2013

Research Review

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UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

UP 2025

Vision

To be a leading research-intensive university in Africa, recognised internationally for its quality, relevance and impact, and also for developing people, creating knowledge and making a difference locally and globally.

Mission

In pursuing recognition and excellence in its core functions of research, and teaching and learning, and integrating engagement with society and the community into these, the University of Pretoria will use quality, relevance, diversity and sustainability as its navigational markers.

Goals

- To be a leading research-intensive university in Africa
- To strengthen the University's international profile and visibility
- To strengthen the University's impact on South Africa's economic and social development
- To pursue excellence in teaching and learning
- To increase access, throughput and diversity



Content

Message from the Vice-Chancellor

In 2013 the University of Pretoria produced its highest ever research output, as well as a growing number of first-rate graduates who are making their mark in society. With an enrolment of 48 901 contact students, the University of Pretoria is South Africa's largest research-intensive university.

Growing student enrolment, while at the same time increasing the quantity and quality of research, is a dual feat of which we are very proud, especially since there is a tendency to view growth at undergraduate levels as a detractor from first-rate research. As a public university in a transforming society, the University of Pretoria's institutional strategy is focused on achieving an optimal balance between enhancing access in areas aligned to the national skills plan and expanding the knowledge capacity through research to enhance the University's status as a leading higher education institution.

In pursuit of this objective in 2013, we sharpened our institutional focus on the implementation of large-scale projects that build on areas of existing research strength. A concerted effort was made to foster multidisciplinary approaches that are responsive to the major challenges facing our society locally and globally. Malaria control, energy, food security, and animal and zoonotic diseases are among the research focus areas that illustrate the University's efforts in this regard.

Building on the success of these institutional and faculty focus areas, in 2013 several new research groupings and centres were established. These included the Centre for the Advancement of Scholarship, which was established to provide an environment for advanced scholarship with an emphasis on the contribution of the humanities and

social sciences. The Capital Cities theme, also launched in 2013, brings together a range of disciplines across faculties and from international networks to rethink and remake capital cities as seats of power and as living symbols of governments. The Genomics Research Institute (GRI), an outcome of the Genomics Institutional Research Theme, spans three faculties, Natural and Agricultural Sciences, Veterinary Science and Health Sciences, in its focus on environmental genomics, human and health genomics, and plant and animal genomics.

Responding to the developmental challenges in the African region, the Centre for the Study of Government Innovation (GovInn) was launched. It is the first research centre in Africa dedicated entirely to conducting leading-edge research on new and alternate models of governance and it is gaining a strong reputation as an "innovation laboratory" that is generating new thinking about public decision-making and socio-economic development.

The information presented in this research review provides clear evidence of growing research intensity and impact, for example, the overall increase in publications, and most notably in high-impact international journals. These very pleasing upward trends bear testimony to the passion and hard work of the people of the University – the academics, students and staff who are committed to the pursuit of ideas that have the possibility of changing our world for the better.

The increased visibility and impact of research at the University is further reflected in the number of prestigious awards bestowed on several academics. Particularly pleasing is the recognition of the University's former Vice-Principal: Research, Professor Robin Crewe, who was awarded the Academy of Science of South Africa (ASSAf) gold medal for outstanding service, and who also received the Harry Oppenheimer Fellowship to produce a monograph on the life history of the honeybee *Apis mellifera* in collaboration with Professor Robin Moritz of the University of Halle-Wittenberg. Noteworthy is also the election of one the University's leading academics, Professor Mike Wingfield, as the President of the International Union of Forestry Research Organisations in the same year that he was awarded the prestigious African Union Kwame Nkrumah Scientific Award in the Life and Earth Sciences category.

The University of Pretoria is proud to be actively participating in a world of knowledge sustained and fuelled by collaboration, partnerships and networks. I wish to extend the University's sincere appreciation to our partners, collaborators and funders who contributed to our successes in 2013. As Vice-Chancellor and Principal I also wish to extend my appreciation to all the staff and students who have ensured that 2013 was a year that we can look back on with a sense of pride in our achievements.

Professor Cheryl de la Rey
Vice-Chancellor and Principal

Report by the Vice-Principal

As the Vice-Principal for Research and Postgraduate Education, it is an honour to provide an overview of the University's research achievements in 2013. This was a year in which encouraging progress has continued to strengthen our position as a research-intensive university.

In 2013, the number of UP researchers among the top 1% of scientists globally grew by 50% from 10 in 2012 to 15 in 2013, and the number of journal articles produced by members of the academic staff rose by 11% when compared with the output in 2012. Significantly, the 11% increase was also reflected in the papers published in internationally recognised peer-reviewed journals.

Our continued focus on developing the research profile of the University and its staff, by increasing the number of researchers who have National Research Foundation (NRF) ratings, resulted in growth of almost 11% to a total of 375 (up from 333), including 11 scholars who have A ratings. The percentage of academic staff members who have doctoral degrees rose by 5% compared to 2012, assisted in part by the Research Development Grant awarded to UP by the Department of Higher Education and Training.

During 2013, five new industry-funded research chairs were established, three of which focus on the critical issue of water, not just in South Africa, but also as part of the University's commitment to research in Africa. This commitment is further reflected in the work of the University's high-profile Institute for International and Comparative Law in Africa, and the extensive continentally based work in Veterinary Science. Veterinary researchers have, for instance, been undertaking research on diseases that have severe negative effects on economically important livestock, and on the surgical rescue and rehabilitation of rhinos that have had their horns removed by poachers.

The University's commitment to research that is relevant to the African continent and globally, and which draws on our research strengths, was also given expression in the Institutional Research Themes (IRTs) established before 2013. Covering the areas of animal and zootic diseases, capital cities, energy, food, nutrition and well-being, and genomics, where substantial contributions were made to growth in research productivity, the presence of post-doctoral fellows, and research collaboration, as well as highly successful activities in raising research funds.

While the IRTs and their accompanying Faculty Research Themes (FRTs) continued to gather significant momentum, the year also saw the launch of four new research centres, institutes and clusters, including the Centre for the Advancement of Scholarship, the Genomics Research Institute, the University's membership of the Tshwane Animal Health Cluster, and the University's participation in the National Exotic Leather Cluster, which was announced in late 2013.

The Department of Science and Technology's South African Research Chairs Initiative (SARChI) was designed to strengthen the country's universities to increase research capacity in order to generate high-quality research and innovation and, through this, increase the quality of the training of postgraduate students. In 2013, the University had 11 such chairs, ranging from Mammalian Behavioural Ecology and Physiology to International Development Law and African Economic Relations.

These developments reflect the University's stature as a highly regarded research organisation, which is also signalled by the University's rise in both the Quacquarelli Symonds (QS) and Leiden global university ranking systems between 2012 and 2013.

A part of the improvement in UP's global ranking and its research output is the result of strengthening international linkages and collaboration. Of the University's 3 924 master's and doctoral students, almost 16% were international students, while the number of international staff members grew to almost 5% of total academic staff. During the year, UP signed additional working collaboration agreements with 19 universities in 15 countries in Africa, Asia, Europe, the Americas and Australasia.

Sustaining the growth of research activity and productivity is dependent on funding, much of which has to be raised from beyond the University's own resources. This places the responsibility for generating research income on members of the academic staff in collaboration with the Department of Research and Innovation Support (DRIS). The year under review saw R314 630 000 in research funds raised from outside sources.

In 2013, the proportion of students enrolled at post-graduate levels exceeded 40% for the first time, a figure that approximates the postgraduate enrolments in some of the world's leading universities. In graduation ceremonies, 242 doctoral degrees were awarded, an increase of 22% on the 198 awards made in 2012. Post-doctoral fellows, many attracted to UP from abroad, are an important source of support for the University's researchers – and a foundation for research skills for the future. In 2013, the University hosted 168 postdoctoral fellows, a year-on-year increase of 7%.

The University's research achievements, underscored by the international and local awards earned by the scholarly staff of the University, reveal the human face of our research strengths. During 2013, 16 such awards were made to individual members of the academic staff, across 13 departments and six of our nine faculties. It is this recognition that serves to remind us that the University's research achievements are in fact the achievements of its academic staff and senior students. It is fitting, therefore, to end this overview with sincere congratulations and thanks to the staff, postdoctoral fellows, senior students and members of DRIS who made UP's 2013 performance as successful as it has been.

Professor Stephanie Burton
Vice-Principal: Research and Postgraduate Education


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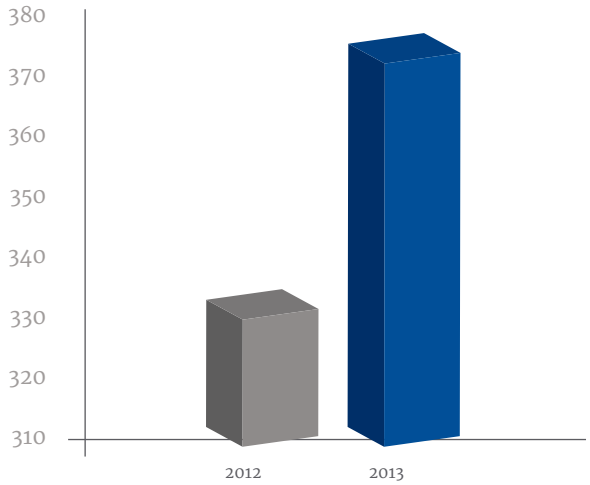
Research at a glance in 2013

Number of UP researchers in the top 1% of scientists in the world

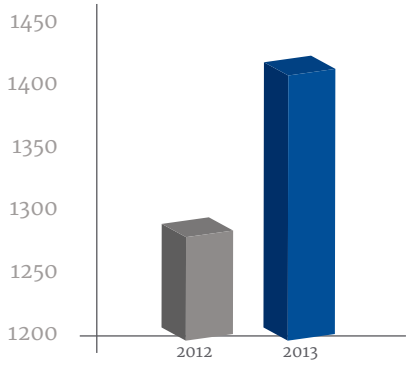
10 → 15

2012 2013

UP scholars who hold NRF ratings



Journal articles published by UP researchers



The number of PhDs awarded in 2013 at the University of Pretoria

242

Funds raised for research from external sources in 2013

R314 000 000

Percentage of articles published in internationally recognised, accredited journals

67,4%

UP scholars who received awards from national and international organisations in 2013

16

New industry-funded chairs, centres, institutes and clusters established in 2013

9

Research overview

Research overview

Research performance

The University of Pretoria has made significant strides in its focus on research excellence in 2013.

- The number of journal article publication units produced by our researchers increased from a total of 1 277.4 in the previous year to 1416.51 in 2013.
- Of these, the number of article units published in the internationally recognised, accredited journals listed in the International Science Index (ISI) and International Bibliography of the Social Sciences (IBSS) journals increased to 67.4% as a percentage of the overall publication output.
- In 2013, 15 UP researchers were among the top 1% of scientists globally, as identified on the Web of Science Essential Science Indicators compared to the 10 identified in 2012. This 50% increase reflects the growth in international standing of our top researchers.
- The total number of National Research Foundation (NRF)-rated researchers increased by 12.6% in 2013, with 375 academic and research staff now holding NRF ratings, of whom 11 are A-rated scholars.
- Some 55.2% of UP academic staff now have doctoral degrees – a 5 % increase compared to 2012.

Funding for research

In 2013, UP researchers and research partners secured R314 million from external funders:

- Research grants, including funding from the NRF, the Technology and Human Resources for Industry Programme (THRIP), the Medical Research Council (MRC) and other funders, amounted to R98 million.
- Research contracts from national partners and sponsors totalled R103 million.
- International funders provided support to the amount of R114 million.
- The University also contributed R139 million of internal resources to fund research equipment, innovation, publications, scholarships and fellowships, and research development.

Research chairs

New industry-funded research chairs introduced in 2013:

- **Rand Water Chair in Water and Public Health** in the Faculty of Health Sciences (Professor Maureen Taylor)
- **Rand Water Chair in Water Microbiology** in the Faculty of Natural and Agricultural Sciences (Professor Fanus Venter)
- **Rand Water Chair in Civil Engineering** in the Faculty of Engineering, Built Environment and Information Technology (Professor Fanie van Vuuren)
- **Rand Water Chair in Mechanical Engineering** in the Faculty of Engineering, Built Environment and Information Technology (Professor Stephan Heyns)
- **Barclays Africa Chair in Banking Law in Africa** in the Department of Mercantile Law in the Faculty of Law (Professor Corlia van Heerden)

The University of Pretoria now has more than 30 research chairs, including the following 11 DST/NRF South African Research Chairs Initiative (SARChI) chairs:

- **SARChI Chair in Mammalian Behavioural Ecology and Physiology** in the Faculty of Natural and Agricultural Sciences (Professor Nigel Bennett)
- **SARChI Chair in Carbon Technology and Materials** in the Faculty of Natural and Agricultural Sciences (Professor Brian Rand assisted by Professor Ncholu Manyala)
- **SARChI Chair in Artificial Intelligence** in the Faculty of Engineering, Built Environment and Information Technology (Professor Andries Engelbrecht)
- **SARChi Chair in Mathematical Models and Methods** in the Faculty of Natural and Agricultural Sciences (Professor Jean Lubuma)
- **SARChI Chair in Sustainable Malaria Control** in the Faculty of Natural and Agricultural Sciences (Professor Lyn-Marie Birkholtz)
- **SARChI Chair in Complex Systems** in the Faculty of Natural and Agricultural Sciences (Professor Pavel Selyshchev)
- **SARChI Chair in Fluoro-materials Science and Process Integration** in the Faculty of Engineering, Built Environment and Information Technology (Professor Philip Crouse)
- **SARChI Chair in Tax Policy and Governance** in the Faculty of Economic and Management Sciences (Professor Riël Franzsen)
- **SARChI Chair in Non-parametric, Robust Statistical Inference and Statistical Process** in the Faculty of Natural and Agricultural Sciences (Professor Subha Chakraborti)
- **SARChI Chair in Advanced Sensory Networks** in the Faculty of Engineering, Built Environment and Information Technology (Professor Attahiru Alfa)
- **SARChI Chair in International Development Law and African Economic Relations** (due to be filled shortly)

Research overview — new developments

New research centres, institutes and clusters

Two new centres were launched at UP during 2013:

- **The Centre for the Advancement of Scholarship** provides an enabling environment for multi-disciplinary scholarship with an emphasis on the contribution of the Humanities and Social Sciences (Director: Professor Robin Crewe).

- **The Centre for the Study of Government Innovation (GovInn)** in the Department of Political Sciences is the first research centre in Africa dedicated entirely to governance innovation (Director: Professor Lorenzo Fioramonti).

The following institutes and clusters were also launched and announced during 2013:

- **The Genomics Research Institute** spans the three Faculties of Natural and Agricultural Sciences, Veterinary Sciences and Health Sciences and focuses on environmental genomics, human and health genomics, and plant and animal genomics (Director: Professor Don Cowan).

- **The National Exotic Leather Cluster (NELC)** was established towards the end of 2013 following the formal approval by the Department of Trade and Industry (dti) of a proposal by the faculties of Veterinary Science and Natural and Agricultural Sciences, together with leading industry role players. This research cluster forms part of the dti's Competitiveness Improvement Programme. The Exotic Leather Research Centre at UP will have dedicated research chairs in Animal Health and Welfare and Animal Production and Trade to work on specific research projects in partnership with the industry (Director: Professor Gerry Swan).

- UP is a partner in the **Tshwane Animal Health Cluster**, with the Technology Innovation Agency (TIA), the National Research Foundation (NRF), the Agricultural Research Council (ARC), Onderstepoort Biological Products (OBP), and the Council for Scientific and Industrial Research (CSIR). The focus of 13 UP projects within this cluster is on the development of new and improved diagnostics, vaccines and treatment for animal diseases and health.

Innovation

With respect to innovation activities:

- The UP Technology Transfer Office was awarded NIPMO (National IP Management Office) grants to an amount of R2.3m to increase Intellectual Property (IP) awareness activities on campus, and to increase capacity for effective management of IP produced by UP researchers and postgraduate students.
- There were 22 new invention disclosures, and three international and two South African patents awarded.

Early career researchers

The **University of Pretoria Early Career Researcher Programme** was introduced to support young academics and emerging scholars as they become independent researchers.

The specific areas of support included:

- assistance in the completion of postgraduate qualifications; and
- skills training in research and research management, writing for publication and postgraduate supervision.

More than twenty workshops on writing for publication, postgraduate supervision and grant proposal writing took place with over 100 emerging researchers participating in these workshops.

Postgraduate education

- In 2013, the University enrolled 13 995 postgraduate students (at all postgraduate levels and excluding distance education), and graduated 4 587 postgraduate students, including 242 doctorates.
- The Graduate Support Hub in partnership with the University Library Services hosted and facilitated a wide range of workshops and activities to provide postgraduate students with information and tools to assist in their career planning and research training. Examples of these workshops are proposal writing, thesis and dissertation writing, statistics boot camps, supervisor-student relationships, bursary funding applications and life skills.
- The Graduate Support Hub was also involved in the recruitment of postgraduate students and postdoctoral fellows at national and international forums, including virtual forums such as the Brazilian PhD Virtual Fair.

The UP Postdoctoral Association (UPPA) was formally launched in April 2013.

Postdoctoral fellows

- The number of postdoctoral fellows hosted by the University of Pretoria grew to 168 fellows by the end of 2013.
- The UP Postdoctoral Association (UPPA) was formally launched in April 2013. The key goals of the UPPA include fostering a sense of community among postdoctoral fellows at UP, raising the profile of postdoctoral fellows on the various campuses, and facilitating support for professional research training and career development.

Internationalisation

- UP has active agreements and collaborative programmes with institutions, research groups and individuals across the globe. In 2013, 19 new institutional agreements were signed with universities and institutions in Kenya and Zambia, and in Australia, China, France, Georgia, Germany, Italy, Mexico, Poland, Sweden, Singapore, Trinidad and Tobago, the Netherlands, and the USA.
- UP enrolled 4 462 international students, of whom 2 272 were undergraduate and 2 190 postgraduate students.
- Of the postgraduate students registered in 2013, 15.8% were international students.
- Approximately 75% of postdoctoral fellows are international scholars from more than 45 countries.
- **UP's Visiting Professors Programme** was introduced in 2013 to host distinguished academics from international institutions to contribute toward research excellence, postgraduate supervision and academic mentoring, and to strengthen our networks of international collaboration and partnerships. In 2013, five awards were made to international scholars from the United States, Europe and the United Kingdom, hosted in the Faculties of Engineering, Built Environment and Information Technology, Natural and Agricultural Sciences, Humanities and Health Sciences.

Research overview — awards

Professor Daya Reddy, President of the Academy of Science of South Africa (ASSAf) (right), presents the Academy's Gold Medal for Outstanding Service to President Emeritus, **Professor Robin Crewe**.

UP researchers were recognised in 2013 with national, regional and international awards for their research excellence and their significant contributions.

- **PROFESSOR ROBIN CREWE**, Director of the Centre for the Advancement of Scholarship, was awarded the **Academy of Science of South Africa (ASSAf) Gold Medal for Outstanding Service**. Professor Crewe was also awarded the **Harry Oppenheimer Fellowship for 2012**, making him the first UP recipient of the Fellowship, which has a monetary value of R1 million. The Fellowship Fund is considered a special investment to encourage and acknowledge excellence in scholarship. Professor Crewe has used the Fellowship to continue his research and to produce a monograph on the life history of the honeybee, *Apis mellifera*, in collaboration with Professor Robin Moritz of the University of Halle-Wittenberg.
- **PROFESSOR MIKE WINGFIELD**, Director of the Forestry and Agricultural Biotechnology Institute (FABI), received two honorary doctorates. The first was an **honorary doctorate from the University of British Columbia in Canada** (at the end of 2012), and the second, **an honorary doctorate from the North Carolina State University, USA.** He also received the **Life and Earth Sciences Award at the African Union (AU) Kwame Nkrumah Scientific Award Ceremony.** The Kwame Nkrumah Scientific Award is one of the AU Commission's initiatives to strengthen Africa's science and technology capacity and to promote efforts to transform scientific research into the sustainable development of the continent. Also in 2013, Professor Wingfield became the first African elected to serve as the **President of the International Union of Forestry Research Organisations (IUFRO).**

- **PROFESSOR IGNACY CUKROWSKI** of the Department of Chemistry received the **Excellence Award: Teaching and Research from the International Society of Electrochemistry (ISE)** in recognition of his exceptional contribution to the advancement of environmental chemistry and electrocatalysis in South Africa.

- Three UP academics were the winners of the 2013 **National Science and Technology Forum (NSTF)-BHP Billiton Awards** for their outstanding contributions to science, engineering, technology and innovation (SETI). **PROFESSOR ROBERT MILLAR**, Director of the Mammal Research Institute in the Faculty of Natural and Agricultural Sciences and the Receptor Biology Research Unit at the Medical Research Council (MRC), won the Lifetime Achiever Award. **PROFESSOR MARIETJIE VENTER**, Director of the Zoonosis Research Unit in the Faculty of Health Sciences, and **PROFESSOR SAURABH SINHA**, former Director of the Carl and Emily Fuchs Institute for Microelectronics (CEFIM) in the Faculty of Engineering, Built Environment and Information Technology, each received the **TW Kambuhle Award** for outstanding contributions to SETI over the past five to ten years.

- **PROFESSOR DAVE BERGER**, Head of FABI's Molecular Plant-Pathogen Interactions Group, was the winner of the **Biotech Fundi Capacity Builder Award**. The award recognises innovation and excellence in training methods that prepare a well-rounded scientist. It also recognises the promotion of previously disadvantaged individuals and women in biotechnology.

- **PROFESSOR JEAN LUBUMA**, Head of the Department of Mathematics and Applied Mathematics, was awarded the **Sign of Honour of the Bulgarian Academy of Sciences** for his contribution to the development and strengthening of research collaboration between the Bulgarian Academy of Sciences and the University of Pretoria. He was particularly recognised for his contribution to the organisation of the International Conference on Mathematical Methods and Models in Biosciences (BIOMATH), and the joint research initiatives between UP and the Bulgarian Academy of Sciences.

Professor Mike Wingfield (centre) was awarded an honorary doctorate from the University of British Columbia in Canada by Professor Stephen Toope, Vice-Chancellor and Principal (right) and Sarah Morgan-Silvester, Chancellor (left).

Research overview — awards

Professor Mike Sathekge receives the Ralph Kirsch Golden Pen Award in recognition of the most cited article in the *South African Medical Journal* over three years.

- **PROFESSOR SUNIL MAHARAJ**, Head of the Department of Electrical, Electronic and Computer Engineering and Director of the Sentech Chair in Broadband Wireless Multimedia Communications, was the winner of a **THRIP Technology Award** in the category Advanced Hi-Tech Research in Information and Communication Technology in South Africa for the work of his research group on broadband wireless multimedia communications.

- **PROFESSOR MIKE SATHEKGE**, Head of the Department of Nuclear Medicine, was the first recipient of the **Ralph Kirsch Golden Pen Award**. The award was made in recognition of a paper that was the most cited article in the *South African Medical Journal* over three years.

- **PROFESSOR BERNARD SLIPPERS**, a senior lecturer in Genetics at FABI, received the **JE Vanderplank Award** at the Southern African Society for Plant Pathology (SASPP) Congress. The award is made to an outstanding young plant pathologist, based on the evaluation of his or her research. He was the first recipient of such an award.

- **JOHAN VAN DER LINDE**, a PhD student in the Department of Microbiology and Plant Pathology and FABI, was the recipient of the **John and Petakin Mildenhall Award** for a PhD student at the SASPP Congress.

- **PROFESSOR RANGAN GUPTA**, a senior lecturer in the Department of Economics, was ranked **16th among the top 200 young economists in the list of the Research Papers in Economics (RePEc)**. These rankings only consider RePEc's youngest registered economists. RePEc is a collaborative effort of hundreds of volunteers in 75 countries to enhance the dissemination of research in economics and related sciences.

- **DR HEINRICH BADENHORST**, a senior lecturer in the Department of Chemical Engineering, was a winner in the **2013 International Green Talents Competition**. He received the award for his efforts to find innovative ways of using carbon and graphite material for renewable energy capture and storage.

- **PROFESSOR WANDA MARKOTTER**, a lecturer in the Department of Microbiology and Plant Pathology, was **first runner-up in the Life Sciences category in the 2013 South African Women in Science Awards**.

- Die Suid-Afrikaanse Akademie vir Wetenskap en Kuns acknowledged two scholars in 2013. **PROFESSOR WIM VILJOEN**, Head of the Department of Music, received the **2013 Huberte Rupert Prize for Classical Music**. **PROFESSOR GERRIT OLIVIER** (extraordinary professor in the Department of Political Sciences) was awarded the **2013 Stals Prize** for his exceptional contribution to the discipline of political science.

- **PROFESSOR MICHAEL PEPPER**, Director of the Institute for Cellular and Molecular Medicine in the Faculty of Health Sciences, was awarded one of the prestigious **University Flagship Project research grants from the MRC.**

- **PROFESSOR WERDIE VAN STADEN** has been appointed as the **First Professorial Chair in Philosophy and Psychiatry outside Europe.** He is supported by the International Network of Philosophy and Psychiatry (INPP) and the World Psychiatric Association's (WPA) Section for Philosophy and History of Psychiatry.

Internal awards

Each year, the University honours and celebrates academic achievers and researchers for their contribution to the University. There are three categories of awards: Exceptional Academic Achievers, Exceptional Young Researchers and NRF-rated researchers.

Exceptional Academic Achievers

This annual award is bestowed on senior academics who have already achieved the status of professor, are regarded highly by their peers and have consistently excelled in the areas of undergraduate and postgraduate teaching and learning, research, community engagement and administration over a period of time. This also includes A-rated researchers of the NRF, who automatically qualify as Exceptional Achievers for as long as they retain their rating.

In 2013, Exceptional Achiever Awards were made to the following academics:

- Professor Roumen Anguelov
- Professor Marthán Bester
- Professor André Boraine
- Professor Riana Bornman
- Professor Erika de Wet
- Professor Jaco Greeff
- Professor Johan Joubert
- Professor Linda Korsten
- Professor Kobus Maree
- Professor Zander Myburg
- Professor Wimpie Odendaal
- Professor Jolanda Roux

Exceptional Young Researchers

Young emerging researchers are recognised for their research productivity and potential. This award is given to exceptional young achievers in research, as measured against the University's strategic goal of achieving academic excellence, international recognition and local relevance. All NRF P-rated researchers at UP are awarded Exceptional Young Researcher status. The following exceptional young academics were recognised in 2013:

- Dr Celia Abolnik
- Professor Roula Inglesi-Lotz
- Professor Wanda Markotter
- Dr Ferdi Meyer
- Dr Elmar Venter
- Dr Chris Weldon

Research overview — NRF ratings

The University annually honours its exceptional academic achievers and NRF-rated researchers (back from left): Professor Daya Reddy, President of Academy of Science of South Africa (ASSAf), Professor Brenda Wingfield (A-rated researcher), Dr Jeff Garnas (Y-rated researcher), Dr Phil Mjwara, Director-General in the Department of Science and Technology; (front from left): Dr Albert van Jaarsveld, CEO of the National Research Foundation, Professor Cheryl de la Rey, Vice-Chancellor and Principal, Dr Chris Chimimba (C-rated researcher), Dr Chris Weldon (C-rated researcher) and Professor Don Cowan (A-rated researcher).

The National Research Foundation (NRF) rates individuals on the quality of their research outputs over the past eight years. These ratings are conducted by national and international peers and reviewers. In 2013, 82 researchers were newly rated or re-rated by the NRF.

Professors Don Cowan and Brenda Wingfield were recognised as A-rated researchers, bringing to 11 the University's total number of researchers with A-ratings in 2013.

The following researchers hold an A-rating from the NRF based on the fact that they are unequivocally recognised by their peers as leading international scholars in their field for the high quality and impact of their recent research outputs.

- Professor NC Bennett (Zoology and Entomology)
- Professor DLC Cornell (Jurisprudence)
- Professor DA Cowan (Genetics)
- Professor RP Millar (Zoology and Entomology)
- Professor B Rand (Institute of Applied Materials)
- Professor JD van der Vyver (Private Law)
- Professor C van Onselen (Centre for the Advancement of Scholarship)
- Professor J van Oort (Church History and Church Polity)
- Professor BD Wingfield (Genetics)
- Professor MJ Wingfield (FABI)
- Professor X Xia (Electrical, Electronic and Computer Engineering)

The complete list of the University's NRF-rated researchers, in the different categories, is included on the CD accompanying this report.

Research focus areas

Research focus areas

As a research-intensive university, the University of Pretoria believes that it can make a positive contribution to the economic and social development of the country.

Our research agenda is focused on a number of carefully selected themes where proven capacity exists in the University, building on the work of excellent researchers and research leaders. In this way, the University can make a significant contribution to overcoming South Africa's challenges and developing human capital in our country.

The University has focused on establishing multidisciplinary research groups to build on its research strengths. These are known as Institutional Research Themes (IRTs) and Faculty Research Themes (FRTs). The IRTs involve a number of participating faculties in collaborative networks.

These themes add to the University's research reputation, while engendering a climate that promotes scholarship among academic staff and postdoctoral fellows, with the objective of producing more doctorates.

By focusing on unique local opportunities and collaborative research, the University is also in a position to increase its international profile. The primary objective of these research focus areas is on strengthening activities in areas of immediate national and regional needs, and developing those fields that ultimately affect human welfare.

The following IRTs are focused on multidisciplinary research:

- Animal and Zoonotic Diseases (involving the faculties of Veterinary Science, Natural and Agricultural Sciences, and Health Sciences)
- Capital Cities Project (involving the faculties of Humanities, Law, Health Sciences, Natural and Agricultural Sciences, Engineering, Built Environment and Information Technology, Theology, and Economic and Management Sciences)
- Energy (involving the faculties of Engineering, Built Environment and Information Technology, Natural and Agricultural Sciences, and Economic and Management Sciences)
- Food, Nutrition and Well-being (involving the faculties of Natural and Agricultural Sciences, Health Sciences, Veterinary Science, Education, and Law)
- Genomics (involving the faculties of Natural and Agricultural Sciences, Veterinary Science, and Health Sciences)

Faculty Research Themes include:

- Cellular and Molecular Medicine (in the Faculty of Health Sciences)
- International and Comparative Law in Africa (in the Faculty of Law)
- Sustainable Malaria Control (in the faculties of Health Sciences, and Natural and Agricultural Sciences)

Institutional Research Themes

Animal and Zoonotic Diseases

The development of a new generation of animal vaccines is a top biotechnology priority in South Africa. The Animal and Zoonotic Diseases IRT addresses questions and problems in the field of animal diseases, as well as diseases that spread from animals to humans (zoonoses). It develops improved diagnostic tools and vaccines, and conducts cutting-edge studies on the pathogen-vector-host interfaces and associated epidemiology.

The IRT was formally launched in October 2013, building on the University's research strengths and capacity, with research being carried out in the faculties of Veterinary Science, Natural and Agricultural Sciences, and Health Sciences.

Highlights during 2013 included the expansion of the research focus to include poultry diseases in a programme directed by Professor Celia Abolnik, the chairholder in Poultry Research in the Faculty of Veterinary Science. The Zoonoses Research Unit in the Faculty of Health Sciences has developed a range of new molecular and serological diagnostic tools, as well as the development of a range of surveillance programmes on vector-transmitted pathogens, including a bat surveillance programme. The outbreak of rabies in KwaZulu-Natal generated renewed interest for the IRT's research on the control of rabies in dogs.

Other research highlights include the establishment of a full plasmid-based reverse genetics system for the African horse sickness virus (AHSV), which is a world-first for orbiviruses. This programme is likely to have a major impact on both fundamental orbivirus research and the development of a new generation of AHSV vaccines.

Particularly promising is the potential of developing similar strategies for dealing with blue tongue virus and other viruses of economic importance in animal production. Excellent progress was made with the IRT-funded project on tick control, which delivered tools that will be of long-standing value in the laboratory and in the field. This research has already attracted significant international funding.

A substantial increase in the level of external funding was achieved in 2013, with research associated with the IRT succeeding in securing over R16 million in funding, which includes significant funds from the Tshwane Animal Health Innovation Cluster (TAHIC). A further important indicator of success is the number of research articles published by the members of this IRT, which almost doubled from 48 in 2012 to 94 in 2013.

Capital Cities

Capital cities are seats of power, and living symbols of a government in action. Monuments, government buildings, cultural landmarks, public spaces, schools, universities and recreational facilities in capital cities all tell countless stories about countries. A capital city is also an abstract space, a symbol, a place studied by historians and ethnographers, narrated by novelists, analysed by sociologists and psychologists, interpreted and appropriated by artists, and contemplated by philosophers.

The aim of the Capital Cities IRT is to bring together existing research and practice from a range of disciplines across the University, and to provide a new platform for researchers and postgraduate students to engage with Pretoria/Tshwane, as well as other capital cities and their geographical surrounds, and historical and discursive contexts. The IRT makes a meaningful contribution to UP's strategy to make a positive impact on its immediate and broader communities and environments and hopes to enrich the lives of city residents through its research.

The IRT is a cross-faculty research project that involves researchers and postgraduate students from the faculties of Humanities, Law, Health Sciences, Natural and Agricultural Sciences, Engineering, Built Environment and Information Technology, Theology, and Economic and Management Sciences.

Officially launched in 2013, it is guided by the following four initial themes:

- Cities represented (arts and culture)
- Cities lived (movements, exchanges, memories and histories of the present)
- Cities remapped (industry, power and linkages)
- Cities revisioned (violence, dignity and interventions)

In order to create opportunities to rethink and remake capital cities, activities have been initiated that include public conversations with scholars, the Mayor, media personalities and citizens. Research walks have also been organised in the city, as have public events centred around reusing spaces in the inner city.

During 2013, the IRT facilitated public lectures and the first Capital Cities Research Conference, and participated in art exhibitions at UP and the Royal Academy of Fine Arts in Antwerp. UP has already made a significant investment in Capital Cities. Some of its initial activities were supported by an Andrew W Mellon Foundation grant and research collaboration initiated with the Humboldt University in Berlin and the University of the Western Cape.

Energy

The IRT on Energy (IRT_E) was established to recognise and foster excellence in research by finding the best balance between the University's current research activities and the energy focus areas that are prioritised by government. It coordinates research in a number of faculties and partner institutions, focusing on topics that are relevant to South Africa's future energy security. Such a focused and concerted research effort is necessary to ensure that the country succeeds in achieving the goals of the national government's Integrated Resource Plan 2010 (IRP2010).

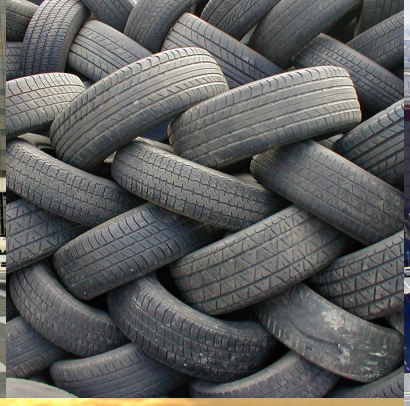
Based on the IRP2010, together with other government energy policies and strategies, the IRT_E has concentrated on research related to electricity generation, transmission and distribution. Research subthemes were identified that are relevant to South Africa's future energy security and internationally.

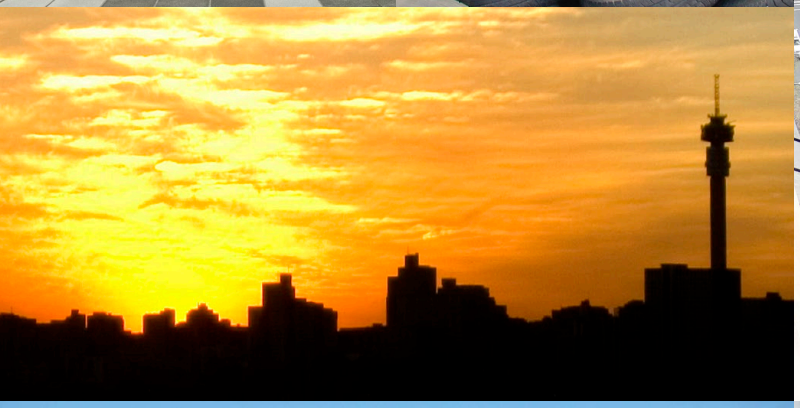
Academic staff and postgraduate students from a number of departments in the faculties of Engineering, Built Environment and Information Technology, Natural and Agricultural Sciences, and Economic and Management Sciences contribute to research aimed at achieving the goals of the IRT_E.

These include the departments of Mechanical and Aeronautical Engineering, Electrical, Electronic and Computer Engineering, Materials Science and Metallurgical Engineering, Chemical Engineering, Physics, Chemistry, and Economics, as well as the Graduate School for Technology Management and the Institute for Technological Innovation.

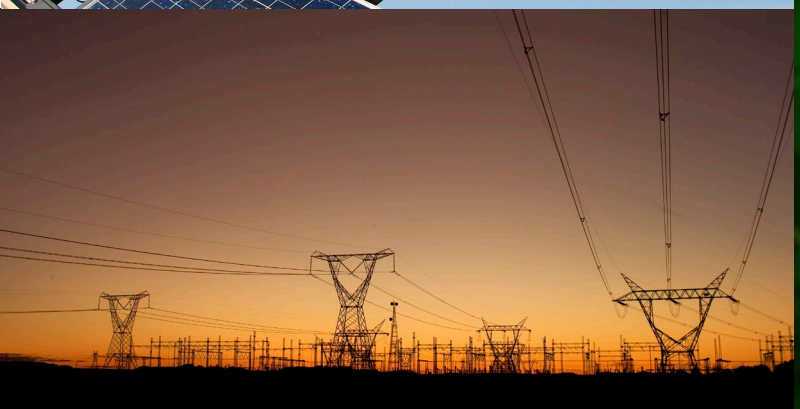
Research projects that have formed part of the IRT_E include projects investigating heat exchanger optimisation, energy efficiency, chemical process integration and smart grid optimisation. Additional projects involve energy system assessment and modelling, silicon carbide for nuclear applications, energy optimisation in renewable energy systems, and electrical double-layer vanadium batteries.

Solar energy studies have also been conducted on carbon-based composites for energy storage, renewable and electrical lighting systems, nuclear waste minimisation, conduit hydropower as an alternative source of sustainable renewable energy, renewable energy from scrap tyres, and fault-tolerant high-power LED lighting systems.






Centre for Microbial
Ecology & Genomics
enomics Research
titute
A University of Pretoria
Institutional Research Theme

Food, Nutrition and Well-being

The Institute for Food, Nutrition and Well-being (IFNuW) was established to conduct research addressing the emerging social and economic challenges related to food insecurity, nutrition deficiencies and hunger, especially in Africa, by coordinating work conducted in over 30 different disciplines across the faculties of Education, Engineering, Built Environment and Information Technology, Health Sciences, Humanities, Law, Natural and Agricultural Sciences and Veterinary Science.

The work of the IRT represents a significant, internationally recognised programme in food security with over 100 active researchers involved in finding ways to build more resilient agriculture and food system that can more effectively reduce hunger and malnutrition.

Research is grouped into five broad themes:

- Feeding the world in a resource-constrained environment
- Ensuring safer food through effective control and regulation
- Promoting health, nutrition and well-being
- Changing consumption behaviour for improved health
- Strategic planning and policy reform to manage food security risks

The Institute has succeeded in generating close to five times the institutional investment through external funding (over R25 million), and in creating long-term research projects that would not have been possible without long-term support.

Highlights for 2013 include:

- The national award of the DST Centre of Excellence in Food Security, co-hosted with the University of the Western Cape.
- The expansion of international networks through partnerships with three USA Innovation Labs (the equivalent of Centres of Excellence) and collaborations in four funded Australia-Africa University Network projects.
- The training of more than 80 master's and doctoral students
- Over two years, more than 100 journal papers have arisen from work related to this IRT.

Genomics

Genomics, the study of the total genetic complement of any organisms, is the newest revolution in the biological sciences. Genome studies have the potential to stimulate enormous advances in fields as diverse as plant breeding, human health and the use of indigenous bioresources.

The University's Genomics Research Institute (GRI) has actively promoted the development of genomics applications across the faculties of Natural and Agricultural Sciences, Veterinary Science and Health Sciences by providing seed-fund grants, and supporting genomics researchers with bioinformatics training and data analysis.

The year 2013 was a very active year for the Institute. Thirty-five research grants, totalling over R4 million, were awarded to GRI members. In return, members reported over 100 research papers from GRI projects, published in international peer-reviewed journals, and the external leveraging of GRI funding to more than R30 million for genomics research. The strength of genomics research at UP was particularly highlighted in a comparison of the publications in genomics and metagenomics by UP with other leading universities in South Africa, which showed UP as the leading national institution in this field.

Highlights for 2013 include:

- Host-pathogen genomics is one of the strongest themes of the GRI, and Professor Bernard Slippers and his team completed the genome sequence of three related organisms: the plant pathogenic fungus, *Amylostereum areolatum*, its wasp vector, *Sirex noctilio* and a nematode biological control agent, *Deladenus siricidicola*.
- Professor Zander Myburg was invited by the United States Department of Energy Joint Genome Institute (JGI) to present the results of the Eucalyptus Genome Project, for which he is the principal investigator.
- The discovery of key factors controlling cell cycling in malarial parasites by Professor Lyn-Marie Birkholtz, the SARCHi Chair on Sustainable Malaria Control, and her team. These will be targets for parasite control.

Faculty Research Themes

Cellular and Molecular Medicine

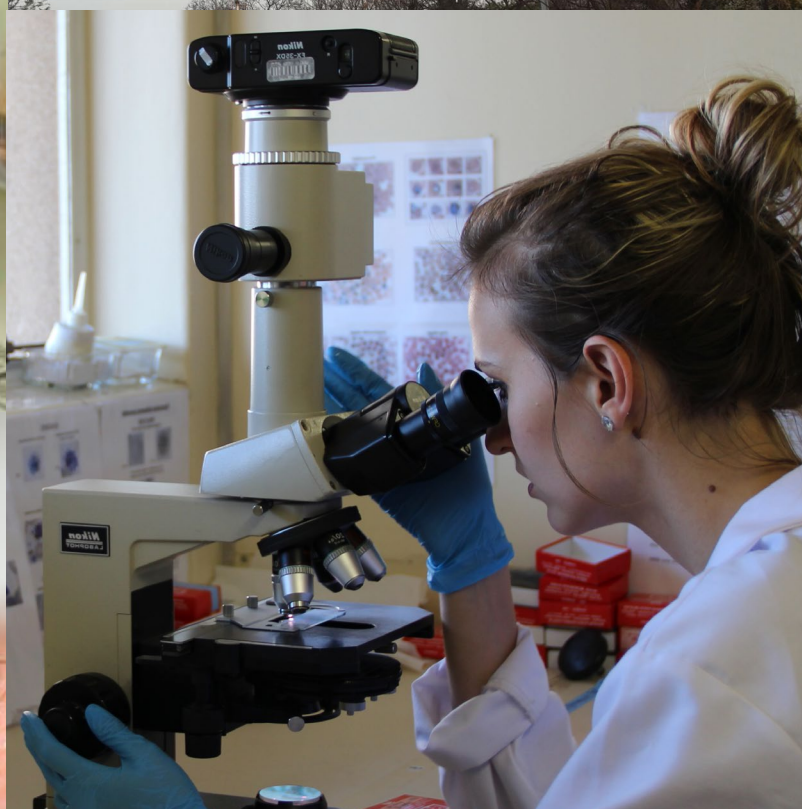
The Institute for Cellular and Molecular Medicine (ICMM) has a solid research basis in human health sciences and has entered a phase of rapid growth as it responds to the national and regional burden of communicable and non-communicable diseases.

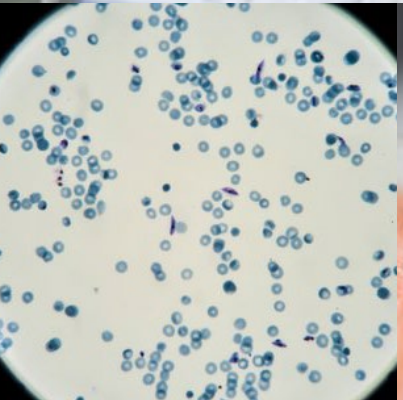
The activities of the Institute in 2013 involved more than 20 research groups across seven faculties: Economic and Management Sciences, Engineering, Built Environment and Information Technology, Health Sciences, Humanities, Law, Natural and Agricultural Sciences, and Veterinary Science, and various cross-cutting disciplines have been defined in an effort to focus the Institute's activities.

The ICMM is set to make a major contribution to the alleviation of the high disease burden in South Africa, as well as to add to global efforts to reduce morbidity and mortality, and the impact on all facets of life.

Research highlights for 2013 include:

- Stem cell research: In collaboration with colleagues at the universities of Geneva and Zurich (Switzerland), a proof of concept has been provided for a gene therapy approach for rendering the immune system resistant to HIV, which affects more than 6.5 million South Africans.
- Genetics and genomics: The Southern African Human Genome Programme completed the sequencing of 24 South African individuals.
- Cancer cellular physiology: The research group is using in silico virtual screening to enable a pharmaceutical company to preselect potential anti-cancer compounds that can later be synthesised. In vivo studies will then commence in 2015, biochemical cancer markers will be measured and possible reduction in tumour size will be measured to determine the efficacy of the new drug candidates.
- Bioengineering: Work in 2013 focused on the development of user-specific computer models for cochlear implant users, where for each user the geometric shape is deduced from computed tomography (CT) images of the user's cochleae.





International and Comparative Law

The Institute for International and Comparative Law in Africa (ICLA) is unique to the continent. As a research institute, its vision is to generate knowledge and develop research capacity at the highest level within African territorial, legal and language limits, as well as within international and comparative law parameters.

Through research and postgraduate guidance, the ICLA is positioning itself as a major contributor to advanced legal knowledge and capacity in the broader African and global community.

Its objective is to become a first port of call for those who wish to engage in legal research and legal reform in Africa. As a continental focal point, it strives to promote the role and rule of law in Africa through advanced research.

Achievements during 2013 include:

- In January 2013, the ICLA, in collaboration with the Department of Public Law, formally introduced the specialisation in international humanitarian law and human rights law in military operations in the LLM in Public International Law.
- Professor Christof Heyns, Director of the ICLA, presented thematic reports to the United Nations (UN) on lethal autonomous robots (LARs) and on drones.
- The ICLA has made an impact in promoting constitutionalism in Africa through its involvement in the *Oxford Constitutions Online (OCO),* the leading publication in its field, which covers the constitutions of more than 180 countries in the world. Working with its research partners in different African countries, the ICLA is responsible for coordinating the reports on countries in Africa.
- During 2013, the ICLA finalised six country reports.
- In September 2013, Professor Charles Fombad also organised the the first Stellenbosch Annual Seminar on Constitutionalism in Africa (SASCA 2013), jointly with the Stellenbosch Institute for Advanced Study (STIAS).

Sustainable Malaria Control

The University of Pretoria Centre for Sustainable Malaria Control (UP CSMC) was established to promote collaborative research on safer and more sustainable malaria control and management. It is a multidisciplinary, interdepartmental and interfaculty platform that consolidates existing research expertise in terms of malaria control. The University enjoys wide support for this initiative and is now a key role-player in the fight against malaria.

In 2013, more than 60 staff members from the faculties of Health Sciences, Natural and Agricultural Sciences, Engineering, Built Environment and Information Technology, Economic and Management Sciences, Veterinary Science, and Education were involved in the activities of the Centre. It is also strategically aligned with the national Department of Health and other partners regarding the control and elimination of malaria.

The UP CSMC addresses pivotal issues through three research clusters: human health, parasite control and vector control. Research topics in 2013 included molecular approaches to blocking transmission, drug development, novel approaches to vector control, modelling and health promotion.

The SARChI Chair on Sustainable Malaria Control, funded through the DST/NRF, was initiated in 2013. Professor Lyn-Marie Birkholtz was appointed as the chairholder in this Chair. It plays a key role in facilitating and supporting research expertise in sustainable malaria control, contributing to the National Malaria Programme's aim to eliminate malaria by 2018.

Highlights in 2013 included:

- Co-hosting the 6th Multilateral Initiative on Malaria Pan-African Malaria Conference with the South African Medical Research Council in October 2013.
- At the same event, hosting a symposium entitled "From sustainable malaria control to elimination: An African approach".

The conference and symposium enabled UP researchers to present some of the novel aspects of research into sustainable malaria control.

Faculty research highlights

Faculty research highlights

The University of Pretoria has nine faculties and one business school. Each pursues an active research agenda to position the University as an institution that is recognised internationally for its quality, relevance and impact.

- *Faculty of Economic and Management Sciences*
- *Faculty of Education*
- *Faculty of Engineering, Built Environment and Information Technology*
- *Faculty of Health Sciences*
- *Faculty of Humanities*
- *Faculty of Law*
- *Faculty of Natural and Agricultural Sciences*
- *Faculty of Theology*
- *Faculty of Veterinary Science*
- *Gordon Institute of Business Science (GIBS)*


ECONOMIC AND MANAGEMENT SCIENCES
LECTURE HALLS

Faculty of Economic and Management Sciences

The Faculty of Economic and Management Sciences strengthened its research profile and recognition nationally and internationally in 2013, and initiatives implemented in previous years have begun to bear fruit.

Research outputs reached an all-time high as articles published in international journals continued to increase the international exposure of the Faculty's research. Three staff members received NRF ratings for the first time. This brings to 19 the number of rated researchers in the Faculty. This is the highest number in the economic and management sciences field in the country, among them four B-rated researchers. Departments, centres and the single institute in the Faculty have been working on a number of exciting research areas that show significant promise, not only in the growth of research productivity, but also in terms of national and international impact.

Three departments in the financial sciences (Accounting, Taxation and Auditing) conducted research into pedagogical practices at universities that enhance the preparation of students for the realities of professional practice and the critical skills needed by 21st-century organisations. Professor Stephen Coetzee, Ms Astrid Schmulian and Professor Jean Myburgh were ranked among the top third of international scholars in the field of accounting education research during the year.

Research published by the Department of Financial Management reflects topics such as financial decision-making, risk and capital investment, with retirement finance and behavioural finance becoming increasingly prominent.

While the Department of Business Management offers subjects such as entrepreneurship, and supply chain management strategy, the research of the Department illustrates the applied nature of research in the Faculty. The Tsepho 10 000 Project, which is sponsored by the City of Tshwane to train 10 000 unemployed youths, has provided an opportunity for research to assess necessity entrepreneurship compared with opportunity entrepreneurship. Research is also underway to understand the tasks, competencies and role of business rescue practitioners. This is a new phenomenon that arose from the revised Companies Act of 2009.
The Division of Tourism embarked on a collaborative research study with the Haaga-Helia University of Applied Sciences in Finland on the future of travel management companies. The Division's research output reflects its expertise in the use of information and communication technologies, sustainable tourism, and the impact of tourism events.

The Department of Marketing Management's research primarily focuses on consumer engagement, consumer decision-making and consumer information privacy. Several funded research projects that focus on social media as a marketing tool were established. A UP Scholarship of Teaching and Learning (SoTL) grant linked teaching and learning with research where students' perceptions, attitudes and behaviour were measured in relation to how they use and learn from e-textbooks in marketing management.

Current research projects in the Department of Human Resource Management focus on cultural differences in personality, behavioural and physiological responses to selection assessments, the measurement of greening

Dean's message

behaviour, employee psychological ownership, work and family, as well as gender diversity in the workplace.

A major research project on talent management in higher education, funded by the South Africa-Netherlands Research Programme on Alternatives in Development (SANPAD), was concluded.

Research conducted by the School of Public Management and Administration (SPMA) continued to focus on public sector administration and the management challenges facing the three spheres of government: national, provincial and local. Publications offered critical evaluations and prescriptions for policy.

The Department of Economics maintained its leadership in research productivity, with significant contributions in both applied and theoretical economics. Published papers focused on monetary policy, energy economics, economic development, housing, inflation and economic theory.

The research agendas of two research centres in the Faculty, the African Tax Institute and the Albert Luthuli Centre for Responsible Leadership, have created a footprint across Africa through their focus on tax policy, corporate governance, responsible leadership, integrated reporting, and biodiversity and sustainability.

The Faculty celebrates its research achievements in 2013 and thanks all involved in reaching the goals set.

Professor Elsabé Loots
Dean: Faculty of Economic and Management Sciences

Institutes

African Tax Institute

Centres

Centre for Communication Reputation Management
Albert Luthuli Centre for Responsible Leadership

Units

Unit for Forensic Accounting

Research chairs

Chair in Logistics
Chair in Entrepreneurship
South African Reserve Bank Chair in Monetary Economics
SARChI Chair in Tax Policy and Governance

Faculty research highlights

Changing accounting education

Professor Stephen Coetzee and Ms Astrid Schmulian of the Department of Accounting conducted an extensive research project to advance the way in which teaching in accounting is being undertaken. As a result of their research outputs, Professor Coetzee and Ms Schmulian have been ranked 22nd on the Brigham Young Accounting Education Researchers Ranking. They are the first South African-based authors to be ranked on this list.

Through research that focuses on a student-centred and mixed-method pedagogical approach, the researchers published various studies in high-profile journals on the nature of pedagogy in accounting teaching. They concluded that the nature of the pedagogy employed may need to be reconsidered.

In response to their research, more student-centred interventions have been, and continue to be introduced. This has resulted in a mixed-method pedagogical approach to financial reporting, which facilitates the generation of knowledge and skills development, as required by the profession's new Competency Framework for Education and Training of Chartered Accountants.

South Africa has for many years been involved in and supported the work of the International Accounting Standards Board (IASB), and consequently adopted the International Financial Reporting Standards (IFRS). The research undertaken by Professor Coetzee and Ms Schmulian highlighted two significant effects this has had on accounting education in South Africa: both "English" and "Afrikaans" universities have had to shift from a rule-based pedagogy to the framework-based teaching of financial reporting. Furthermore, because the financial reporting standards are no longer available in Afrikaans, the translation of the standards into Afrikaans poses risks.

With much being written about South African students' poor literacy skills and the importance of the Conceptual Framework for Financial Reporting, the researchers are currently leading a project to determine students' abilities to read this critically important document and other selected IFRSs, with the understanding required.

Auditors' capability and competency requirements

Various factors have changed the business environment in which today's auditors operate. This has resulted in a worldwide challenge to align the capabilities (technical knowledge, skills, values, ethics and attitudes) of auditors to the requirements of this new environment. Professor Karin Barac, Head of the Department of Auditing, and her global research team conducted research on the current and future capability requirements of auditors performing complex financial statement audits.

Relevant stakeholders in Australia, South Africa and the United Kingdom were consulted in this qualitative study. There was agreement regarding the need for a statutory audit, and although general satisfaction was expressed about auditors' current capabilities and performance, the statutory audit in its current form was judged as being too static. The highly regulated audit environment resulted in the performance of two parallel audits. One is aimed at expressing an opinion on the financial statements, while the other is focused on "ticking the right boxes". The latter practice has elicited much criticism on the development of auditors' capabilities.

The constantly changing business environment challenges the current capabilities of the audit team. There is an expectation that the auditors of the future will need to be more forward-looking, predictive and able to warn of corporate collapses.

Increased demands are being made for specialisation within the audit team, which poses challenges for team integration. The composition of audit teams will change as more of the routine work will either be offshored or replaced with more sophisticated IT system interrogations and data analytics. The audit teams of the future will thus have various different core specialist skills.

A strategy was proposed to ensure that the audit remains relevant and meets users' expectations, and a model was suggested to optimise individual and collective capabilities.

Investigating monetary policy in developing economies

The South African Reserve Bank (SARB) Chair in Monetary Economics initiated a research programme on the formulation of monetary policy in emerging small open economies. The research is undertaken by Professor Nicola Viegi, incumbent of the Chair, and his team, in collaboration with the Research Department of the SARB.

Three related research projects have focused on South Africa's attempt to contribute to the international debate on monetary policy formation.

The first studies the effect of international capital flows on the macroeconomic stability of emerging countries such as South Africa. In a world of free capital mobility, international conditions play an important role in determining national economic conditions. The project investigates how monetary policy can be conducted in a turbulent environment by developing unique theoretical modelling tools and empirical statistical analysis.

The second project investigates the role of banks in this globalised capital market. South Africa has a highly sophisticated financial and banking system, and this sector is an important link between the South African economy and the rest of the world.

However, very little research has been dedicated to it. The project aims at understanding the role that this financial system plays in the economy, and how the sector can be leveraged to promote economic growth and social cohesion.

The third project focuses on the relationship between monetary policy and unemployment, the most striking characteristics of the South African economy.

The research shows the critical importance of labour market institutions and practices in explaining the persistent weakness of the South African economy. It also suggests that monetary policy in South Africa has been undermined by the fact that the central bank does not have the leadership in policy-making, which is instead dominated by distorted industrial relationships.

Formulating guidelines for business rescue practitioners

As business rescue practitioners (BRPs) do not have broadly accepted tools, systems and processes to predict the success of their turnaround practices, Professor Marius Pretorius of the Department of Business Management conducted a study to determine the required competencies of these practitioners. At present, no formal scientific research exists on the required qualifications for BRPs to guide the Companies and Intellectual Property Commission (CIPC), which is the appointed regulator.

Navigation towards the new best position is what brings BRP competencies together. To navigate successfully as a BRP, the four higher-order competencies should be supported by rescue-specific knowledge; something that is easier said than done. Moreover, such competencies cannot be addressed in isolation, but should be used simultaneously.

The interdependence of the competencies, however, suggests that any business rescue education should include the development of these core or higher-order competencies, together with specific technical knowledge.

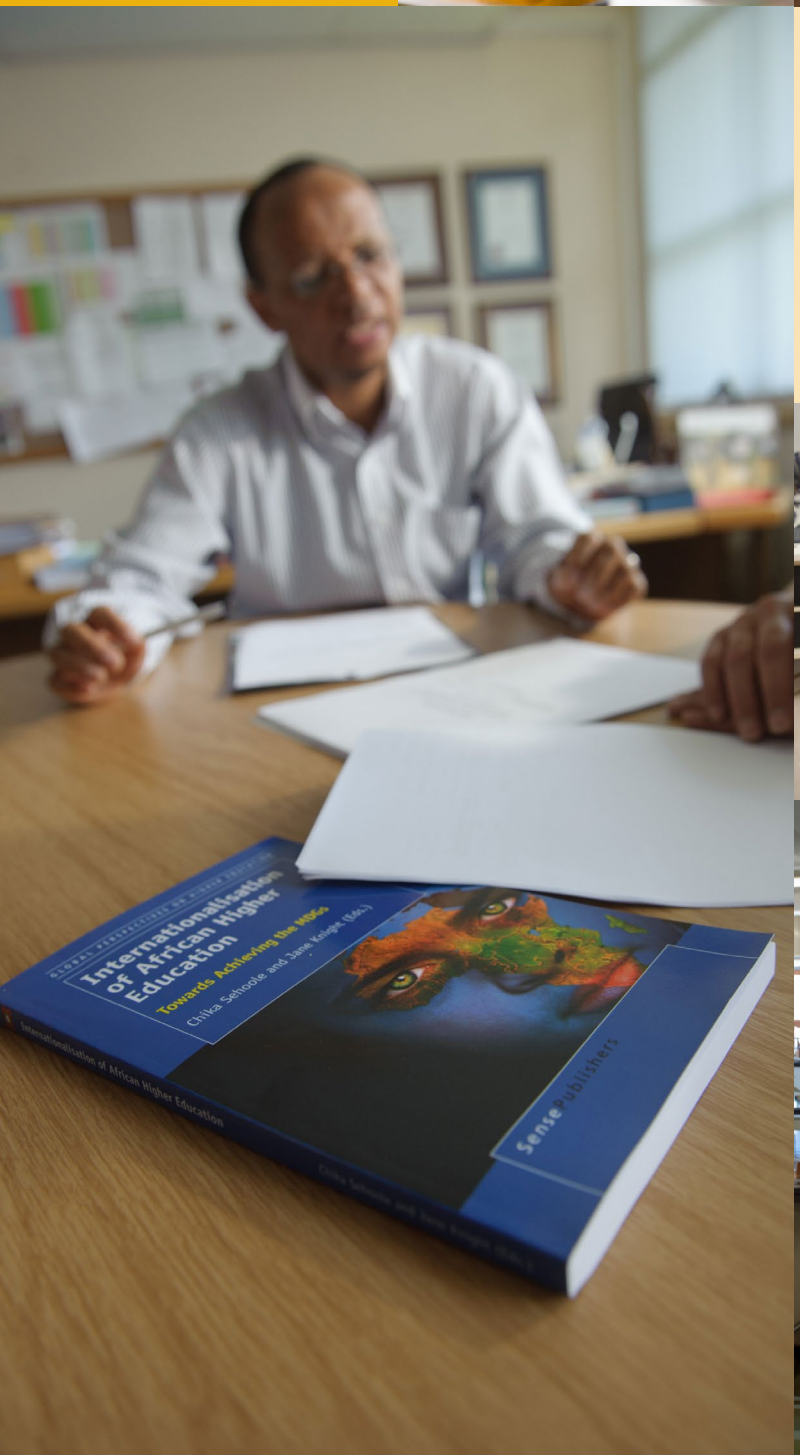
The specific knowledge will probably be supported by the application of known techniques, such as ratio analysis, verifier determinants, delegations, checklists and many more to enhance the use of the competencies. Further research into the techniques that BRPs use to ensure sense-making, collaboration, decision-making and integration would be relevant.

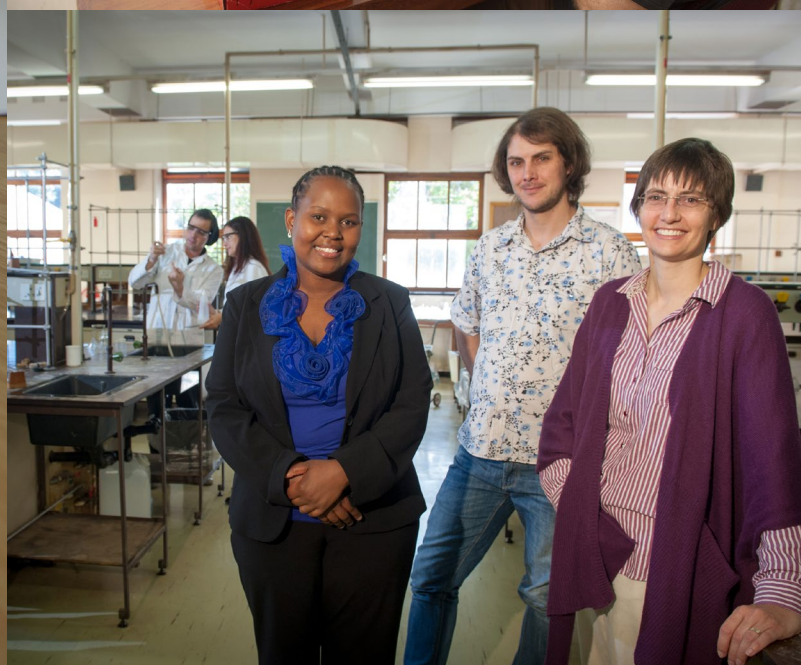
The four higher-order competencies are therefore interrelated and can be considered unspecific; they could be applicable to CEOs and leaders in general. Each competency depends on a network of skills, knowledge and activities within the specific, individual rescue context.

African Tax Institute

The African Tax Institute focuses on Africa and the positive role UP can play in the development of the region.

The goal of the African Tax Institute (ATI) is to develop independent capacity within African countries to address internal tax policy and tax administration issues, while also recognising the dramatic increase in cross-border activity that requires greater cooperation and coordination in the design and implementation of tax systems. Since 2002, more than 30 students have completed the MPhil: Taxation and seven students are enrolled in the PhD in Tax Policy. More than 1 400 government officials and academics from various African countries have benefited from the ATI's short courses. Partnering with the prestigious Lincoln Institute of Land Policy in Cambridge, Massachusetts, the ATI is involved in a major research project: mapping property tax systems across the African continent.


Internationalisation of African Higher Education
Towards Achieving the MDGs
Chika Sehoole and Jane Knight (Eds.)
SensePublishers



Faculty of Education

In 2013, education as a discipline at the University of Pretoria was again ranked in the top 150 in the world on the QS World University Rankings. These rankings, based on peer review and international citations of research, recognise the importance of global competitiveness for researchers in education.

The research drive in the Faculty of Education increased significantly in 2013, and it achieved the highest number of research outputs in its history. The number of NRF-rated researchers also increased. Professor Gerrit Stols (Science, Mathematics and Technology Education), Professor Salomé Human-Vogel and Professor Ronél Ferreira (both of Educational Psychology) all received ratings.

The Faculty has active research teams in a variety of research focus areas: resilience, higher education, early childhood education, mathematics education, food, nutrition and well-being, language and literacy, assessment and social justice.

The Faculty forged growing international partnerships in education. The existing research collaboration with Fordham University, USA, was strengthened and a new partnership was initiated with the University of Alberta, Canada. The Faculty also signed a memorandum of understanding with the University of Nebraska-Lincoln, USA, and in Romania, it explored potential partnerships with the University of Bucharest and the University of Babes-Bolyai.

Professor Liesel Ebersöhn (Educational Psychology) was elected to the Executive of the World Education Research Forum and Professor Carien Lubbe-De Beer (Educational Psychology) was elected as Chairperson of the Sexuality and Gender Division of the Psychological Society of South Africa (PsySSA). She also represents PsySSA on the International Network on Lesbian, Gay and Bisexual Concerns and Transgender Matters in Psychology.

The Faculty welcomed five postdoctoral fellows in various academic departments. Their research has focused on themes ranging from resilience to higher education and family structures.

Several books by staff members were published in 2013. Professor Kobus Maree (Educational Psychology) published three books: C*omplete your thesis or dissertation successfully*: *Practical guidelines, First steps in journal article writing* and *Counselling for career construction*. Dr Ina Joubert (Early Childhood Education) edited the book *Literacy in the Foundation Phase.* Academics in Education Management, Law and Policy Studies were involved in the publication of three

Dean's message

books. Professor Rika Joubert and Dr Sakkie Prinsloo published *Creating a safe and effective classroom,* Dr Jean van Rooyen edited *Financial management in education in South Africa* and Professor Chika Sehoole co-edited *Internationalisation of African higher education: Towards achieving the MDGs*.

The annual Research Indaba for Postgraduate Students once again offered postgraduate students an opportunity to present their research and engage in broader debates about their work. The keynote speaker at the Indaba was Professor Veronica McKay, Deputy Dean of Education at the University of South Africa (Unisa) and a leading South African expert on literacy.

The Faculty of Education will continue to build on its solid foundations for knowledge creation in education.

Professor Irma Eloff
Dean: Faculty of Education

Centres

Centre for Evaluation and Assessment (CEA)
Centre for the Study of Resilience
Interuniversity Centre for Education Law and Education Policy (CELP)

Units

Unit for Education Research in AIDS (ERA)
Living Lab for Innovative Teaching at UP (LLITUP)

Faculty research highlights

Higher education institutions are essential in Africa

Between 2009 and 2013, Professor Chika Sehoole was involved in the Mobilising Regional Capacities (MRCI) project of the Association of African Universities (AAU), which was conducted through the African Network for Internationalisation of Education (ANIE). A number of young scholars were selected to undertake research on how the international dimension of higher education can contribute to African development and, in particular, the achievement of the Millennium Development Goals (MDGs).

The MRCI project engaged emerging scholars and leaders in higher education who are involved in empirical research projects. Nine projects involving 13 researchers were conducted under the supervision of Professor Sehoole and Professor Jane Knight of the Comparative, International and Development Education Centre at the University of Toronto. Seven case studies of African universities in Cameroon, Ghana, Kenya, South Africa, Tanzania and Uganda were published in a book entitled *Internationalisation of African higher education: Towards achieving the MDGs*.

The premise of this book is that higher education, and its international dimension in particular, can play a central role in Africa's development. Higher education institutions are expected to provide solutions to the challenges of African countries through research, highly skilled graduates and service to the community. More attention is now being given to how access to international resources and partnerships can strengthen higher education's contribution to development in Africa.

The book provides empirical evidence of the social role of higher education and how internationalisation at African universities has addressed some of the MDGs. Although internationalisation has been thought of in terms of opportunities for universities to increase their revenue, the book demonstrates the social value and human element of the internationalisation of higher education.

Why is Maths such a problem?

Mathematics is frequently a subject with which learners struggle. Dr Gerrit Stols, a former mathematics teacher and now a lecturer and researcher in the Department of Science, Mathematics and Technology Education, has for a number of years conducted research on various aspects of mathematics education.

Dr Stols identified several problems in mathematics teaching, one of which is incorrect teaching methods. To prepare learners adequately for the future world of work, more attention should be given to higher-order thinking. Instead, teachers in South Africa focus on routine exercises, which can be done by computers.

Learners who do not acquire higher-order thinking skills will not be able to promote themselves in the future job market. The opportunity to learn was investigated among Grade 12 mathematics learners. Opportunity to learn is mainly measured by teacher quality and the time spent on reviewing, practising and applying concepts and/or the depth of content covered.

Teacher absenteeism, inadequate curriculum coverage and teachers' poor content knowledge were identified as significant problems in South Africa. In order to develop an understanding of mathematics, enough work must be done on an appropriate level. The most neglected topics and subtopics involve the application of mathematics in real life (modelling) – the very topics that would give learners the skills needed to access science-related careers.

With regard to teacher quality, pre-service teachers were surveyed to determine whether the use of dynamic geometry software would be beneficial in increasing their geometric cognitive growth. The software enhanced student teachers' geometric visualisation, analysis and deduction, but not their ability informally to justify their reasoning and understand the formal aspects of deduction.

Dr Stols's research indicates that mathematics education needs radical intervention from policy-makers and government to improve and expand the higher-order thinking skills of both learners and teachers.

Researching teacher mobility

International teachers, including South African teachers, learn about the possibility of working in the USA in part through websites maintained by teacher recruitment agencies and organisations.

Unsubstantiated assertions of a teacher shortage in the USA are being used to rationalise the recruitment of overseas-trained teachers, especially from developed countries. Professor Rian de Villiers of the Department of Science, Mathematics and Technology Education found this practice to be fraught with difficulties and practices bordering on exploitation.

Professor de Villiers and his research team investigated the information provided about the US education system, as well as about living in the USA and the ongoing support for teachers. Data from 21 US-based recruiters, which is publicly available, was analysed for this study. Recruitment agencies describe their services as a response to the teacher shortage in the USA (which suggests a secure job for teachers) and as a way for schools to build cultural understanding while, not incidentally, cutting costs. Almost all the agencies describe their organisational mission as building cultural understanding, and are representing overseas-trained teachers as global ambassadors who work well with multicultural students. Countries with high poverty rates and a teacher surplus are often used as primary sites for recruitment.

The review suggests that publicly available information, which may be the recruits' main or only source of information, do not provide comprehensive information about essential services and costs to the teacher recruits. Almost none of the websites include arguments that the overseas-trained teachers will improve the quality of teaching and learning in a school.

As teacher mobility is becoming increasingly important within the ambits of global teacher education, this study suggests that there is a dire need for improved information dissemination to potential international teacher recruits. There is also a need for deepened discourses about the effects of high teacher mobility on national agendas, and on the supply and demand of teachers.

Developing metacognition in chemistry students

Ms Kgadi Mathabathe of the Department of Science, Mathematics and Technology Education conducted research on developing metacognition in undergraduate students in chemistry education. It is considered necessary for students to possess this metacognitive skill to ensure success in postgraduate study.

Metacognition can simply be defined as thinking about one's thinking. In a science laboratory context, indicators of metacognitive activity are actively planning, monitoring, controlling and evaluating one's thinking while carrying out experiments.

The way in which laboratory instruction at the upper undergraduate level is conducted in most tertiary institutions fails to produce chemists with the skills that are necessary for industry or postgraduate research. Such skills include critical thinking, problem-solving and conceptual understanding, skills that are known to be associated with higher metacognitive ability.

The research was aimed at elucidating the metacognitive processes involved in collaborative laboratory learning and the various ways in which undergraduate chemistry laboratories may be modified to assess and develop metacognitive abilities in order to carry out experiments with understanding.

Ms Mathabathe was invited by the lecturers of the third-year practical organic chemistry class to give educational input towards creating an entirely new practical course, based on an inquiry-driven approach.

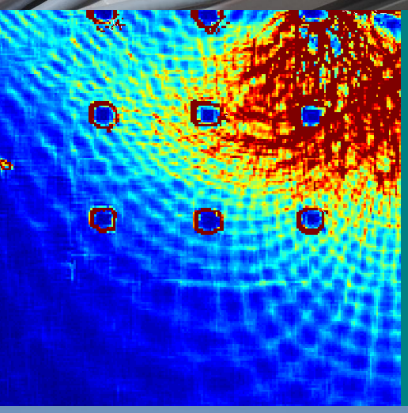
This research enabled Ms Mathabathe to contribute to the design of theoretically informed laboratory activities aimed at encouraging students to practise their metacognitive abilities of monitoring and regulating their learning and understanding while conducting experiments in the laboratory.

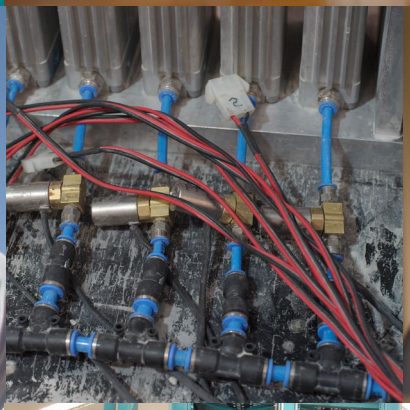
Centre for Evaluation and Assessment

The Centre for Evaluation and Assessment is chosen as one of the flagship centres of the Faculty of Education to illustrate the pivotal role the faculty plays in building system-level capacity in assessment through the work that is undertaken by this centre.

The focus of the Centre is on system-level evaluation and assessment, school-level evaluation, instrument development and classroom assessment, test construction and evaluation. The Centre forms partnerships with external agencies, government ministries and related organisations, non-government organisations and other higher education institutions. The nature of these partnerships vary from internships for master's students, jointly run seminars, Centre staff serving on committees, collaborative research projects and training. Staff from these partner organisations are also invited to teach on the master's programme and participate in seminars run by the Centre. The Centre seeks to collaborate with centres of excellence and prominent institutions nationally and in other parts of the world.


Africa Writes Back
ALBERTO MANGUEL
A History of Reading
acer






African Scholarly Publishing. Essays
ALBERTO MANGUEL
Africa Writes Back
A AUTHOR'S GUIDE TO SCHOLARLY PUBLISHING
LOOKING GOOD IN PRINT
FOURTH EDITION
EVERY BOOK ITS READER
South Africa
25 YEARS OF THE MAIL & GUARDIAN

Faculty of Engineering, Built Environment and Information Technology

Research is seen as an essential and integral part of the activities of the Faculty of Engineering, Built Environment and Information Technology. Its work is founded on inquiry-based teaching, leading to research activities.

The Faculty's research agenda is aligned with the needs of industry, government and the professions, with the aim of also making significant contributions on an international level. Industry support for research increased significantly in the form of sponsorships for research chairs, students and laboratories. Researchers maintained their journal and conference contributions and also achieved more citations and impact during 2013.

Research activities are conducted in the form of group and individual project-based activities at under-graduate level. These projects lead to more formal courses in research methodologies and basic and applied research at postgraduate levels. Academic staff are strongly encouraged to develop their research skills and research agendas to position themselves for NRF ratings and leadership of their own research groups.

The Faculty's research activities are supported by excellent laboratory and support services, which were further augmented with new state-of-the-art teaching and research facilities in the Engineering 3 Building. Major research infrastructure additions include a geotechnical centrifuge to facilitate research in geotechnical engineering and a wafer prober to make the direct evaluation of microchips possible in support of the mm-wave spectrum research that has potential application in the Square Kilometre Array (SKA) project.

Departments are encouraged to develop and consolidate research activities and to promote the alignment of student research with those of their supervisors, especially in the professional postgraduate programmes. The aim is to increase the quality and impact of the research outputs. The quest remains to improve both the participation of staff in research activities, and the number and quality of their research outputs.

Research entities such as the Department of Science and Technology (DST) research chairs in the Faculty (in Fluoro-material Science and Process Integration, in Carbon Technology and Materials, and in Artificial Intelligence), the National Hub for Energy Efficiency and Demand-side Management (EEDSM), the Industrial Metals and Minerals Research Institute (IMRI), the South African Institute of Welding (SAIW) Centre for Welding Engineering, as well as industry-sponsored chairs, are functioning well and have made significant contributions to building a research ethos in the Faculty. The Specialist Centre in Plant Asset Management, part of the Eskom Power Plant Engineering Institute in the Department of Mechanical and Aeronautical Engineering, was further developed into the Centre for Asset Integrity Management to include activities on condition monitoring, simulation and testing, and non-destructive observation.

Dean's message

The Faculty also hosts the Institutional Research Theme (IRT) on Energy, in which an interdisciplinary approach to energy research is promoted and supported. Furthermore, the interdisciplinary research group on green and sustainable construction in the School for the Built Environment contributed to knowledge on the carbon footprint of locally manufactured building materials.

Conference participation by staff members was encouraged and supported to increase the international exposure and profile of staff members. The feedback received is indeed very encouraging and contributed significantly to the research profile of the Faculty. The challenge is to convert more conference contributions into journal publications.

The international peer review of research activities was increased by the appointment of prominent researchers as external examiners for theses, encouraging peer review of staff through the NRF-rating system, and encouraging the publication of research in leading international journals. The Faculty focuses on positioning its staff for NRF-rating applications, and consequently the number of staff members with NRF ratings increased significantly in a competitive environment.

The further development, application and commercialisation of research are priorities for the Faculty. Excellent progress was made with the advancement of silicon-based light-emitting devices, initiated in the Carl and Emily Fuchs Institute for Microelectronincs (CEFIM). The joint initiative with the South African Intellectual Property (SAiP) Fund, now known as the INSiAVA initiative, has the potential to enhance the security of electronic devices significantly by using silicon-based light sources for data communication.

The Faculty indeed made significant progress with its research initiatives during 2013. Research is now well established as a core activity of the Faculty, and although it has to be balanced with numerous other demands placed on the Faculty, the foundation for sustained growth into the future is being established. The support and investment of government and the University in the future growth of the Faculty are encouraging, and the completion of additional facilities will significantly increase its teaching and research capabilities in the near future.

Professor Roelf Sandenbergh
Dean: Faculty of Engineering, Built Environment and Information Technology

Institutes

Institute for Applied Materials (jointly with NAS)
Industrial Metals and Minerals Research Institute (IMMR)
Institute for Technological Innovation (ITI)
Carl and Emily Fuchs Institute for Micro-Electronics (CEFIM)
Mining Resilience Research Institute

Centres

African Centre of Excellence in Information Ethics
Centre for Electromagnetism
Centre for Radio and Digital Communication
Centre for Transport Development
Centre of New Energy Systems (CNES)
Centre of Excellence in Teletraffic Engineering for the Information Society (CeTEIS)
Centre of Excellence in Pyrometallurgy
Kumba Virtual Reality Centre for Mine Design
Centre for Asset Integrity Management
Southern African Institute of Welding (SAIW)
Centre for Welding Engineering

Research chairs

Sentech Chair in Broadband Wireless Multimedia Communication
Sasol Chair in Safety and Health and Environment
Harmony Chair in Rock Engineering
Rand Water Chair in Mechanical Engineering
Rand Water Chair in Civil Engineering
Transnet Chair in Railway Engineering
SARChI Chair Advanced Sensor Networks
Sedibeng Chair in Water Utilisation
Exxaro Chair in Energy Efficiency
SARChI Chair in Fluoromaterials Science and Process Integration
SARChI Chair in Carbon Technology Materials

Faculty research highlights

From scrap tyres to clean renewable energy

The sun radiates enough energy onto the earth's surface in one hour to provide all the energy consumed by humanity in a year – and this is a natural resource that is underused. Research conducted in the SARChI Chair in Carbon Materials and Technology in the Institute of Applied Materials is focused on developing novel materials and creative new uses for old materials in this field. The innovative ways of using carbon and graphite material for renewable energy capture and storage that have been developed earned Dr Heinrich Badenhorst first prize in the 2013 International Green Talents Competition.

Carbon black reclaimed from recycled scrap tyres is being employed in a variety of solar collectors, while graphite nanoparticles are being drawn on as additives in solar energy storage devices. "In order to make better use of solar energy," says Dr Badenhorst, "it first has to be captured. This can be done by recycling scrap tyres."

Through a technique known as pyrolysis, the tyres are "burned" in the absence of oxygen. This produces a gas that can be used to heat the ovens in which the pyrolysis takes place, which means the process does not consume energy. A liquid that can be used as a fuel oil in industrial burners, or that can be further refined into other petrochemicals, is also released. This process also creates a solid residue known as carbon black, which is an excellent absorber of electromagnetic radiation, such as sunlight.

Ultimately, the aim is to incorporate the carbon black directly into the salt/nanoplatelet composites. This will enable the direct melting of the salt, drastically reducing the losses and costs associated with conventional systems. Scientists hope to extend this work to include so-called seasonal energy storage. In this case, the harvested solar energy is stored in the form of a chemical reaction. When the energy is needed, the reaction is reversed and the energy is released for use. This process works much like a battery. In this way, all aspects of solar energy harvesting, storage and use are being explored, while using local resources and expertise to solve the issues that prevent a truly renewable energy-based society.

The effect of digital publishing on the traditional environment

Digital technologies, such as e-books, are predicted to have a profound effect on publishing, but are yet to have a serious impact on the industry. Research conducted by Susan Gaigher, under the supervision of Dr Elizabeth le Roux in the Department of Information Science, considered the implications of digitisation and digital publishing for the trade book publishing industry in South Africa by evaluating the current state of the industry using the context and predictive value of disruptive technology theory.

A disruptive technology is a technology that initially serves only a niche market, but eventually displaces the current technology in the mainstream market. Disruptive technologies initially underperform established ones in serving the mainstream market, as they do not satisfy the minimum requirements that are most valued by mainstream customers. The research included a survey of South African trade publishers. The survey aimed to test to what extent respondents are experiencing and reacting to the opportunities and barriers to digital publishing, and how their processes are changing throughout the publishing process. It became apparent that South African publishers have not made significant adjustments to their business models to accommodate the changes necessitated by digital processes. Although publishers have digitised many of their processes, they have invested very little in e-books and have not taken advantage of opportunities to make changes to each step in the publishing value chain.

However, disruptive technology theory provides many cautionary tales of businesses that did not invest in new technology for these very reasons. When the tipping point is reached and the digital publishing market becomes profitable, traditional publishers that did not invest in digital technologies will face the risk of being left behind.

The recommendations formulated from disruptive technology theory can provide a useful how-to guide for publishers implementing and managing digital publishing in their business processes.

State-of-the-art geotechnical centrifuge

In 2013, the Department of Civil Engineering, headed by Professor Elsabé Kearsley, opened the largest geotechnical centrifuge in the southern hemisphere. This is a significant milestone for research in the Department, as the soil behaviour of envisaged infrastructure with foundations in soil is more realistically simulated in a centrifuge than by way of a physical scale model. The 150 G-ton centrifuge can accelerate a one-ton model to 150 G.

Civil engineers design infrastructure by using mathematical equations to model the loads that act on the infrastructure. As designs become more complex, it is more difficult to ensure that all possible combinations of forces that can act on the infrastructure have been taken into account.

Small-scale model behaviour, for example, does not reflect the actual behaviour of a full-scale structure with foundations on soil. To overcome this problem, the model can be placed in a centrifuge. If it is rotated at high speed, centrifugal forces will act in the direction of the soil's self-weight, increasing the stress in the model foundations to the point where the behaviour of the model can be compared to the actual behaviour of full-scale infrastructure problems.

The centrifuge is used for research on:

- Soil structure interaction problems in which the foundations of buildings are designed to efficiently transfer the load of the building to the soil
- Ultra-thin continuously reinforced concrete pavements in which a very thin, very strong concrete layer is used to distribute the load caused by the wheels of heavy vehicles to the underlying gravel layers
- Factors controlling the size of sinkholes and the way in which cavities propagate to the surface to form sinkholes
- Mine backfill – the differential settlement that mine backfill undergoes after the rehabilitation of open-cast mines and how to reduce this differential settlement to facilitate construction on rehabilitated land

Mining company-municipality relations in South Africa

During 2013, Professor Mark Oranje and his students in the Department of Town and Regional Planning undertook a series of studies to investigate the views and experiences of mining companies and municipalities in areas with strong mining economies in South Africa. The focus was on mining company-municipality relations. While research has consistently focused on the economic impact of mining, the results of mine closures, labour relations and migration have received far less attention.

The research team anticipated that if the relations between mining companies and municipalities were better understood, such relations could be strengthened to ensure that those living and working in mining areas benefitted optimally from this industry and its spin-offs. In addition, and with respect to local and regional economies, it was important to consider the sustainability of mining activities so that foundations could be laid for resilient future economies that support the livelihoods of people living in these settlements, municipalities, as well as mining companies.

Professor Oranje undertook a further study, commissioned by the Industrial Development Corporation (IDC). The study was undertaken through Business Enterprises at University of Pretoria (BE at UP) with the focus again on mining company-municipality relations.

The study revealed positive dynamics and aspects that could be harnessed in enhancing the spatial, social and economic development of municipalities in areas with strong mining economies. However, more worrying are the negative dimensions that were also evident. It was suggested that policy-makers and mining companies would benefit from exploring these dynamics so as to ensure that the country's mining industry delivers positive outcomes – not just for communities living in areas with strong mining economies, but for the country as a whole.

Sentech Chair in Broadband Wireless Multimedia Communication

At the cutting edge of innovation, the Sentech Chair in Broadband Wireless Multimedia Communication demonstrates the potential impact of research on development. The Sentech Chair in Broadband Wireless Multimedia Communication (BWMC) participates in research activities in the field of broadband wireless multimedia communications. Research focus areas include radio frequency transmission and penetration, modelling, and wireless access technologies. The main thrust of the current research activities is in the area of dynamic spectrum management in cognitive radio networks, massisve multiple-input-multiple-output (MIMO) technology and the optimisation of resource allocation in wireless networks.

Carl and Emily Fuchs Institute for Microelectronics

The Carl and Emily Fuchs Institute for Microelectronics (CEFIM) illustrates the importance of creating a research space conducive to research and postgraduate training. The Institute is actively involved in research in the field of microelectronics. Its primary focus is in the field of integrated circuit design, especially the design of analogue signal processors, radio frequency circuits and optical receivers in CMOS (complementary metal-oxide-semiconductor) technology. The simulation and modelling of circuits, devices and processing technologies are also investigated, while the application of semiconductors as opto-electronic devices plays an important role in its research activities. The development of the recently commercialised INSiAVA (injection-enhanced silicon in avalanche) technology to generate light from an electrical current is the result of CEFIM's research initiatives.






Biograph

Faculty of Health Sciences

As a faculty, we are committed to building on the unique identity, strengths and relevance of the health sciences, and to increasing our research contribution to society. This means becoming ever more focused on research and the hybrid between research and practice.

The Faculty's vision is informed by the University's strategic plan, UP 2025, and its academic implementation and enrolment plans, the external environment, the unique features of a health sciences faculty, the alignment of resource allocation to key priorities, and financial sustainability. Based on a review of performance and progress, the Faculty has set targets with key strategies and actions to realise them and ultimately to achieve the University's strategic goals.

It is a partner in three IRTs: Food, Nutrition and Well-being, Animal and Zoonotic Diseases, and Genomics. These are complemented by the FRTs on Sustainable Malaria Control, and Cellular and Molecular Medicine, as well as a range of other research interest groups that reflects a diversity of research, from stem cells to paediatric respiratory disease.

In 2013, research performance remained modest, albeit growing, at 173 publication units, 21 PhD graduations, and 24 NRF-rated researchers. Much progress has been made over the past three years in shifting the research culture in the Faculty and supporting research. There are notable improvements in the pipeline, and third-stream income has doubled over the past two years.

The fact that staff members have excelled in a variety of areas is proof of the high standards and quality of the research conducted at the University of Pretoria.

A number of emerging researchers received new and renewed NRF Thuthuka funding, two large NRF equipment grants boosted the Faculty's infrastructure base, and an international partnership award was granted for a three-year period.

Furthermore, Professor Michael Pepper was awarded an Medical Research Centre (MRC) flagship grant for a project on stem cells. In addition to the scientific and medical impact of the research, the project will address stem cell and related human tissue legislation in South Africa, as well as the role of bioentrepreneurship in bringing stem cell products and services to the market.

A doubling of grant and contract income has continued to support a number of research entities and niches in the Faculty. These include Essential Steps in Managing Obstetrics Emergencies, Community-oriented Primary Care and the Albertina Sisulu Executive Leadership in Health programmes.

The Department of Family Medicine received a National Excellence Award from the Higher Education Learning and Teaching Association in South Africa (HELTASA), and the Department of Orthodontics was recognised as a Centre of Excellence by the International Team for Implantology.

The Faculty received a number of local and international awards, such as the W Khambule NRF-NSTF Award,

Dean's message

the Ralph Kirsch Prize for the most cited article in the *South African Medical Journal*, the South African Medical Association (SAMA)-Bonitas Housecall Doctors Award and the SAMA Young Researcher Award. It also won first prize in the Second International Medical Olympiad.

Research in the Faculty is supported by a range of well-equipped laboratories, and a number of global discoveries have been made. It is the proud host of two MRC units (one on inflammation and the other on mother and child health), the Institute for Cellular and Molecular Medicine, as well as centres for Sustainable Malaria Control, Forensic Anthropology and Applied Morphology. The Environmental Chemical Pollution and Health Unit, the Clinical Trials Unit, the DST/NRF SARChI Chair on Sustainable Malaria Control and the Rand Water Chair in Public Health are also housed in the Faculty of Health Sciences.

In 2013, there were 6 317 students in the Faculty: 4 854 undergraduate students in 10 programmes and 1 453 postgraduate students. The postgraduates include 228 research master's students, 397 professional specialisation master's students, 305 coursework master's students, and 158 PhD enrolments. The latter has doubled in the last five years and measures are in place to attract more clinical PhDs.

The initiatives above and envisaged projects hold the promise of even greater research productivity in health sciences in the years ahead, and ever increasing the contribution of the University of Pretoria to addressing health and healthcare challenges in South Africa, Africa and the rest of the world.

Professor Eric Buch
Dean: Faculty of Health Sciences

Institutes

Institute for Cellular and Molecular Medicine
Institute for Sport Research

Centres

Applied Morphology Research Centre
Comprehensive Physical Rehabilitation Centre
Forensic Anthropology Research Centre
UP Centre for Sustainable Malaria Control

Units

Clinical Research Unit
MRC Unit for Inflammation and Immunity
MRC Unit for Maternal and Infant Health Care Strategies
Environmental Chemical Pollution and Health Research Unit

Faculty research highlights

Nursing Sciences focuses on women and children

In line with the Millennium Development Goals (MDGs), the main research theme in the Department of Nursing Sciences is improving women's and children's health. The subthemes are HIV/AIDS and malnutrition, gender-based violence, reproductive health, and maternal and child health. Communities of practice (CoPs) on breastfeeding, techniques and maintenance of lactation, and evaluating the quality of care rendered were developed. Using the best practice guideline development approach, the HIV and AIDS, and related malnutrition CoP developed a "Breastfeeding Best Practice Audit Toolkit/Instrument" to conduct an audit in the relevant wards in the Tshwane District Hospital.

The gender-related violence CoP conducted baseline and follow-up audits of service delivery at crisis centres. The tool used in the first audit was amended to address issues of concern. The findings of the two audits showed improvements in service delivery, as well as in the appropriateness of the audit instrument. A number of posters and brochures were produced to increase awareness of the early initiation of feeding infants, the kangaroo mother care (KMC) unit guidelines (in English, Sepedi and Afrikaans), colostrum, the advantages of breastfeeding, signs of normal labour, and the Pretoria pasteurisation method. The HIV and AIDS, and related malnutrition CoP conducted an awareness campaign with various stakeholders at the Kopanong taxi rank in Hammanskraal in October 2013 in view of the high incidence of HIV and AIDS in this community. The reproductive health CoP conducted a community outreach programme at the Soshanguve Central High School, which was reported to experience an increase in teenage pregnancies, reaching 494 students.

Stepping Stones is a 12- to 18-week training and education process that involves individuals developing the ability to look at the societal norms and values that critically influence their attitudes and behaviours. They identify ways in which these attitudes and behaviours may need to change in order to protect these individuals and others from HIV and associated risks, and to bring about more general life changes and improvements.

Forensic Anthropology researches diverse projects

The Forensic Anthropology Research Centre (FARC) in the Department of Anatomy completed several longer and shorter term research projects during 2013.

"At the Miertjie le Roux experimental farm, we validated the method in which total body score (TBS) and accumulated degree-days (ADD) are used to estimate the postmortem interval (PMI). We produced linear regression formulae to estimate PMI from ADD with a 95% prediction interval and found that smaller bodies decomposed much faster than larger bodies as they do not reach a plateau phase. Burn patterns on decomposed remains were also investigated to establish whether they were fully fleshed, partly fleshed or completely skeletonised when they were exposed to fire, and described in detail. Three papers resulted from this research," explains Professor Maryna Steyn, Director of the Centre.

Culminating in papers in the Goodwin Series of the *South African Archaeological Bulletin*, researchers attempted to find and investigate human skeletal remains, especially of Khoisan individuals, popular collector's items that were often unethically exported to Europe and other regions of the world in the 19th and 20th centuries. Remains were documented and analysed with special attention to health indicators.

A project on skeletal tuberculosis (TB) investigated whether bone lesions associated with TB became more or less common in the post-antibiotic period, and if the pattern of skeletal involvement has changed.

A PhD project that provided accurate and reliable methods to estimate the age and sex of South African subadults from birth to 12 years from long bone lengths and breadths was successful due to the large, modern sample size, which ultimately captured a wider range of human variation than previously collected.

Molecular imaging for TB and HIV studies

The work of the Department of Nuclear Medicine is aligned with the continued global growth of novel strategies to improve targeted molecular imaging and therapy in TB, HIV and HIV-associated malignancies. The Department has a track record of implementing new methods that can rationalise and improve patient care in a decisive way and with an emphasis on early personalised diagnostics and targeted radioisotope therapy.

The Department's biomedical research, through close collaboration between physicians and scientists, is focused on radioimmunotherapy, the translational research of molecular imaging (translating novel probes from pre-clinical to clinical applications), the development of Ga68-based radiopharmaceuticals, and the development of therapeutic radiopharmaceuticals.

Through interdisciplinary research, world-class modern care with a commitment to scholarship, discovery, education and outstanding patient care can be provided to citizens of the country.

Professor Mike Sathekge, Head of the Department of Nuclear Medicine, explains that the effect of the dual HIV and TB epidemics is felt most acutely in our country, with recent estimates of dual infection rising. There is an increasing need for effective imaging, not only for diagnosis, but also for the follow-up of these patients. The introduction of radiopharmaceuticals in Nuclear Medicine has enhanced infection imaging, because it depends on the demonstration of patho-physiological and pathobiological changes, which occur earlier in the infection process and also resolve quicker after the cure of the infection, compared with gross changes in structure. The establishment of novel point-of-care diagnostics and therapies will expand the usage of F18, Ga68, Lu-177, Y90 and Cu64 to help address the TB and HIV challenge. These will be labelled to the receptor-specific agents, which include peptides and antibodies, thus allowing the mapping of receptor expression in vivo.

Such mapping represents the future of nuclear medicine imaging, as it aids in diagnosing the type of inflammation, in therapy decision-making, in selecting suitable candidates for therapy, and in evaluating treatment efficacy.

New drugs to minimise side-effects and resistance

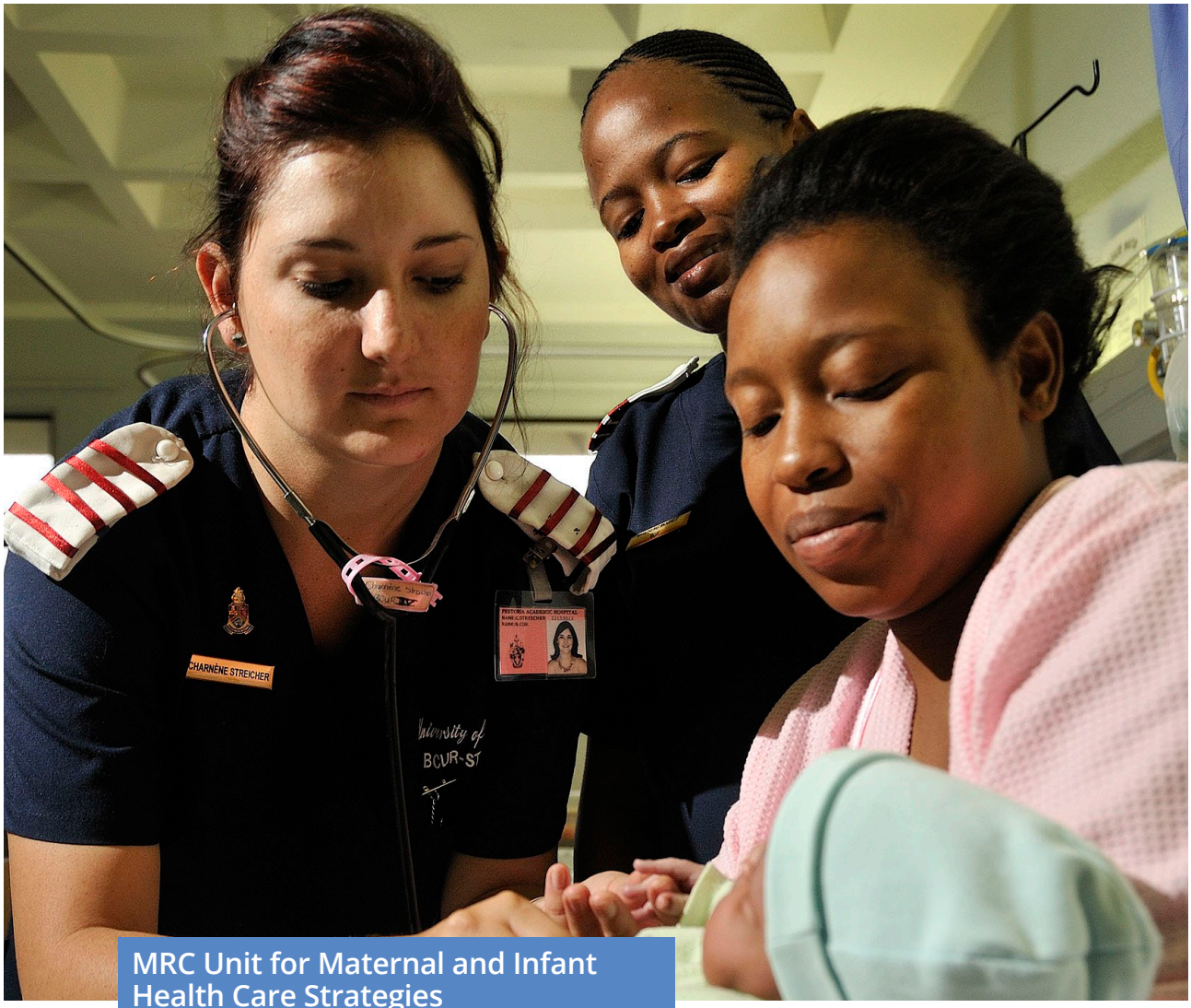
The Drug Discovery Division seeks to find new herbal therapies as they provide a rich biosource of pharmaceutical leads in order to find new drugs due to the prevalence of resistance or side-effects associated with current drug therapies.

The Division assesses in vitro biological activity of herbal remedies pertaining to a specific disease. Bioassay-guided fractionation of plants presenting with promising activity uses state-of-the-art equipment. Thereafter, in vitro mechanistic and toxicological studies are carried out. Toxicological analyses include hepatotoxicity assessment, a leading cause of drug attrition, using an in-house developed assay panel, as well as potential drug-herb interaction assessment. The latter involves determining the effects on pharmacokinetic parameters, such as absorption and metabolism.

Resistant and multi-resistant strains of microbes pose a serious threat to patients with infectious diseases who are immune-compromised. Except for assessment against planktonic forms of the microbe, current assays include assessment of activity against biofilms, the natural, more resistant form in which microbes occur in the body.

Type 2 diabetes places an enormous burden on the healthcare system due to increased morbidity and mortality. Concluded research has shown that single herbal therapy use is more effective than polyherbal treatment in controlling glucose levels. This finding is beneficial as it leads to the elimination of a number of potential threats, which come into play with polyherbal use.

The Division is collaborating with UP's Department of Chemistry and the Department of Pharmacology and Clinical Pharmacy at Carol Davila University in Romania to synthesise herbal-derived derivatives for the treatment of Alzheimer's disease and cancer. Structure-activity relationship studies are taken into account when these drugs are synthesised in an effort to increase efficacy. Assessment of acetylcholinesterase inhibitory activity has led to the identification of candidate compounds with activity superior to the standard treatment, which will shortly be subjected to toxicity testing.



MRC Unit for Maternal and Infant Health Care Strategies

Access to quality health care is central to the well-being and development of South Africa. The MRC Unit for Maternal and Infant Health Care illustrates the direct relevance of research undertaken.

The Medical Research Centre (MRC) Unit for Maternal and Infant Health Care Strategies strives to increase the quality of life of South African mothers and their babies. It develops health strategies at primary and secondary care levels for mothers and infants by researching solutions to specific problems that are generally acceptable to the women, healthcare workers and health administrators involved. Research highlights include the development of and implementation of effective antenatal and postnatal care, emergency obstetric and neonatal care (including intrapartum care)and kangaroo mother care in secondary- and primary-level institutions. Effective evaluation and monitoring tools for quality of care audits have been developed for maternal, perinatal and child care and are run throughout the country.


AWAY WITH HUNGE
FOOD PRICE


The Amber Spyglass


SINGER

Faculty of Humanities

Humanities is the most diverse faculty at the University of Pretoria and offers a wide range of disciplines to deepen our understanding of society. In this faculty, different methodologies are employed to study and document human experience.

The set of skills acquired in the humanities provides a broad range of applications to understand issues such as corruption, industrial strike actions, civil protests, youth behaviour, the quest for a more sustainable environment, poverty and its consequences, and any other phenomena that affect the social well-being of ordinary human beings. The field of humanities is relevant in building a better society, and the University is committed to promoting and facilitating research in the humanities that contributes to building a stronger democracy.

Research is fundamental to the institution and the Faculty, and projects harnessing the diverse expertise in the Faculty are supported. In 2013, the Faculty received substantial funding from the Mellon Foundation for the development of an IRT and several FRTs.

Capital Cities, which originated in this Faculty, was inaugurated as an IRT, and was launched by the University's Vice-Chancellor and Principal, Professor Cheryl de la Rey, and the City of Tshwane's Executive Mayor, Mr Kgosientso Ramokgopa, at the Pretoria City Hall in October 2013. The project has international significance, as more than 50% of the world's population resides in urban areas, with an increasing number of people migrating towards capital cities.

As an IRT, it creates opportunities for cross-faculty and cross-university collaboration, which are also the critical ingredients for creative and innovative research. In promoting imaginative and resourceful research, this project is aimed at enhancing the systems that structure the lives of those living and working in capital cities. Research emanating from this project has the potential to produce both long-term and immediate social value and utility.

The Human Economy Programme is one of five niche research themes in the Faculty, and was launched in 2011. This programme has witnessed a steady flow of postdoctoral students and research associates to the University. With its dual aim of academic research and practical application, it aims to expand ideas on "economic democracy" into Africa and the "global south".

Since July 2013, the Human Economy Programme has been located at the University's Centre for the Advancement of Scholarship.

Progress was also made with research related to the other four niche research themes in the Faculty.

Dean's message

Enhancing the Well-being of Vulnerable Children is a faculty research theme that focuses on vulnerable children in various resource-constrained environments in South Africa.

The faculty research theme on Southern Modernities seeks to examine southern modes of modernity based on exchange and debate between thinkers in the southern hemisphere.

Social and political intricacies that impede peace are at the heart of the faculty research theme on Peace and Conflict. This project seeks to generate empirical, evidence-based research around the complexities of peace-building post-conflict reconstruction and development in Africa. Enhancing an understanding of peace and conflict requires a holistic understanding of societal conditions. This project promotes a multidisciplinary research approach to this issue in Africa and in the Faculty of Humanities.

The faculty research theme on Visual Technologies: Critical Encounters examines the place and role of visual technologies in shaping and influencing cultures and identities.

The academic diversity of the humanities is reflected in the niche research themes in this Faculty. These research themes are interdisciplinary in nature and are significantly developing and enhancing our understanding of society, while also contributing to the research outputs of the Faculty and playing their part in establishing the University as a research-intensive institution.

Professor Norman Duncan
Dean: Faculty of Humanities

Centres

Centre for Augmentative and Alternative Communication (CAAC)
Centre for Mediation in Africa
Centre for Research in Politics of Language (CentRePol)
Centre for the Study of Governance Innovation
Centre for the Study of AIDS

Units

Unit for Academic Literacy
Unit for Creative Writing
UP Cochlear Implant Unit (UPCIU)

Research chairs

Jean Monnet Chair of European Studies

Faculty research highlights

Research promotes the rights of people with disabilities

The Centre for Augmentative and Alternative Communication (CAAC) provides research and training to improve the lives of people with severe communication difficulties. Professor Juan Bornman, Director of the Centre, has been involved in three large-scale international research projects.

The first, a research collaboration with the Children, Health, Intervention, Learning and Development (CHILD) Group at Jönköping University in Sweden, focused on disability issues from a human rights perspective instead of the usual charity perspective.

The second project, on speech and language delays in children with neurodevelopmental disorders, has been conducted in cooperation with the Centre for Research on Atypical Development (CRADL) at Georgia State University, USA.

The third project focuses on protecting people with little or no functional defence against abuse. It has been carried out together with Professor Diane Bryan of Temple University, USA. The project forms part of the Mellon Research Theme on Vulnerable Children.

Evidence suggests that individuals with disabilities are at greater risk than able-bodied persons of experiencing violence against them. Incidents of violence occur on an international scale, and often remain undisclosed. Non-literate, or pre-literate augmentative and alternative communication (AAC) users are particularly vulnerable, as they are unable to construct their own messages.

"You can Tell and be Heard" communication boards were developed as a means of disclosing that one had been the victim of abuse or violence. The important potential role of these three communication boards (a symbol-based board for children and one for adults, as well as an alphabet-based board) was clearly recognised, as requests for the translation of these boards were received from various countries, and boards were consequently translated into a number of international languages, as well as the main language groups of South Africa.

Exploring the role of children's books

Dr Molly Brown of the Department of English has been undertaking research on children's literature (among other themes) for a number of years now. As a result of her activities, the English Department has built up a reputation for expertise in children's literature studies and the University of Pretoria is now recognised for this research. Children's books and storytelling is being developed into a faculty research theme.

This development is exciting, as it is generally recognised that the experience of narrative involves a complex web of relations between storytellers or writers, publishers, the people or imagined characters whose experiences are told and the larger environment embedding those experiences, including the experience of the person reading or listening to the story. Furthermore, the value of narrative in shaping experience, transmitting cultural memes and contributing to social development is widely acknowledged, even if it is difficult to quantify.

A challenge, however, is that local story-telling traditions are declining at a time when it is statistically demonstrated by scientific tests that South Africa is facing a reading crisis.

There is a need for more wide-ranging academic studies of children and narratives, focused not simply on the acquisition of reading fluency, but also on bigger issues, such as what children read, in what languages they read, what ideas are being promulgated in their stories and how young readers respond to, reject or appropriate the narratives given to them.

Children's exposure to stories may promote both empathy and active, self-aware citizenship.

Studying economics from a humanities perspective

Professor John Sharp of the Department of Anthropology and Archaeology is the Co-director of the Human Economy Programme. This programme studies "the economic system as it actually exists" from local to global level, using the full range of methods characteristic of humanities disciplines. It reflects on ways in which the economy could be made to serve human interests – the interests of society as a whole, including those of the majority of the world's more than seven billion inhabitants who enter it from positions of disadvantage.

The ultimate aim of the Human Economy Programme is to develop an operational vision of the world economy that sustains all.

The Human Economy Programme stems from the premise that scholars in humanities disciplines can make an important contribution in understanding the economy. In the second half of the 20th century, many of the questions on the economy were left to the economists. In this regard, it is significant to note that Nobel Prize-winning economist Ronald Coase observed, shortly before he died, that "the degree to which economics is isolated from the ordinary business of life is extraordinary and unfortunate... Knowledge will come only if economics is reoriented to the study of man [sic] as he is and the economic system as it actually exists".

Established in 2011, the programme has resulted in postdoctoral fellowships, the recruitment of doctoral students from the African continent, significant publications and the hosting of international conferences.

The programme contributes dedicated academic research to the movement for greater economic democracy. It has a strong African focus and the majority of postdoctoral fellows and postgraduates are drawn from Africa, giving substance to the programme's intention to support, train and retain young scholars from the "home" continent. The University and the project team are also providing opportunities for South African students from disadvantaged social backgrounds.

Taking democracy seriously

The Department of Sociology was awarded a grant of R1 million by the Rosa Luxemburg Institute to conduct a workers' survey in 2014, which is a longitudinal study that has been conducted since 1994. The project, led by Dr Malehoko Tshoaedi, is in collaboration with the universities of Johannesburg, the Witwatersrand, Cape Town, KwaZulu-Natal and Fort Hare, as well as the Nelson Mandela Metropolitan University.

The survey is conducted every five years before national elections and examines workers' conceptions of trade union democracy and how that extends to broader political democracy. It also focuses on workers' political attitudes and how they intend to vote in upcoming elections. The last survey was conducted in 2008 and the results published in 2012 in a book entitled *COSATU's contested legacy*, co-authored by Sakhele Buhlungu and Malehoko Tshoaedi.

In 2013, the Department of Sociology hosted a planning workshop with all the partners from the different regions. The questionnaire was updated and the pilot survey and fieldwork planned. The findings will be published in an edited book and in leading social sciences journals.

The survey is significant in terms of tracking changes in workers' views and attitudes towards democracy. One of the important findings in the previous surveys has been changes in workers' views regarding their support for the Tripartite Alliance between the African National Congress (ANC), the South African Communist Party (SACP) and the Congress of South African Trade Unions (COSATU). In 1994, more than 80% of workers supported the Alliance, while in 2008 support declined to 62%. The number of workers who said they would vote for the ANC in 1994 was estimated to be 75%. This was significantly lower in 2008. It is also interesting to note that only 46% of women indicated support for the ANC in 2008.

The fact that the survey has been conducted since 1994 means that South African labour scholars have access to unprecedented levels of data on longer-term changes in trade union members' attitudes to democracy and politics in general. The survey, which is unique in Africa, positions UP as one of the foremost centres of labour studies in South Africa.

Centre for Augmentative and Alternative Communication

The Centre for Augmentative and Alternative Communication (CAAC) strives to provide appropriate and sustainable services for individuals (both children and adults) with severe disabilities and little or no functional speech. The Centre's research activities are focused on providing evidence-based practice appropriate to the South African context, and to mobilise support for persons with little or no functional speech by framing disability as a human rights issue. Three significant projects conducted by staff of the Centre include a collaborative research project between the Centre and Georgia State University, USA , into speech and language delays in children with neurodevelopmental disorders in South Africa, a collaborative project with colleagues from Jönköping University in Sweden on children's rights in South Africa, and a project on ensuring equal access to the justice system for individuals with significant communication disabilities.


Human
Wisdom
Potential
Common
Mercy
Mistakes
Prejudice


Child Law in South Africa
Commentary on the Children's Act
CJ Davel
AM Skelton

Faculty of Law

All departments and centres in the Faculty of Law contributed to growing research productivity through increasing numbers of publications.

Alumni of the master's programme in Human Rights and Democratisation in Africa of the Centre for Human Rights contributed to the volume of essays on constitutionalism in Africa, *Constitutionalism and democratic governance in Africa: Contemporary perspectives from Sub-Saharan Africa*.

A collaborative research project between the Centre and partners in Brazil and India culminated in the publication of the book *Transformative constitutionalism: Comparing the apex courts of Brazil, India and South Africa*.

The Centre for Human Rights produced the highest number of publications ever (10.5 credit units) in Thomson Reuters Web of Science-listed journals. Professor Christof Heyns published research related to his work as UN Special Rapporteur on extrajudicial killings in the *Harvard International Law Journal* (in collaboration with S Knuckey) and in the *Human Rights Quarterly* (in collaboration with S Srinivasan).

Other staff members who published are Professor Erika de Wet, with an article on the tension between human rights and UN Security Council resolutions, Professor Charles Ngwena, with four articles in Web of Science journals, and Professor Charles Fombad, with an article on durability and change under modern African constitutions.

The Centre for Child Law was instrumental in ensuring that the government replaces traditional mud schools in the Eastern Cape with brick schools. Following a successful court application, ongoing research has tracked whether children's right to education has been transformed from promise to reality.

The Department of Jurisprudence furthered its focus on the development of the discipline of jurisprudence within the present South African legal, social and political context as a research theme through various publications. The subthemes covered were Roman Law jurisprudence, race theory, feminist theory, critical theory and transformation, poverty and spatial justice.

Members of the Department of Mercantile Law published two articles in international publications in 2013. In their article in the Web of Science journal *International Insolvency Review* 2013, Ms Hermi Coetzee and Professor Melanie Roestoff made recommendations that provide for a more accessible, effective and non-discriminate debt relief system. Professor André Boraine and Professor Melanie Roestoff argued for a balanced and integrated approach to the treatment of overindebted consumers in South African law and for a complete overhaul of current debt relief measures in their article in the *World Bank Legal Review.*

Dr Jacolien Barnard published an article, "Unfairness of price and the doctrine of *laesio enormis* in consumer sales", in the November 2013 issue of the IBSS-rated *Tydskrif vir Hedendaagse Romein-Hollandse Reg (THRHR).* She received the award for the best overall contribution in *THRHR* for 2013 by the Vereniging Hugo de Groot.

In an article published on Litnet, Professor Birgit Kuschke of the Department of Private Law dealt with the treatment of insurance claims for environmental

Dean's message

damages caused by fracking. This is a novel situation that will surely give rise to claims in time to come, as it has tested unchartered waters in South African law in a time when fracking may well become a reality.

Staff members in the Department of Procedural Law produced eight accredited publications and one chapter in a book in 2013. Two publications were published in IBSS journals, one in a Web of Science journal. The rest were published in Department of Higher Education and Training (DHET) journals. The main focus areas of the publications were criminal procedure, legal practice and insolvency law.

The Department of Public Law produced 11.5 accredited publications and one book. Four papers appeared in IBSS journals and three were published in Web of Science journals, with the rest published in DHET journals. Thematically, the publications covered criminal law, medical law, and constitutional and administrative law.

I would like to thank all staff members for their valuable research contributions that have applications in practice and strengthen the Faculty's research standing.

Professor André Boraine
Dean: Faculty of Law

Institutes

Institute for International and Comparative Law in Africa (ICLA)

Centres

Centre for Advanced Corporate and Insolvency Law
Centre for Child Law
Centre for Human Rights
Centre for Intellectual Property Law
Centre for Law and Medicine
Sports Law Centre in Africa

Units

International Development Law Unit (IDLU)

Research chairs

UNESCO Chair in Education Law in Africa
Barclays Africa Chair in Banking Law in Africa
SARChI Chair of International Development Law and African Economic Relations

Faculty research highlights

Law's transformative power – from mud schools to brick schools

Against the scenic background of rural Eastern Cape in South Africa, every school day there are children walking to schools that are made of mud. Well, not every school day. If it rains, it may not be worth going to school. In 2011, Zinathi, a 12-year old learner at Tembani Junior Primary, explained:

"When we get to school after it has rained like this, we have to clear the water from the classroom before we can learn. We take some of the planks we use for desks to make a little bridge through the door of the classroom. Our school is made of mud and the classrooms have no windows or doors. The rain drips onto our books. It is difficult to learn in our classroom, even when it doesn't rain."

Zinathi is fortunate, her school was one of the first seven schools in the Eastern Cape to be replaced by a new, state-of-the-art brick school. The situation took a positive turn in 2011 when the government was taken to court about the severe infrastructure backlogs in the Eastern Cape. The Centre for Child Law at the University of Pretoria was the institutional applicant in the case, with the Legal Resources Centre as its lawyers. The case, which has come to be known as the Mud Schools Case, settled out of court, and resulted in a memorandum of agreement that pledged R8.2 billion over three years.

University of Pretoria Law Professor, Professor Ann Skelton, appointed to the UNESCO Chair in Education Law in Africa in 2012, wrote the founding affidavit for the case and has continuously monitored compliance with the agreement. Her research has shown that the allocation of these funds did not immediately translate into tangible results on a broad scale – and that this was not due to a lack of money, but rather to a lack of capacity. By the end of the three years referred to in the court order, only 70 of the 510 mud schools had been replaced with brick schools.

Professor Skelton has published local and international articles on the justiciability of the right to education. She argues that litigation, implementation monitoring and budgetary analysis are important mechanisms to obtain funds for education at the country level, and to hold governments accountable for efficient spending.

Research on southern hemisphere courts

In 2013, following an international research project of four years, a book entitled *Transformative constitutionalism: Comparing the apex courts of Brazil, India and South Africa* was published by the Pretoria University Law Press (PULP). Professor Frans Viljoen of the Centre for Human Rights was involved in the research and is a co-editor of this publication.

Other co-editors are Professor Upendra Baxi, a lecturer in Law in Development at the University of Warwick, and Professor Oscar Vilhena Vieira, a lecturer in Constitutional Law and Human Rights at the School of Law of the Getulio Vargas Foundation, São Paolo. South African contributors to the project include retired Constitutional Court judge Justice Zak Yacoob and the academics Professor Jaco Barnard (University of Cape Town), Professor David Bilchitz (University of Johannesburg), Professor Henk Botha (Stellenbosch University), Professor Sandra Fredman (Oxford University), Professor Vinodh Jaichand (University of the Witwatersrand) and Professor Wessel le Roux (University of the Western Cape).

The study took the form of a collaborative research project between researchers in Brazil, India and South Africa. Its first objective was to understand the role of the apex courts in Brazil, India and South Africa in the promotion and protection of human rights through a comparative assessment of legal and political strategies, judicial precedents and institutional designs that have impacted on issues related to constitutional and human rights in Brazil, India and South Africa. The second objective was to provide the legal profession with a comparative array of legal decisions and strategies to improve the practice of human rights.

This research is part of the gradual questioning of the traditional and long-standing north-south axis of comparison and the exploration of the potential of a south-south axis of comparison. The project also aims to bridge the often too rigid a divide between "common law" and "civil law" countries, even in the south.

Establishing a legal framework for unmanned weapons systems

While for most of human history, states conducted foreign policy very much as they wished, and frequently through war, with little or no legal constraints, there are now fairly stringent conditions that must be met before a state may use force on the territory of another state. One of the most significant recent military technological developments has been the introduction of unmanned weapons systems.

Some states are developing unmanned weapons where the remote-controlled decision-making by humans of the earlier models is now taken over by an onboard computer that decides who and when to target. The question is whether the use of such autonomous weapons systems (AWS) is acceptable under international law.

A group of non-governmental organisations (NGOs) and robotocists have been campaigning against AWS for some time and, in October 2012, they briefed Professor Christof Heyns from the Faculty of Law, in his capacity as United Nations (UN) Special Rapporteur on extrajudicial, summary or arbitrary executions, on the topic in New York. He introduced the issue through a report on AWS to the UN Human Rights Council in June 2013. The matter was immediately taken up further throughout the UN system, and in regional bodies such as the North Atlantic Treaty Organization (NATO). Of greatest significance was the fact that the states' parties to the Convention on Conventional Weapons (CCW) took the issue on its agenda and arranged major international meetings around it.

Professor Heyns has also presented a subsequent report to the UN General Assembly on the use of these weapons during law enforcement and on drones. Based on this experience, he has completed two major articles: one on AWS during armed conflict and one on AWS during law enforcement. They are both based on the UN reports, but draw on his interaction with experts from many disciplines in this field.

In terms of his analysis of the problem at hand, Professor Heyns insists that it is not merely a question of protecting the right to life of civilians who may be caught in the crossfire by indiscriminate robots. It is also a question of protecting the dignity of those who may be legitimately targeted, as well as the dignity of those in whose name the targeting is done.

As far as the future is concerned, Professor Heyns advances what he calls the "good tools" approach to this and other similar technology: they must serve as good *tools* in that they are still subject to "meaningful human control". If not, they must be prohibited. They must also be *good* tools in that they allow better targeting than would be the case with human operators. Technology that plays a role in lethal decision-making, even where humans have the overall control, must contribute towards avoiding unnecessary loss of life.

Fracking, environmental damage and insurance claims

Professor Birgit Kuschke of the Department of Private Law has investigated the longer-term effect fracking in the Karoo may have on the insurance industry. There is an almost certain probability that insurance claims will arise from environmental damage caused by fracking, which may take years to manifest.

Insurance against this kind of environmental damage poses unique challenges for both property and liability insurance. The purpose of the research was to sensitise potential insurers and their insured to the risks and complexities of insurance claims against the long-term gradual environmental damage that will be caused by fracking.

The research examined the effect of insurance trigger theories and their practical effect on insurance claims for environmental damage. Issues pertaining to multiple types of cover, cumulative cover and the possibility of the exclusion from cover altogether were investigated.

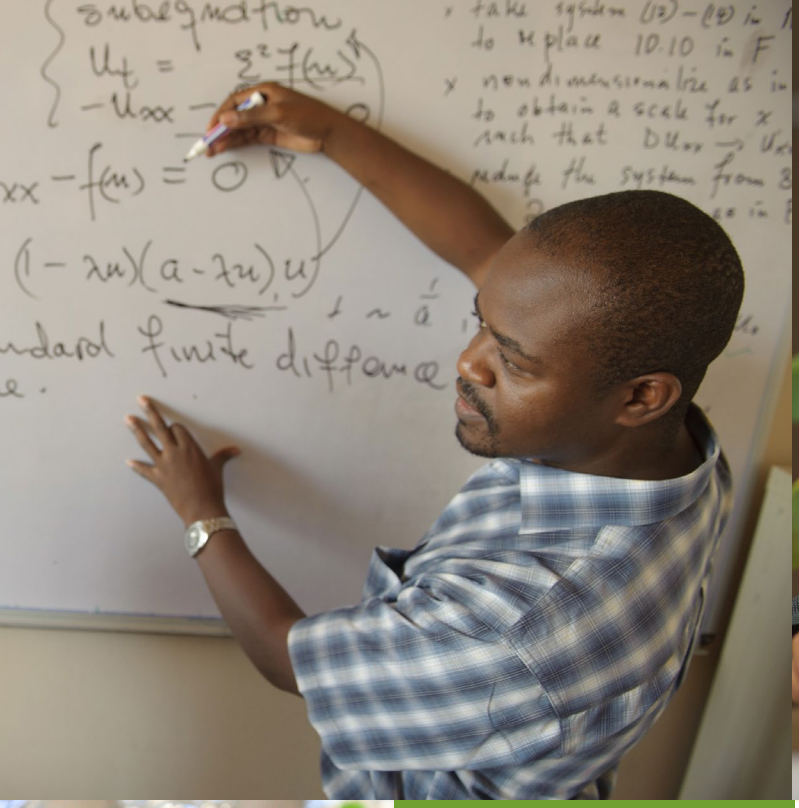
Because of the extent of claims in this regard, it is important for insured parties and their risk managers, insurers, agents and brokers to be aware of the risks they face in anticipation of claims relating to property damage caused by fracking. Risk managers should launch due-diligence investigations on the insurance cover available before disputes arise or liabilities occur that may not be covered as anticipated. For the optimal management of risk, buy-back of additional cover by the insured may be required.

To pre-empt problems in future, authorities are called upon to introduce mechanisms to regulate the liability for, and the insurability of claims pertaining to, environmental damage and its remediation. The acknowledgement of a prejudiced third party's direct claim against the wrongdoer's liability insurer could also benefit innocent parties and speed up the process of effective indemnification.

Centre for Child Law

The Centre for Child Law is a highly effective centre with its work directly linked to establishing and promoting the interests of children in South Africa.

The Centre contributes to establishing and promoting the best interests of children in South Africa through litigation, advocacy, research and education. Litigation activities include those related to Constitutional Court cases that challenged the provisions of the Criminal Law (Sexual Offences and Related Matters) Amendment Act, Act No 32 of 2007. Other matters that have received attention include protecting the right of pregnant learners to basic education, protecting the right of children to basic education through the employment of teachers. determining who has the power to determine the maximum number of children a public school can admit, the payment of subsidies to independent schools, and the provision of school furniture to impoverished schools.



Faculty of Natural and Agricultural Sciences

The Faculty of Natural and Agricultural Sciences strives to be the leading science faculty on the African continent. It has a strong research ethos with many researchers recognised as international leaders.

Through its postgraduate research, the Faculty contributes significantly to some of the major challenges the continent faces in relation to poverty, and to food, energy and water security, climate change and its impact on agriculture, animal and human health, as well as economic sustainability.

The Faculty is one of the most diverse science faculties in South Africa. It is highly regarded internationally in the fields of agriculture, environment and ecology, as well as in the plant and animal sciences. The University produces more articles in the latter field than any other university in South Africa. It also has significant expertise in the physical and mathematical sciences, with strong connections to the mining and mineral industries, including organisations such as Sasol and the National Energy Regulator of South Africa (NERSA).

The strong research ethos of the Faculty is highlighted by the fact that 137 of its scientists are formally recognised by the NRF's peer evaluation system for the high quality and impact of their research nationally and internationally.

Many of the Faculty's researchers are recognised as international leaders in their respective fields. Five of these are A-rated researchers. Furthermore, 156 master's and 64 doctoral degrees were awarded, and the Faculty increased its post-doctoral fellows from 50 in 2011 to 82 in 2013. The Faculty awarded an honorary doctorate to Professor Tim Clutton-Brock, a dedicated zoologist and leading behavioural ecologist in 2013.

The Faculty reiterated its commitment to research with the acquisition of two SARChI research chairs: one in Mathematical Models and Methods in Bioengineering and Biosciences (chaired by Professor Jean Lubuma) and one in Sustainable Malaria Control (chaired by Professor Lyn-Marié Birkholtz). These chairs are funded by the DST through the NRF.

The UP Water Institute, which is internationally recognised for the quality of its education and research in water, was successful in aquiring one of four Rand Water Chair positions. This was awarded to Professor Fanus Venter in the field of microbiology.

Although it is impossible to mention all the special awards for recognition to our scientists, it is appropriate to note the following outstanding achievements:

Professor Mike Wingfield, Director of FABI, was elected to serve as the next President of the International Union of Forestry Research Organisations. He is the first ever African to be elected to this position. The prestigious African Union Kwame Nkrumah Scientific Award in the Life and Earth Sciences category was also awarded to Professor Wingfield. He was the recipient of an honorary DSc degree from the North Carolina State University as well.

Dean's message

The Bulgarian Academy of Sciences awarded the Sign of Honour to **Professor Jean Lubuma** for his contribution to the development and strengthening of the research collaboration between the Bulgarian Academy of Sciences and the University of Pretoria.

Professor Ignacy Cukrowski of the Department of Chemistry received the International Society of Excellence Award: Teaching and Research in recognition of his exceptional contribution to the advancement of environmental electrochemistry and electrocatalysis in South Africa.

Professor Robin Crewe, a professor in the Department of Zoology and Entomology and Director of the Centre for the Advancement of Scholarship, was the 13th recipient of the prestigious Harry Oppenheimer Fellowship Award for 2012 and the first person from UP to receive this award.

Professor Robert (Bob) Millar, Director of the Mammal Research Institute, was awarded the National Science and Technology Forum (NSTF) Lifetime Achiever Award to an individual for his outstanding contribution to science, engineering, technology and innovation.

Professor Anton Ströh
Dean: Faculty of Natural and Agricultural Sciences

Institutes

Forestry and Agricultural Biotechnology Institute (FABI)
Institute of Applied Materials (jointly with EBIT)
Institute for Food, Nutrition and Well-being (IFNuW)
Mammal Research Institute
UP Water Institute
Genomics Research Institute

Centres

African Centre for Gene Technologies (ACGT) with CSIR and Wits)
UP Natural Hazard Centre Africa
Centre for Environmental Economics and Policy in Africa
Centre for Environmental Studies (CFES)
Centre for Geo-Information Sciences (CGIS)
Centre for Sustainable Malaria Control (jointly with Health Sciences)
Centre for Microbial Ecology and Genomics (CMEG)
Centre for Wildlife Management
Joint Centre for Maths, Science and Technology Education (JCMSTE) – jointly with Education
SADC Centre for Land Related Regional and Development Policy
Centre of Excellence for Tree Health Biotechnology
Centre of Excellence for Food Security (co-host with the University of Western Cape)

Units

Bioinformatics and Computational Biology Unit
Conservation Ecology Research Unit (CERU)
STATOMET (Bureau for Statistical and Survey Methodology)

Research chairs

Absa Chair in Actuarial Science
Aon Benfield Chair in Geology
Austin Roberts Chair of African Mammalogy
Kumba Exxaro Chair in Geodynamics
Mondi Chair in Tree Pathology
SARChI Chair in Sustainable Malaria Control
SARChI Chair in Carbon Science and Technology
SARChI Chair in Complex Systems
SARChI Chair of Mammal Behavioural Ecology and Physiology
SARChI Chair in Mathematical Models and Methods in Bioengineering and Biosciences
SARChI Social Science Chair in Non-parametric, Robust Statistical Inference and Statistical Process Control
Sappi and Mondi Chair in Forest Genomics and Biotechnology
SAFCOL Chair in Forestry
Rand Water Chair in Water Microbiology.

Biomath Forum
Experimental Farms
Laboratory for Microscopy and Micro-analysis
Postgraduate School of Agriculture and Rural Development
Sci-Enza Science Centre

Faculty research highlights

Bat-borne viral zoonotic diseases under the microscope

The Viral Zoonoses Research Group led by Professor Wanda Markotter and the Centre for Emerging and Zoonotic Diseases led by Professor Janusz Paweska of the National Institute for Communicable Diseases, collaborated to investigate bat disease ecology.

Most emerging infectious diseases of humans originate from animals, and bats host a suite of viruses with severe public health consequences. Factors such as the availability of food resources, co-infecting parasites, age, reproductive status and population density have all been demonstrated to increase or decrease the risk of viral infections within host populations.

"Our research uses monitoring of wild bat populations to investigate how virus prevalence varies in space and time, and to identify individual, population and environmental risk factors for infection. We are involved in a long-term project to monitor South African bat populations for their possible role as reservoir host of viruses. We have already shown, for the first time, the presence of rabies-related lyssaviruses (Lagos bat and Duvenhage virus), paramyxo and filoviruses in South African bats.

One of the newly described paramyxoviruses is closely related to mumps. We also described several new viruses from bat parasites," says Professor Markotter.

Recent results also indicated a correlation between age and seroprevalence in bats, and this information can now be used to identify high-risk periods for the transmission of pathogens to humans and other animals. The outcome of this project makes a significant contribution to understanding the role of bat-borne zoonotic pathogens on public health in South Africa.

Research helps combat yield losses

Dr Lucy Moleleki of the Forestry, Agriculture and Biotechnology Institute (FABI) in the Department of Microbiology and Plant Pathology is the research group leader of bacterial genomics and host pathogen interactions.

"Our research is focused on two important pathogens, *Pectobacterium brasilinse,* which causes soft rot and black leg diseases, and root knot nematodes. Both these pathogens can cause devastating yield losses for growers, both in the field and during post-harvest storage.

In the first area of our research, we are making progress towards understanding virulence mechanisms of soft rot pathogens – specifically *Pectobacterium carotovorum* subspecies *brasiliense* – and how these bacteria interact within their major host potato," explains Dr Moleleki.

The group is also interested in studying host defences in potato plants elicited by the soft rot pathogens. "In this respect, we have identified a potato cultivar that has resistance to *Pectobacterium* spp.

The second focus area is on root knot nematodes of potatoes. In this area, we endeavoured to better understand the threat posed by root knot nematodes to the potato industry through understanding the diversity and overall impact of root knot nematodes on potato production. We have identified new root knot species that are highly virulent and are a potential threat to potato production."

The group is mainly funded by the NRF and THRIP, Potatoes South Africa, the International Foundation for Science and the Gauteng Department of Agriculture and Rural Development.

Birds and mammals: Coping with a changing world

The research undertaken by Professor Andrew McKechnie of the Department of Zoology and Entomology falls into three main areas: climate change and desert birds, metabolic diversity in birds, and ecology and evolution of heterothermy. Professor McKechnie is also a member of the DST/NRF Centre of Excellence at the Percy Fitzpatrick Institute of African Ornithology

In collaboration with colleagues in the USA and Australia, and currently funded by a grant from the National Science Foundation in the USA, physiological and behavioural studies are employed to understand how birds cope with very hot conditions in deserts, such as the Kalahari, and how they are likely to cope with the significantly higher temperatures expected in the future. The approach taken links physiological data on variables such as evaporative water loss, and behavioural data such as the temperature dependence of heat dissipation behaviours, like panting. Models developed using these data provide the basis for identifying those species most vulnerable to climate change and likely to be affected first by rising temperatures.

As far as research into metabolic diversity in birds is concerned, the researchers examined variation in metabolic rates among and within species, in order to understand how birds have evolved in response to environmental factors, and the role of phenotypic plasticity as a source of metabolic diversity. "We use a combination of experimental work under laboratory conditions, investigate physiological variation in free-ranging populations, and conduct synthetic analyses of published data. Our current work is focused on the white-browed sparrow-weaver, a common species that occurs over large parts of southern Africa in a variety of habitats," he explained

With regard to research into the ecology and evolution of heterothermy, many small mammals and birds use daily torpor, a short-term form of hibernation, to conserve energy during periods of high demand and/or low supply. The research team has been studying the ecology and evolution of this phenomenon in species as diverse as elephant shrews and nightjars. This work relies heavily on the remote measurement of body temperature via telemetry.

Examining the global honeybee population

Albert Einstein once said: "If the bee disappears from the surface of the earth, man would have no more than four years to live." Professor Robin Crewe, a renowned bee expert in the Centre for the Advancement of Scholarship at the University of Pretoria, has been undertaking research to determine why the global honeybee populations are declining.

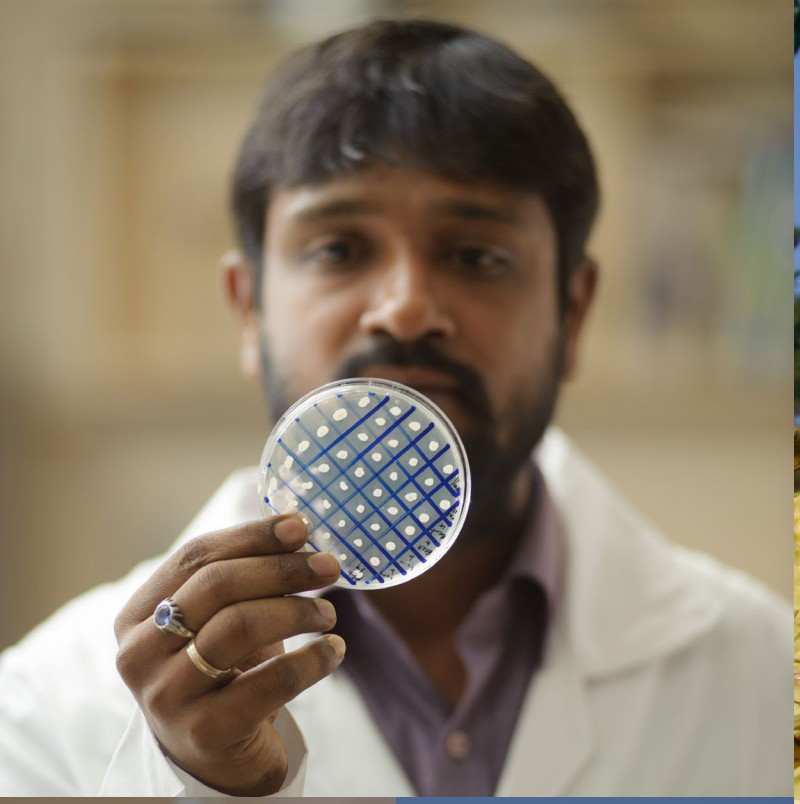
The threat to honeybee populations in the USA, Europe and Latin America has received extensive media attention over the past few years, because a decline in the bee population could also lead to a decline in food production. Bees are responsible for the pollination of 80% of all insect pollination and one third of the food we eat.

Research conducted in these regions suggests that we should be concerned by this apparently global pandemic affecting honeybee populations. The populations are declining because of developments in agriculture and changes in natural environments.

According to Professor Crewe, bees are barometers of the effect humans have on the environment. They are sensitive to changes in pesticides and vegetation, and industrialised agriculture produces large areas of monoculture crops, which are like a desert to bees.

The situation looks different in South Africa, as the local honeybee population is declining at a slower rate than that of their counterparts abroad. Researchers are not sure why, but they believe in may be because African honeybees are more resilient. However, according to Professor Crewe, beekeepers are reporting higher colony losses and there is little data available to help academics determine whether this population decline is to be expected, or whether the decline in the population is taking place for the same reasons as in the northern hemisphere.

A group of researchers from the University of Pretoria has contributed to an international research venture, known as the COLOSS BEEBOOK. This publication aims to standardise methods of studying the honeybee (*Apis mellifera*). It comprises 33 chapters authored by more than 160 of the world's leading honeybee experts, three of whom are from UP.



Taking the cue from nature

Professor Namrita Lall of the Department of Medicinal Plant Science focuses on researching South Africa's plant diversity and its largely untapped potential for medicinal and cosmeceutical purposes.

In one of her research projects, she focused on finding effective medicinal plant species for products to be used as complimentary medicine to counter the side effects of conventional tuberculosis and cancer therapy, and which could be given in combination with these conventional drugs as an adjuvant from ethnobotanically selected plants.

A significant number of plants with potential inhibitory activity against *Propionibacterium* acnes are undergoing clinical studies. Colonisation of these bacteria contributes to the etiology of the disease, Acne vulgaris, a most common skin disorder. Several agents that have been found to interfere with the transcription of genes encoding tyrosinase-protein have been identified. The sample formulated into a cream was tested on 25 healthy volunteers for skin-irritancy and a rather soothing effect was observed. The samples were further subjected to clinical studies and their use has been recommended for melasma and skin toning purposes. The research results have attracted the attention of a number of national and international cosmeceutical companies who are willing to commercialise selected South African plant extracts and purified compounds.

Working with one of her PhD students, Richa Sharma, Professor Lall is exploring the use of the *Leucosidea sericea* shrub (also known as oldwood) and has found that chemical compounds in its silky grey leaves reduce the inflammation caused by a particular acne-causing bacterium. The results were published in the scientific journal *Phytochemistry Letters*.

In a collaborative project with Professor Debra Meyer of the Department of Biochemistry, it was found that the Red Sea soft coral (*Litophyton arboretum*) has certain inhibitory qualities. This might be valuable in developing drugs that target HIV and cancer. The results were published in the journal *Marine Drugs*.

Solving biological questions with mathematical modelling

Dr Michael Chapwanya of the Department of Mathematics and Applied Mathematics focuses on the study of real-life problems that lead to interdisciplinary research. With his collaborators, he seeks answers and avenues for future directions for some of the issues mentioned below. The approaches taken include the development of mathematical models, the application of mathematical techniques to simplify problems and finding efficient computational methods.

The threat posed by biofilms cannot be underestimated. In settings where the biofilm grows sufficiently to impinge on flow, the effect is termed bio-clogging. In industrial applications, this has undesirable effects on process and health. "In a paper published in collaboration with the research group of Professor Andrew Fowler, we investigated the growth of biofilms under industrial applications. In particular, how the competition between growth and erosion-like surface detachment affect flow in a channel. The results suggest that full clogging of the channel is possible for flows driven by a fixed pressure drop," he said.

Like biofilms, navy beans are assumed to be porous structures. In a related project, the hydration of navy beans were investigated before canning operations to decrease the cooking time, minimise losses and improve the nutritional quality and protein digestibility of the cooked product. "We proposed a predictive mathematical model capable of simulating the change in grain properties during soaking," he explained.

While, from a mathematical viewpoint, it is important that the derived differential models are well posed before any solution approach is implemented, significance is also placed on the numerical methods designed to solve these equations.

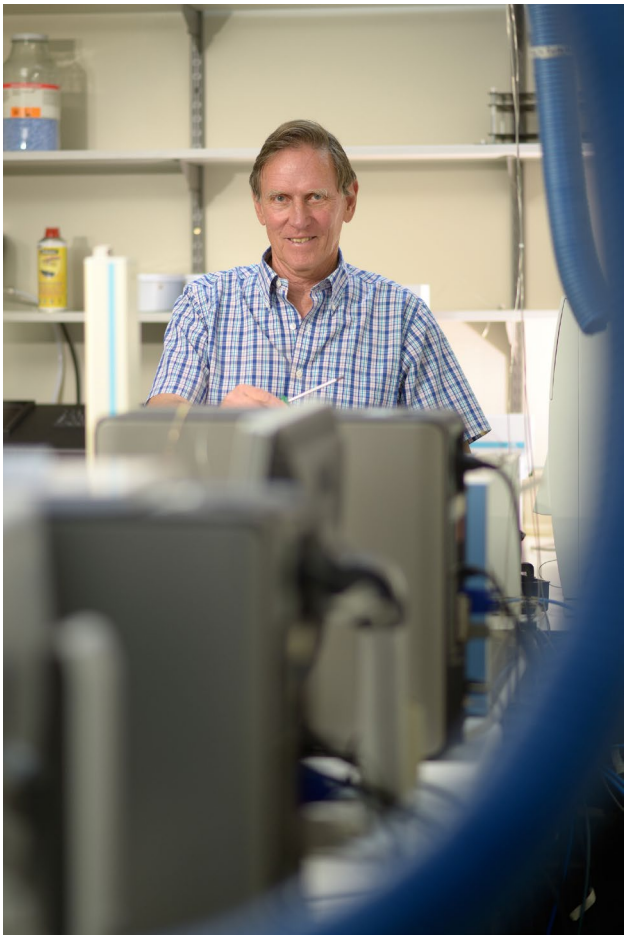
The results form part of collaboration with Professor Jean Lubuma under the SARChI Chair in Mathematical Models and Methods, where non-standard finite difference schemes are designed for these equations. The reliability of the schemes is highlighted via their application in models arising from cancer modelling and bioremediation, for example.

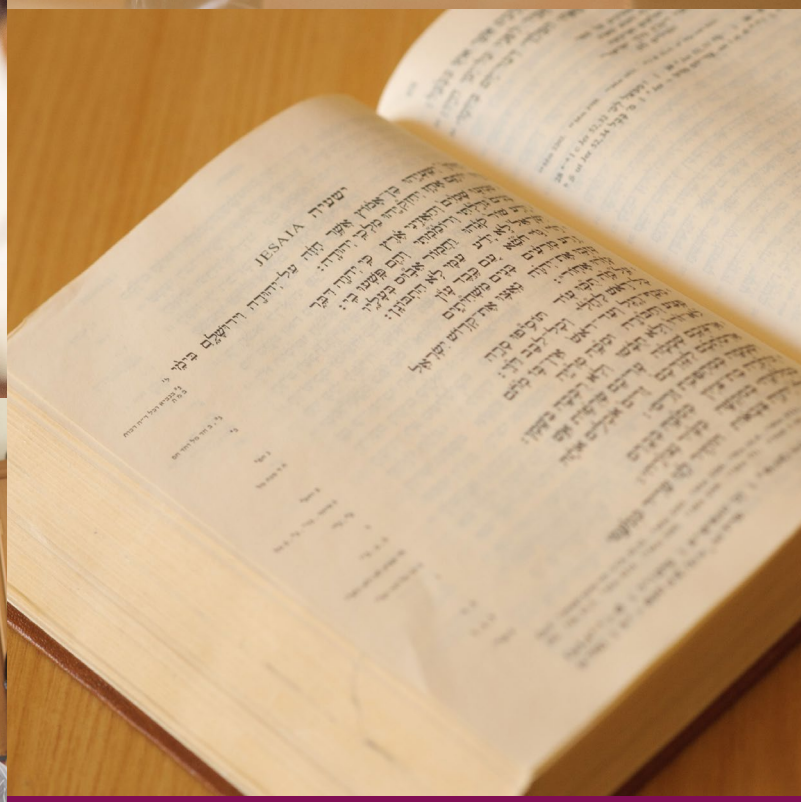
Mammal Research Institute

The Mammal Research Institute (MRI) is dedicated to research and teaching on the biology and ecology of African mammals, including the conservation of our indigenous mammal fauna in the context of sustainable human development. It is internationally recognised for research and teaching on African mammals, and strives to maintain a focus that is relevant to Africa in general, and to southern Africa in particular. The Institute attracts students and academics from around the globe, including Europe, North America and Australasia, while student enrolment from a variety of African countries – including Sudan, Mozambique, Cote Ivoire, Ethiopia and Tanzania – has grown in recent years. It is the only institute in Africa that is specifically dedicated to mammal research, and published over 100 articles in peer-reviewed journals in 2013. The MRI recently established a stable isotope facility, which is extensively used for research. The Centre for Wildlife Management has joined the MRI to provide a strong complementary teaching and research activity.

Forestry and Agricultural Biotechnology Institute

The Forestry and Agricultural Biotechnology Institute (FABI), which was established as a multidisciplinary postgraduate research entity, completed its 16th year of operation in 2013. In this time, FABI has established a substatial international footprint, growing to accommodate 24 academic research leaders and approximately 140 postgraduate students and postdoctoral fellows. FABI hosts nationally and internationally important research entities, such as the DST/NRF Centre of Excellence in Tree Health Biotechnology, with the majority of FABI's leadership holding NRF ratings, including two A ratings and eight B ratings. Research is strongly linked to the broad field of plant health and the performance of forestry and agricultural crops. These goals are achieved largely, but not soley, by utilising modern molecular genetic techniques, mostly undertaken with support from the forestry and agricultural industries, with FABI having leveraged approximately R30 million worth of support in 2013.

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Faculty of Theology

The year 2013 was an extraordinary academic year for the Faculty of Theology due to achievements in research productivity, strengthened international collaboration and an increasing number of international students. Combined these factors have made us a faculty of choice for theological education.

This is primarily a research faculty. Six staff members received an NRF rating in 2013, and more than half of the staff members are currently rated researchers, which puts this Faculty with its 15 researchers ahead of its peers in the country.

The Faculty raised its research output by 28%, with 158 articles in accredited journals, 97 of which appeared in Thomson Reuters Web of Science-listed journals. A further 24 units can be added in the form of books, chapters in books and conference proceedings.

Two ecclesial partners of the Faculty are owners of prominent theological journals: *HTS Theological Studies/ Teologiese Studies* and *Verbum et Ecclesia*. Both are open-access journals and are Scopus- and Scielo-indexed, while *HTS* is also a Web of Science journal.

The fact that 29 PhDs and 77 master's degrees were conferred is commendable. This achievement gives a weighted output of 4.7 per full-time equivalent (FTE) staff member. If this is added to the research output per academic FTE staff member, the contribution of an individual in the Faculty is 10.49.

An increasing number of international students choose the University for under- and postgraduate studies. In 2013, international collaboration agreements were strengthened between the University of Pretoria and universities in Cameroon, Edinburgh, Fordham, Munich and Vienna, among others. The Centre for Contextual Ministry (CCM) is also the preferred academic training provider for Leadership Foundations, an international network of faith-based foundations committed to the socio-spiritual transformation of their cities that is active in more than 40 cities across the world.

In 2010, the Faculty started introducing new curricula in the three undergraduate programmes offered – DipTheol, BA (Theology) and BTh – over a period of four years. These three new curricula were successfully phased in during 2013. The Faculty succeeded in increasing its overall pass rate from 81.72 to 84.85%, while its throughput also increased with 3%.

Dean's message

Both the CCM and the Centre for Public Theology (CPT) are vehicles of community engagement. Through the Urban Studio, Village of Support and Unit for Social Cohesion and Reconciliation, the CCM innovatively blends transdisciplinary research, teaching and community engagement. As it is involved in the formation of community and church leaders, and the facilitation of creative transdisciplinary spaces, its impact is particularly evident in the inner city of Tshwane, and other South African communities.

The Faculty's overarching FRT is Ecodomy – Life in its Fullness. Various aspects of this theme have been addressed in publications and research activities by three clusters: sources (Old- and New-Testament Studies), beliefs (Dogmatics and Church History) and practices (Practical Theology and Missiology) .

As a Faculty of choice for theological education in South Africa, it provides a comprehensive offering of theological expertise.

Professor Johan Buitendag
Dean: Faculty of Theology

Centres

Centre for Contextual Ministry (CCM)
Centre for Public Theology
Centre for Sustainable Communities

Biblical and Religious Studies Programme
Excelsus (Dutch Reformed Church: Centre for Continuing Ministerial Development)
Reformed Theological College

Faculty research highlights

In search of a Christian ethic of responsibility

One of the main foci of Professor Etienne de Villiers' research in Christian ethics has been the search for an appropriate contemporary Christian ethic of responsibility.

Professor De Villiers started out with assessing the attempts by a number of Christian ethicists to develop their own versions of a Christian ethic of responsibility in the aftermath of Hans Jonas's book published in 1979, *Das Prinzip Verantwortung*. He has gradually become convinced that Max Weber's original conceptualisation of an ethic of responsibility, captured in his famous speech in 1919, "Politics as a vocation", provides the most promising model for such a contemporary Christian ethic of responsibility.

When Professor De Villiers found no accessible academic publication in English, he decided to write a monograph entitled *Max Weber's ethic of responsibility: Interpretation and appropriation*. Although he is still busy writing it, he has read two papers at conferences in The Netherlands and in one publication briefly provided his own interpretation, indicating the extent to which Weber's ethic can serve as model for an appropriate contemporary ethic of responsibility. Professor De Villiers interprets Weber's ethic of responsibility as a second-level normative ethic that presupposes the validity of first-level moral and functional values, but provides guidance on how to deal with the plurality of such first-level values and with their application in ethical decision-making.

In several publications, Professor De Villiers has applied the ethic of responsibility approach to particular ethical issues. In "Do the prophetic and reformist approaches in Christian ethics exclude one another? A responsibility ethics attempt at reconciliation", he argued that these two approaches could be accommodated and integrated in a Christian ethic of responsibility. In "The distinctiveness of Christian morality – Reflections after 30 years", he argued that although Christians may depart from their "thick" Christian moral convictions when dealing with contemporary ethical issues, they are not absolved from the responsibility to strengthen the moral consensus in society to enable better cooperation between believers and non-believers in the solution of serious societal problems.

Probing the influence of religion on society

The field of research of practical theologian, says Professor Yolanda Dreyer, is pastoral care. With her research team at the University of Pretoria, the focus is on how religion, religious communities and religious institutions can either cause harm or contribute positively to the resilience, healing and well-being of individuals and groups.

Professor Dreyer participates in the international research group New Directions in Practical Theology, based at the Princeton Theological Seminary in the USA. In 2013, the focus was on "mood" in pastoral psychology. Professor Dreyer's work traced the development from "affect" to "mood" and indicated how homophobia in religious communities and institutions affects the psychological well-being of sexual minorities.

Dr Thinus van Staden focuses on how the family and faith community together can create a space that is conducive to the flourishing of children and emerging adults. By means of life history research, Dr Annelie Botha hones in on the effect that religious and social discourses on marriage and family has on women in families. Pastoral care and faith communities can play a role in deconstructing harmful discourses and reframe meanings not only for women, but also in religious communities and society.

Dr Santie Bothe-Smith's work centres on how individuals and families who deal with the loss of a loved-one experience the communal religious ritual of the funeral service, either positively or negatively. She investigated how individuals and families create their own rituals of remembrance to help them work through the process of grieving. The engagement of pastoral care on this level has much to offer towards the resilience and healing of people recovering from loss.

Rev Abraham Akih, a doctoral student from Cameroon, investigates how incarcerated individuals are perceived and treated both by the officials in the penal system and people in faith communities and religious institutions. He pleads for prison reform in his country and emphasises the value of all human beings before God.

Examining Isaiah in Old Testament studies

The main research focus of Professor Alpheus Groenewald of the Department of Old Testament Studies is the book of Isaiah. The textual analysis takes the historical embeddedness of the text seriously, as the book is the product of a long and complicated process of transmission. It is rooted in the concreteness of human history and cannot be properly understood apart from it.

Synchronic and diachronic analyses are retained. The synchronic analysis indicates a developmental history of Isaiah 1 to 12 in different layers. Although presented as a single block of literature occurring at the beginning of the book, a detailed analysis demonstrates that it is a composite work written over centuries.

"The focus has shifted from reconstructing the events and historical personages mentioned in the biblical tradition," he explained. "The image of the prophet which emerges from the book is now seen as a literary character. Scholars have become increasingly aware of the gap between the book and the historical prophet, and the impossibility of bridging this gap. It is now more about identifying the literary work and theological perspectives of the anonymous tradents and redactors who shaped this tradition. Scholars increasingly pay more attention to the literary character and setting of the texts, including their structure and thematic development, their redactional information and intent, and their social and institutional matrices."

The many interrelationships between the various parts of the book indicate successive re-readings of the Isaianic tradition in view of later historical circumstances. "A key focus of my analysis is exploring the ways in which these texts link with others within the canon. As there were only a few highly educated scribes, they would share, despite their differences, a social discourse reflected in the various products they created. These literary works reflect the robust discourses of the various groups in different periods and therefore contain a multiplicity of ideological viewpoints and voices," concludes Professor Groenewald.

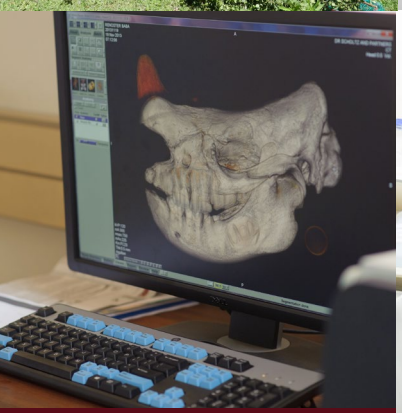
Centre for Sustainable Communities

The mission of the Church is firstly to get involved in its local community. To do so in a meaningful way, the congregation needs resources such as skills, knowledge, funds, networks. The Centre for Sustainable Communities has developed a network of partner organisations who help to develop such resources and make it available to congregations for their work in their communities. Research focuses on the role of the Christian faith and of religion in general, especially African Traditional Religion, and different cultures in the search for a sustainable lifestyle for rich and poor, and a sustainable community. By working with a research partner such as the Nova Institute, the Centre for Sustainable Communities gets the opportunity to take part in different projects to improve the quality of life, mostly with members of poor households.










Faculty of Veterinary Science

A priority for Veterinary Science is the enhancement of high-quality research and relevant postgraduate training. We have made notable progress in research productivity and new research protocols.

The Faculty will continue to ensure high-quality and relevant research related to the animal health needs of South Africa and the region. In 2013, the Faculty was remarkably successful in supporting the University's goal of becoming a research-intensive institution.

The number of staff members with doctoral degrees increased from 21% in 2005 to over 40% in 2014, while the number of staff members with NRF ratings increased from nine to 27. There was a growth of 49% in the number of master's and doctoral students, and the Faculty more than doubled its postgraduate output. Furthermore, the Faculty's research publication output increased from 55 units in 2006 to 112 units in 2013.

The Faculty's Research Committee approved just over 100 new research protocols during 2013, compared to 82 in 2012. In 2013, the first round of funding for research on the control of animal diseases by the Tshwane Animal Health Biocluster was initiated. The Faculty was successful with nine applications in this process. These projects amounted to a total of R23 902 255, which gave the research effort a substantial boost.

The Faculty has chosen research focus areas to ensure that high-quality and relevant research programmes are in place to meet the animal health needs of South Africa and the region.

Ongoing research projects featured in this report focus on economically important livestock diseases (lumpy skin disease, blue tongue and bovine tuberculosis), the treatment of rhino survivors, colour variants in wild felids and the discovery of a new antifungal compound that has higher antifungal activity and provides higher cellular safety against *Candida albicans* than the currently available products. A worldwide patent has been lodged for this invention, and the Technology Innovation Agency (TIA) provided seed funding to conduct research on possible commercialisation.

Furthermore, an NRF grant was awarded to Professor Andrew Leisewitz of the Department of Companion Animal Clinical Studies for research on canine babesiosis as a model for human malaria. The babesia work involves a wide consortium of international collaborators.

Dean's message

In addition, the grant covers the study of gene expression in the brains of dogs infected with distemper virus in an attempt to understand the molecular mechanisms of demyelination.

This disease of dogs may be a model for human multiple sclerosis. This study involves collaboration with Professor Paulette Bloomer of the Faculty of Natural and Agricultural Sciences.

The Faculty is proud of the important research its staff members produce, and I would like to thank them for their hard work and dedication.

Professor Gerry Swan
Dean: Faculty of Veterinary Science

Centres

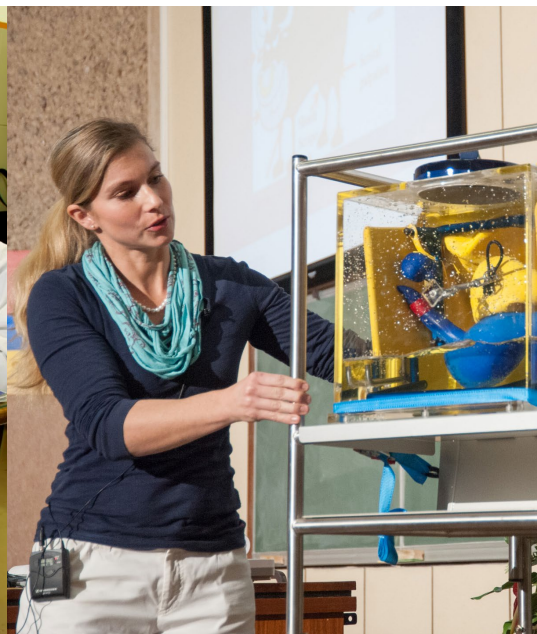
Centre for Veterinary Wildlife Studies
Equine Research Centre
UP Biomedical Research Centre

Research chairs

Afrivet Training Services Chair in Primary Animal Health Care
Southern African Poultry Association Chair in Poultry Health and Production

Onderstepoort Veterinary Genetics Laboratory





Faculty research highlights

Clinical research on the treatment of rhino survivors

Dr Gerhard Steenkamp and Dr Johan Marais have conducted clinical research through Saving the Survivors, the organisation they started to treat rhinos injured as a result of poaching and other traumatic incidents.

They have shown that the removal of especially the front horn of rhino exposes the paranasal sinuses of the animal, resulting in infection and improper healing. The research focused on the treatment of these maxillofacial injuries and ways to cover the wound for a sufficient time to allow it to form good granulation tissue, as well as skin transplants to provide for a stronger tissue layer on the cranial part of the face. They also established a method of treating the wound with a dressing that could stay on for at least four weeks, and developed a unique technique of covering the wound bed for three to five weeks.

Working on the maxillofacial area of rhino while they are immobilised proved to be quite painful to these animals. Although the immobilising drug has very good pain-killing properties, these animals still react violently when the wound bed is surgically explored.

Dr Marais acquired computed tomography software to scan the rhino head. This study identified the infraorbital nerve of the white rhino, with specific landmarks in the live animal, that enabled the team to administer local anaesthetic over the infraorbital nerve before any surgery was initiated, resulting in very good pain management during these procedures.

Colour variants in wild cats

The Veterinary Genetics Laboratory (VGL) partnered with the Theodosius Dobzhansky Centre for Genome Bioinformatics at the St Petersburg University in Russia, together with Dr Steve O'Brien, chief scientific officer. The collaborative project involved completing the genomes of the lion, tiger, white lion and snow leopard.

The genomes were constructed by two laboratories in Asia: BGI, Shenzhen and the Theragen BiO Institute (TBI) in Korea. The putative mutation responsible for the white coat colour of the white lion was identified as a single nucleotide polymorphism (SNP) in the tyrosinase (TYR) gene, a known colour gene. The VGL validated this SNP mutation using samples provided by Ukutula Lodge and the Lion Park near Brits, as well as samples of tawny lions from wild populations across South Africa. The mutation was confirmed to be a recessive trait in the lion.

In his previous role as director of the Laboratory of Genomic Diversity at the National Cancer Institute in the USA, Dr O'Brien initiated a project on pigmentation patterns in domestic and wild cats, including the king cheetah. Dr Greg Barsh's laboratory at the University of Stanford was the lead laboratory, and other experts from around the world assisted in this project. Again, a putative mutation was discovered, this time a single-base pair insertion in the Transmembrane Aminopeptidase Q gene, which causes a frameshift.

As the VGL has a long-standing collaborative relationship with the Ann van Dyk Cheetah Centre, the king cheetah pedigree of this centre was used to validate the mutation as the causative mutation of this cheetah's coat pattern, which is inherited as a recessive trait. Carriers of the mutation have a normal spotted coat pattern. The validation of the test was performed at the VGL.

Economically important livestock diseases

Researchers in the Faculty of Veterinary Science have conducted studies on lumpy skin disease, blue tongue and bovine tuberculosis – diseases that are significant from an economic viewpoint.

Lumpy skin disease occurs among cattle of all breeds in Africa and parts of the Middle East. Professor Estelle Venter, Professor Koos Coetzer, Dr Eeva Tuppurainen (Pirbright, UK), Dr JC Lubinga (PhD student) and Dr Hein Stoltsz showed that ixodid ticks are involved in the transmission of lumpy skin disease virus (LSDV). The presence of LSDV in tick saliva and tick organs following intrastadial and transstadial transmissions and the survival of LSDV in ticks in temperatures below 15 °C were demonstrated. These findings indicate the possible role of ticks in the overwintering of the virus and will assist in the understanding of the epidemiology of the disease.

Blue tongue is an endemic disease mainly found in sheep in South Africa. It recently caused major outbreaks in Europe. Professor Venter, Professor Moritz van Vuuren, Professor M Stokstad (Norway) and Peter Coetzee (PhD student) evaluated the characteristics of reassortants of blue tongue virus vaccine strains with a South African virulent strain and the capability of a European blue tongue virus (BTV) serotype 8 strain to infect goat foetuses through the transplacental route. These studies contribute to a better understanding of the virulence and ability of BTV to cross the placenta in pregnant animals.

Professor Anita Michel and her research team conducted a cross-sectional survey of bovine tuberculosis in the cattle population of Mnisi, close to the Kruger National Park. The findings highlighted shortcomings in the ability of avian tuberculin to flag the diversity of transient sensitisations occurring in cattle exposed to non-tuberculous mycobacteria in South Africa and helped to explain cases of misclassification of reactor cattle when using the prescribed intradermal tuberculin test.

Potential cure for fungal infections

Three University of Pretoria staff members have discovered a new safe and effective antifungal compound for potentially treating *Candida albicans* infections. Professor Kobus Eloff and Dr Francien Botha of the Phyto-medicine Programme in the Department of Paraclinical Sciences supervised the PhD study of Dr Candice van Wyk of the Department of Community Dentistry.

Candida albicans is an oppurtunistic commensal yeast that is harmless in small amounts, but causes oral and genital candidiasis, especially in immunocompromised people worldwide.

In a Phytomedicine Programme project screening more than 530 tree species for activity against eight pathogens in the PhD study of Dr Lita Pauw, *Ptaeroxylon obliquum* leaf extracts showed excellent activity against *Candida albicans*.

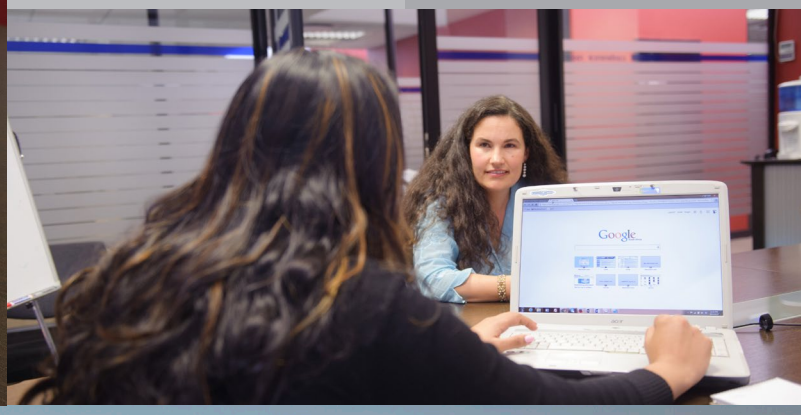
The tree is common in southern Africa and has a number of traditional medicinal uses. Extracts from the tree were investigated and Dr Van Wyk isolated and characterised the most active antifungal compound. It was a new compound, obliquumol, which had never been found in nature before. The compound had higher in vitro activity against *Candida* and a higher cellular safety than amphotericin B, the current gold-standard antifungal product. A current PhD student, Thanyani Ramadwa, has established a method to isolate large quantities of obliquumol from a tree growing at Onderstepoort. He also determined the activity against many other pathogens and synthesised a derivative.

Centre for Veterinary Wildlife Studies

The Centre for Veterinary Wildlife Studies coordinates training, research and services focuses on wildlife and livestock health at the interface with emphasis on transboundary animal diseases and zoonoses. It strives to support conservation and game ranching as a land-use option for the sustainable provision of ecosystem services through research and management programmes. Africa contains some of the most unique and abundant wildlife species that support a major portion of ecotourism that is becoming one of the main drivers of development on the continent. To sustain this unique feature and to deal successfully with expectations of the wildlife sector pertaining to veterinary science, the Centre strongly emphasises national and international networking, especially with other professions and related disciplines.


Crane & Matten
business ethics
Principles of Leadership
Business and Society
Ethics and Stakeholder Management


Reaching Goal
THEORY OF CONSTRAINTS
Eliyahu M. Goldratt and Jeff Cox
THE GOAL
20th Anniversary Edition
THEORY OF CONSTRAINTS
AND ITS IMPLICATIONS FOR MANAGEMENT AND ACCOUNTING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Gordon Institute of Business Science

Gordon Institute of Business Science

The Gordon Institute of Business Science (GIBS) is extremely proud of the improving the quality of its publications. In 2013, a number of papers by its staff members were published in leading international journals.

This momentum is the result of a series of internal research support measures.

GIBS's research is clustered around a number of themes. Given the Institute's commitment to training general managers, it believes that it needs to contribute core knowledge to how functions perform, separately and collectively, within a business. A community of scholars at GIBS is advancing our understanding of fundamental disciplines such as operations management, marketing and human resource management. Professor Margie Sutherland, together with Mr Gary Gilbert, conducted research on the paradox of managing autonomy and control.

The stream of research refines models typically developed in the West, such as the work of Dr Pieter Pretorius on the theory of constraints. Often, the impetus for research is the question of how applicable existing models are in South Africa, with its rather unique social context.
In this regard, Professor Karl Hofmeyr collaborated with Ms Amelia Marais on a project that investigated how damage to institutional trust affects (or does not affect) employee engagement.

The awareness of how business relates to society characterises another research thrust at GIBS, which investigates how a rapidly transforming society and environment creates both challenges and opportunities for business.

There are opportunities for business at the "base of the pyramid", but working with low-income consumers challenges many Western business standards and approaches.

Ms Kerry Chipp, Dr Clive Corder and Professor Dimitri Kapelianis provided evidence that the well-known mantra of "less than $2 a day" does not take into account that many of the base-of-the-pyramid customers are in collectivist societies where individual measures of income are less appropriate.

Given the rise of emerging markets worldwide, the insights from South Africa are very usefully related to other contexts that are undergoing rapid social and economic change, such as in much of Africa, China and India.

Dean's message

The global relevance of insights generated in the South African context also relates to the transformation brought about by ongoing globalisation, another important focal point of research at GIBS.

Globalisation is creating new opportunities and challenges for managers, requiring a better understanding of the political economy of not only South Africa, but also of its trading partners. Dr Lyal White compared South Africa to Brazil, while Professor Daniel Levin and Professor Helena Barnard documented how the internationally scattered connections of South African managers can act as a resource for those managers. Indeed, the diaspora can be of value to South Africans – provided diasporans are prepared to interact with local managers, as shown by Professor Barnard and Ms Catherine Pendock.

Finally, GIBS has long been recognised for its innovative and high-quality teaching, and has increasingly felt the need to document and interrogate the paradigms used in developing its learning interventions. Dr Gavin Price and Mr AJ van der Walt examined the attitudes of MBA students towards ethics, and various other initiatives are underway to document especially the non-traditional innovative teaching practices such as experiential "learning journeys" pioneered at the Institute.

GIBS is confident that its research profile will continue to strengthen.

Professor Nick Binedell
Dean: Gordon Institute of Business Science

The role diasporans play in their homelands

The findings of emerging research indicate that diasporans are sharing knowledge with their home countries to help improve business practices and innovation in the homeland, especially if it is a less developed country than the one to which the migration took place. Professor Helena Barnard and two of her colleagues tested this hypothesis, and their studies produced more comprehensive findings.

They investigated the hypotheses that diasporans who have positive attitudes about their homeland and the migration experience are willing to share knowledge with their homeland, but that the effect may be different in the case of diasporans who have negative attitudes. Feelings of guilt and a sense of loss, in particular, may have differing effects, depending on the intensities of these emotions. The findings suggest that an ongoing beneficial engagement by a diaspora cannot be assumed. Feelings towards the homeland and emotions about the emigration experience determine the extent to which diasporans will engage with, and help their homeland. It was found that the effect of positive feelings was greater than that of negative ones.

The findings about the effect of negative attitudes on helping behaviour are less clear, but the intensity of negative feelings is important in understanding how it correlates with willingness to help the homeland. Both guilt about leaving the homeland and a sense of loss will first increase the willingness to share knowledge with compatriots in the homeland, and will then decrease that willingness. Interestingly, anger has no significant effect.

This research is particularly important, as the field of international business increasingly examines the importance of individuals and subjective dimensions in initiating and sustaining cross-national contact. This work contributes to the continuing conversation on diasporas and warns that it may be wise to temper some of the optimism about these communities.

Research highlights

Business ethics becomes increasingly important

Dr Gavin Price studied South African business students' changes in attitude towards business ethics between 1990 and 2010. He also investigated which aspects of business ethics have to be addressed most urgently by business schools and business practitioners.

The study indicated that business students (a cohort of management and junior executives) held significantly stronger opinions on ethical issues than in the past.

This shows a clear trend towards compliance-based ethics, which can be explained by the proliferation of business legislation and regulation in the wake of recent corporate governance and business ethics failure and the subsequent global financial crisis. Another factor that may have influenced their attitudes is the fact that large-scale lapses of moral judgment by organisations are widely publicised and cause damage to their reputations. Finally, the socio-political environment in which companies operate has changed. This is especially true in the case of South Africa, where affirmative action and black economic empowerment have been implemented, and the corporate environment has become more socially aware and less parochial.

The world's focus on business ethics is reflected by an increase in ethics courses at top business schools. However, there is still much debate on the role, relevance and form of ethics education in business courses. The research indicates that business schools should reinforce their focus of two goals: They should create an effective level of understanding of a broad range of ethical philosophies and approaches – relative and absolute – that may be applied in the business context. Business schools should furthermore ensure that the underlying principles of rules and regulations are understood and considered in the ethical decision-making process.

Enhancing the five focus steps of the theory of constraints

The theory of constraints (TOC), a philosophy focused on the continuous improvement of systems (which are all constrained), contains the well-known element of the five focus steps. These steps provide the focus element of the philosophy and are always described as being sequential. Research by Dr Pieter Pretorius indicated that, in reality, a number of decision points are found between the five focus steps.

He transformed the five steps into a decision map that still includes all five steps, but allows for appropriate decision points to guide the application of this process.

A large part of the literature on these steps refers to seven instead of five steps. The two prerequisite steps to the five steps are to define the goal of the organisation (as an organisation is a system) and to ensure that appropriate measurements are in place to determine the effect of the intervention on organisational performance.

In the most basic form, the five steps are as follows:

- Identify the system's bottlenecks (constraints)
- Decide how to exploit them
- Subordinate everything else to the decision taken
- Elevate the bottlenecks
- Go back to the first step 1 if a bottleneck has been broken in a previous step

As the existing five steps focus on physical constraints, Dr Pretorius's research makes provision for non-physical constraints, as well as the possibility of subordination of the constraint.

This study enhanced the understanding of the five focusing steps by adding detailed decision points that allow a more practical application of this already powerful construct.

Research support and development

The Department of Research and Innovation Support (DRIS) strives to provide excellent research and innovation support to the entire community of researchers at the University of Pretoria.

There are several opportunities for support and development:

The Graduate Support Hub supports postgraduate students, and postdoctoral and research fellows. In addition, **Research Support** targets, more broadly, emerging researchers by providing management and administration support, and hosting research skills development workshops.

More than 25 information and capacity development workshops for UP postgraduate students and emerging researchers were held in 2013. The **Early Career Researcher Programme**, largely funded by the Department of Higher Education and Training (DHET) Research Development Grant, was also successfully initiated and piloted in 2013.

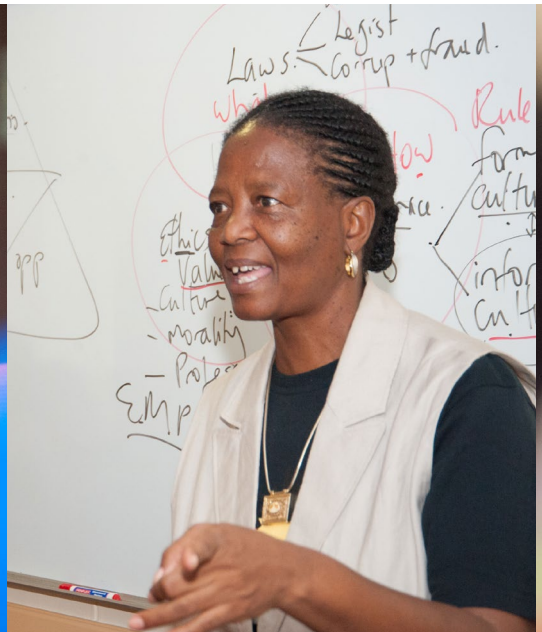
The **Research Grants Management Division** identifies external research funding opportunities and assists researchers with funding applications. Closely associated is the **Research Contracts and Innovation Division** that manages technology transfer, intellectual property, research contracts, THRIP and European Union applications.

The UP income from external research contracts finalised in 2013 increased by 32.5%. The Research Grants Management Division assisted with the submission of two DST/NRF Centres of Excellence applications, of which one was successful. In addition, the majority of applications submitted via this division were to new external funders or new programmes offered by existing funders.

The **International Programmes section** finalises international agreements and manages UP staff exchange and postgraduate student study abroad programmes. Both are central to strengthening UP's partnerships and research networks, and to the increased visibility of researchers.

Each year DRIS nominates UP researchers and post-graduate students for national and international awards. Several nominations were made with the successes including the African Union Kwame Nkrumah Scientific Award, NSTF awards (3) and Women-in-Science Awards (3).

We are pleased with the results from interventions and initiatives introduced in 2013 to support growth in productivity and the impact of UP's research.



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A detailed list of the University of Pretoria's research publications is available on the enclosed CD.