from the School of Literature and Language Studies in the Faculty of Humanities delivered a lecture was entitled *Whose Africa? Whose Culture? Reflections on Agency, Travelling Theory and Cultural Studies in Africa.*

Prof. Anitra Nettleton from the Wits School of the Arts in the Faculty of Humanities spoke on *In Pursuit of Virtuosity: the gendering of masterpieces in 19th Century South African indigenous arts*, Prof. Michèle Ramsay from the Division of Human Genetics, in the Faculty of Health Sciences spoke on *Parallel Journeys: The birth and growth of molecular genetics and its influence on a career spanning three decades.* Prof. Haroon Saloojee from the School of Clinical Medicine in the Faculty of Health Sciences presented his inaugural lecture entitled *Over 200 children die in South Africa every day. What can we do about it?*

Prof. Laurence Boulle from the Mandela Institute in the Wits School of Law in the Faculty of Commerce, Law and Management talked about *Swaying to the Rhythms of the Global Beat: State, Corporation and Citizen under Economic Globalisation*, while Prof. Victor Houliston, from the School of Literature and Language Studies in the Faculty of Humanities delivered his inaugural lecture entitled *The Missionary Position: Catholic Exiles Writing the History of the English Reformation.* Director of the Institute for Human Evolution, Prof. Francis Thackeray, delivered his inaugural lecture entitled *Human Evolution, Past Climates and Statistics* while Prof. Michael Rudolph from the Division of Public Oral Health and Health Promotion in the School of Public Health in the Faculty of Health Sciences delivered a senate lecture entitled *Cavities, Cultivation and Communities: A journey from oral*

health to eco health. Prof. Edward Witkowski from the School of Animal, Plant and Environmental Studies presented on *Conserving plant biodiversity in Africa.*

Prof. Bruce A. Watson from the School of Mathematics in the Faculty of Science delivered an inaugural lecture entitled *Moving boundaries and frequency dependent transmission conditions* and Prof. David Dickinson from the School of Social Sciences in the Faculty of Humanities presented on *Changing the Course of AIDS? Peer Education in South African: The Challenges of Sexual Norms, Folk Theories, and Social Shame.* Prof. Gavin R. Norton from the School of Physiology in the Faculty of Health Sciences delivered a lecture entitled *The Realities of Preventing Cardiovascular Disease in Africa*; Prof. Dilip Menon, from the Centre for Indian Studies in Africa in the Faculty of Humanities spoke on *Moving beyond the Nation: five Indians in search of a narrative*, and Prof. Peter Cooper, Chief Specialist and Academic Head of the Paediatrics and Child Health Department at Charlotte Maxeke Johannesburg Academic Hospital delivered a lecture entitled *The Life and Times of the Newborn – from Ancient Greece to the Millennium Development Goals.* Prof. Edwell Kaseke from the School of Human and Community Development in the Faculty of Humanities delivered his inaugural lecture on *Revisiting social security systems as instruments of social protection: Lessons from SADC.*



In memoriam

Lumby, Anthony

(1947– 2009)

Prof. Anthony Bernard Lumby, former head of the Wits School of Economic and Business Sciences, died in Pretoria on 6 December 2009, aged 63, after a brief struggle with cancer. Born on 16 August 1947, Lumby's mission in life was in education. His academic career began at Wits where he was involved in a night school as a student and as a tutor in the 1960s. After research studies at the University of Nottingham, he joined the University of Natal to lecture economic history. He progressed to full professorship by 1996 and was Dean of the Faculty of Economics and Management at the University of KwaZulu-Natal from 1995 to 2004. With a keen interest in environment economics, he was a pioneering authority in environmental impact assessment and resource management in South Africa. He participated in establishing an African network of environmental economics and served as vice-president and president of the International Interdisciplinary Environmental Association. On his return to Wits in 2007 "he made an extraordinary impression and contributed so much in the three short years," said director of Wits Plus, colleague and friend, Prof. Kathy Munro, in a tribute. "He was an excellent head of school ... he balanced genuine academic leadership with subtle and refined managerial talent." Described as "so kind ... unfailingly well-mannered [with] a penchant for seeing the human and funny side of people and situations without disparaging anyone", Lumby "made the world a better place". He is survived by his sister and nephew.

Jawurek, Harald

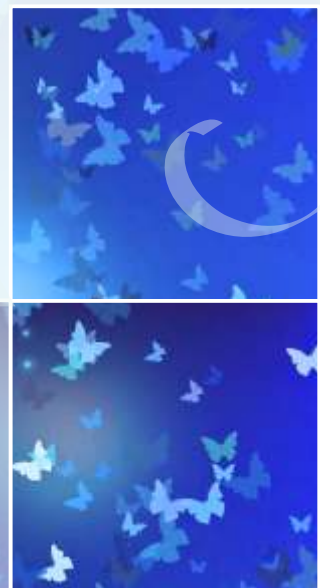
(1939 – 2010)

Prof. Jawurek Harald, an Honorary Associate Professor in the School of Mechanical, Industrial and Aeronautical Engineering, died at the age of 71 on 13 October 2010. Jawurek was associated with the School of Mechanical Engineering for over 40 years and obtained his PhD degree in the School for research in the field of boiling heat transfer. He will be remembered with great affection by staff colleagues and large numbers of undergraduate and postgraduate students for his kind and caring personality and great talent as a lecturer and research supervisor. He was appointed as an honorary associate professor after his retirement and continued to help the School in many ways as a close friend.

Keyser, André

(1938 – 2010)

Dr André Keyser was a well-known palaeontologist and credited with the discovery of the Drimolen hominid site and of numerous hominid remains. Keyser graduated with a Doctorate degree in Palaeontology from Wits and spent most of his career at the Geological Survey of South Africa (now the Council for Geosciences) where he was Head of the Palaeontology department. Keyser undertook taxonomic research on both Permian and Triassic dicynodonts, and was responsible for an extensive fossil collecting campaign in the Beaufort Group for biostratigraphic refinement. After taking early retirement from the Council for Geosciences his research interest changed. In 1994 he discovered a female *Paranthropus robustus*, the most complete australopithecine skull ever excavated and three years later he discovered the skulls of two children dating back approximately two million years ago. The children were under three years old at the time of their death and were found at the Drimolen site near the Sterkfontein Caves. During this period of his life he was associated with Wits as an honorary research associate in the School for Geosciences. He died of cancer on 15 August and leaves behind his wife, Sienie, and four children.





Distinctly Wits

- One of only two universities in Africa ranked in two separate international rankings as a leading institution in the world
- The only university in South Africa to feature in the top 1% in the world in seven defined fields of research according to the 2007 ISI international rankings
- Exceeds the national norms in terms of enrolments in the Science, Engineering and Technology fields and is very close to having half of all its enrolments accommodated in these areas
- Academic programmes continue to enjoy international accreditation
- Spread over more than 400 acres in Parktown and Braamfontein, the University is structured into five Faculties comprising 34 Schools. The Faculties are: Commerce, Law and Management; Engineering and the Built Environment; Health Sciences; Humanities and Science, serviced by about 3 500 permanent staff members.

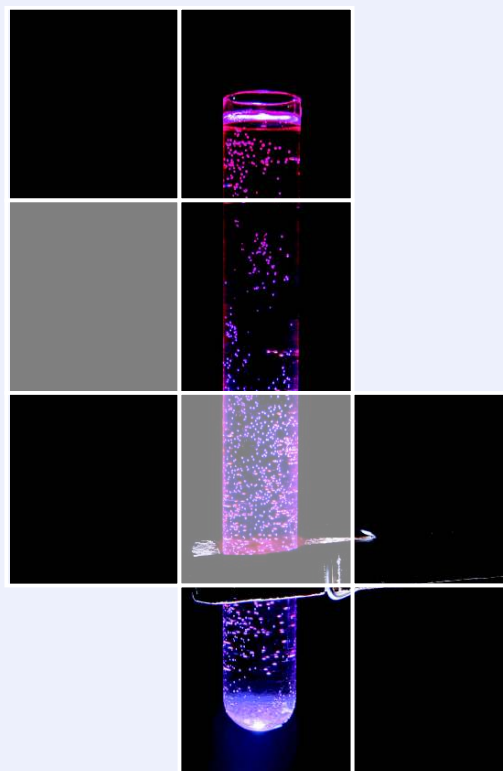
Wits facts

- Wits is an English medium institution which offers approximately 3 000 courses to 29 000 students, approximately a third of whom are postgraduate
- The University can accommodate about 17% of its students in 18 residences
- The University's library system comprises two main libraries and 14 divisional libraries. Students have access to over 1 000 000 book volumes, 400 000 journal titles and 46 000 new electronic resources
- A diverse institution, Wits is home to over 2 000 international students who hail from more than 80 different countries, speaking over 130 languages. Students can choose to join over 100 clubs and societies and can visit 14 museums and art galleries, including the Planetarium, the Origins Centre, the Wits Theatre Complex and the Life Sciences Museum
- Home to over 120 000 graduates, Wits is proud of the 91 Rhodes Scholars and four Nobel Laureates that have emanated from the institution
- In order to create an environment conducive to teaching, learning and research at the highest level, Wits has undertaken an ambitious R1,5 billion infrastructure development programme over four years, which will see its buildings and equipment modernised,

Research at a glance

- Wits accommodates seven research institutes, 20 research units and 10 research groups
- The University hosts 15 prestigious South African Research Chairs:
 - Prof. Phil Bonner (Local Histories and Present Realities)
 - Prof. Raymond Durrheim (Exploration, Earthquakes and Mining Seismology)
 - Prof. Helder Marques (Bio-inorganic Chemistry)
 - Prof. Diane Hildebrandt (Sustainable Process Engineering)
 - Prof. Maureen Coetzee (Medical Entomology and Vector Control)
 - Prof. Robert de Mello Koch (Fundamental Physics and String Theory)
 - Prof. Heini Dirr (Protein Biochemistry and Structural Biology)
 - Prof. Christopher Henshilwood (The Origin of Modern Human Behaviour)
 - Prof. Shabir Madhi (Vaccine Preventable Diseases)
 - Prof. Viness Pillay (Pharmaceutical Biomaterials and Polymer-Engineered Drug Delivery Technologies)
 - Prof. Jill Adler (Mathematics Education)
 - Prof. Philip Harrison (Social Chair in Development Planning and Modelling)
 - Intelligent Systems (To be appointed)
 - Theoretical Particle Cosmology (To be appointed)
 - Radio Astronomy (To be appointed).
- Three Centres of Excellence are based at Wits:
 - The Department of Science and Technology / National Research Foundation Centre of Excellence for Biomedical Tuberculosis Research
 - The Department of Science and Technology / National Research Foundation Centre of Excellence in Strong Materials and
 - The Department of Trade and Industry National Aerospace Centre.
- Wits is home to over 200 rated scientists of which 16 are A-rated, international leaders in their disciplines.
- Wits has prioritised several research thrusts which are innovative, multidisciplinary and relevant to society.

- The current research thrusts focus on:
 - Biodiversity
 - Cities
 - Diseases of Lifestyle
 - Evolution of the Species and Natural Heritage
 - HIV/AIDS
 - India/South Africa
 - Materials Sciences and Engineering
 - Mineral Resources, Exploration and Mining and
 - Molecular Biosciences
- Wits has a separate palaeoanthropology hub called the Institute for Human Evolution, dedicated to palaeoanthropological research. It is also home to one of the largest plant and animal fossil collections in the southern hemisphere. New species are constantly being discovered and described, making Wits a natural home for international researchers in this field.





This report comprises two volumes. Volume 1 is the print edition while Volume 2 is available electronically on CD and at www.wits.ac.za/Research/2010/AnnualReport

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Iain Burns
Ferna Clarkson
Kasturi Naidoo
Shirona Patel
Vivienne Rowland
Data capturers in the departments

Copies of the report can be obtained from:

Shirona Patel
+27 11 717-1019
shirona.patel@wits.ac.za
5th floor, Senate House, Jorissen Street,
Braamfontein
or
Ferna Clarkson +27 11 717-1027
ferna.clarkson@wits.ac.za
5th floor, Senate House, Jorissen Street,
Braamfontein

Queries and comments can be directed to:

Iain Burns
+27 11 717-1231
iain.burns@wits.ac.za

Articles compiled by:

René Bosman
Heather Dugmore

Photographs:

Eyescape Studios
Researchers

Design and layout:

Lilla Fourie, Boxemdaais

Project leader:

René Bosman
+27 12 56-6512
+27 82 454-6363
renewrite@gmail.com

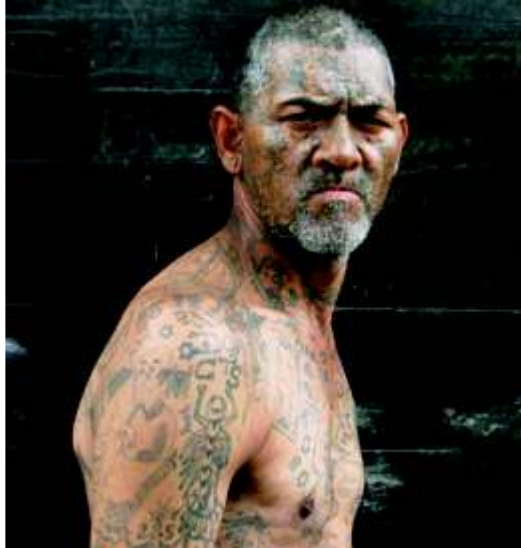
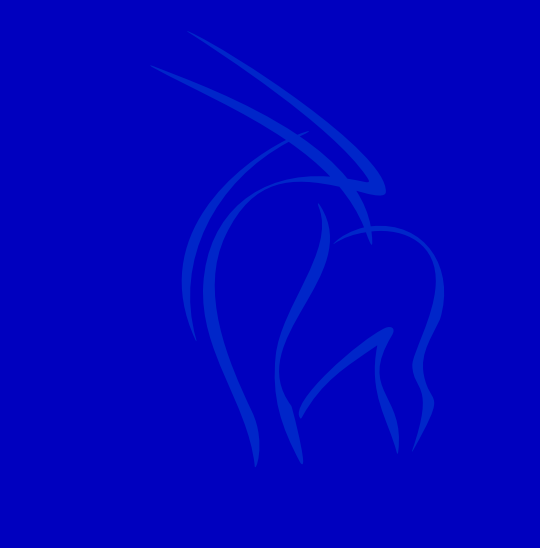
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RESEARCH REPORT

University of the Witwatersrand,
Johannesburg

2010



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

Jan Smuts Avenue
Braamfontein
Johannesburg
South Africa

Tel: +27 11 717-1000
www.wits.ac.za

