



UNIVERSITEIT  
STELLENBOSCH  
UNIVERSITY

# RESEARCH EXCELLENCE 2014

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## Africa's research leader

Stellenbosch University (SU) is the leading research-driven higher education institution on the African continent.

The University is an innovative, future-focused and inclusive institution, guided by its new Institutional Strategy and Intent 2013-2018. This vision will be achieved by remaining an excellent institution through innovative research, by making a positive impact on our society and on the environment, and by being accessible to students and staff in a welcoming environment.

As its research strategy, SU has set the goal that by 2015 our research output will be characterised by excellence and relevance generated by researchers representing the diversity of South Africa and the African continent. Currently, the research community at Stellenbosch University comprises more than 10 000 postgraduate students, 199 postdoctoral fellows, and 915 academics.

The University's reputation as a leading research institution is confirmed by, among others, the highest number of weighted research outputs per academic staff member of all South African universities, 23 Research Chairs, 347 NRF evaluated researchers, and seven Centres of Excellence.

SU's research output makes the University a leader in Africa. In 2012, SU had the highest per capita publication output units (1.36 units per permanently employed academic) in South Africa. For the fifth consecutive time, SU also

produced the highest weighted research output per capita, with 3.06 units. Also, SU received the second highest number of units (91.56) for books and chapters in books.

SU not only strives for excellence in research, but also towards social relevance in ever-changing contexts. New knowledge is unlocked and put to use to the benefit of society.

**> 2500**  
ACTIVE RESEARCH  
CONTRACTS

This science-for-a-better-society approach is embodied in SU's HOPE Project, which is anchored in the three core functions of the University – research, learning and teaching, and community interaction.

Among the University's achievements, which make it Africa's leading research-driven university, are that SU has become the first university in South Africa to exceed 3 weighted research output units per capita, and now has the highest student success rate of South African Universities.

The areas of research in which SU excel and which enjoy strategic institutional priority are closely aligned with South Africa's national priorities, as well as with the Millennium Development Goals.

Through its research, SU therefore helps to address some of the biggest scientific and societal challenges in South Africa, on the African continent, as well as in the rest of the world.

Vice-Rector: Research and Innovation, Prof Eugene Cloete, supports sustainable academic excellence and social relevance. His portfolio consists of various environments, among which the Division for Research Development (DRD), the Library and Information Services, and the Postgraduate and International Office (PGIO), Telematic Services and Information Technology.

SU is also playing a leading role in Africa in the development of high-level human capacity, through its training of highly skilled and sought-after postgraduate students from across the continent. It has a particularly well-developed and well-documented network of African research collaborators.

Through a sustained investment in our people and research infrastructure, research at SU will continue to influence decision-making processes, make direct contributions to improving the lives of people, generate innovative ideas that lead to technological developments, and devise new concepts of doing, which lead to more sustainable practices.

SU already serves, and will continue to grow into the future, as a flagship research institution that provides hope to Africa and the rest of the developing world.

Stellenbosch University actively positions itself as a leading higher education institution on the African continent with, amongst others:

- an exceptional research community of which many are national and international leaders in their respective research fields;
- a dynamic postgraduate student body and postdoctoral fellows from all over the world;
- a significant number of peer-rated researchers, Research Chairs and Centres of Excellence;
- a top central analytical facility with clients from the academic world and industry;
- the highest number of weighted research outputs per permanent academic staff member in South Africa;
- numerous strategic partnerships with, among others, science councils, industry and national and international research institutions; and
- the most technologically innovative campus in South Africa (as adjudicated by the DST).



# Improving lives through research

## Centres of Excellence and Research Chairs make a difference

With its seven Centres of Excellence and 23 Research Chairs, Stellenbosch University (SU), Africa's leading research institution, is making a contribution towards skills development, promoting collaborative and interdisciplinary

research, and generating research in areas that are regarded as being of national interest.

At SU's Centres of Excellence the existing capacity and resources are concentrated to enable researchers to collaborate across disciplines and across institutions on long-

term projects. These projects are usually locally relevant and internationally competitive to enhance the pursuit of research excellence and capacity development.

These seven centres include, among others, the DST-NRF South African Centre for Epidemiological Modelling and Analysis, the Centre for Renewable and Sustainable Energy Studies, and the DST-NRF Centre for Invasion Biology.

The latest Centre of Excellence at SU is the DST-NRF Centre on Scientometrics and Science, Technology and Innovation Policy, launched in April 2014. This is one of five new centres announced by Science and Technology Minister Mr Derek Hanekom.

The aim of these centres is to promote collaborative and interdisciplinary research among research-performing institutions, and to provide high-end skills development in priority research areas. According to Hanekom, the five new centres will contribute to South Africa's knowledge-generation capacity, increase the number of world-class researchers and attract and retain research excellence.

SU's 23 Research Chairs are positioned strategically around specific research areas where the University is seen as a leader in the field and where existing resources and capacity exist for a focused knowledge and human resource intervention.

7  
CENTRES OF  
EXCELLENCE

23  
RESEARCH  
CHAIRS

These chairs focus on, among others, engineering electromagnetics, economics of social policy, integrated wine sciences, wastewater management, intellectual property, energy research, and meat science.

Eighteen of the 23 Research Chairs were awarded under the South African Research Chairs Initiative (SARChI) of the National Research Foundation (NRF), a flagship initiative of government designed to attract and retain excellence in research and innovation in the South African science system. The main goal is to strengthen universities to produce high quality postgraduate students, research and innovation outputs.



Researchers of Stellenbosch University's Centre for Renewable and Sustainable Energy Studies at work at the Faculty of Engineering.

## Addressing health

South Africa is facing a tuberculosis (TB) problem of such magnitude that this disease has been declared a national health emergency.

The rampant HIV co-epidemic plaguing this country has exacerbated the problem enormously. Although some improvements could be made in controlling TB through reform of existing control programmes, it is widely acknowledged that a quantum leap in the quality of tools for the diagnosis, prevention and treatment of TB will be required if there is to be any hope at all of eradicating this devastating disease.

With a Centre of Excellence and three Research Chairs focusing on research on TB, Stellenbosch University (SU) contributes to addressing the health issues related to TB.

The Centre of Excellence for Biomedical Tuberculosis Research (CBTBR), which forms part of an extensive and collaborative clinical research network, focuses on trying to identify new drug targets and to understand better the biology of the TB bacterium, which enables it to survive in the host and to spread rapidly among humans. The centre searches for ways to shorten the time it takes to evaluate new drugs and vaccines as well as new, multidisciplinary approaches for understanding the occurrence, spread and management of TB.

Established in July 2004 and headed by Prof Paul van Helden, the CBTBR combines clinical grassroots investigations into TB with sophisticated laboratory research that involves various departments and disciplines within and beyond the university campus.

Three Research Chairs at SU also focus on



A researcher of the CBTBR working in the centre's laboratory.

TB: the South African Research Chairs in TB Biomarkers, held by Prof Gerhard Walzl; in Animal Tuberculosis, held by Prof Michelle Miller; and in Mycobactomics, held by Prof Samantha Sampson.

Walzl and his team are working on the discovery of biomarkers that can serve as tools in the fight against TB.

The Chair in Animal Tuberculosis focuses on investigating various aspects of animal tuberculosis, including the human-livestock-wildlife interface, to understand the magnitude of the problem.

The overarching research aim of the Chair in Mycobactomics is to perform in-depth characterisation of clinical strains of *M. tuberculosis* and other mycobacterial species.

## Conserving water

Water is an essential element for the survival of life on Earth. Stellenbosch University (SU) has been at the forefront of research into an array of water-related issues facing the world.

The University's NEPAD Water Initiative and ERWAT Research Chair in Wastewater Management are geared at research relating to water.

The NEPAD Water Initiative forms part of the AU/NEPAD Southern African Network of Water Centres of Excellence Initiative, which focuses on improving the conservation and use of the continent's water resources as well as enhancing the quality and the quantity of water available to rural and urban households.

It helps to strengthen the capacity of South Africa and its neighbouring countries to manage their respective water resources and to reduce impacts of water-related disasters, which can be devastating in some areas. The initiative also tries to enlarge the range of technologies for water supply and to improve access to clean, safe and affordable water.

SU's NEPAD Water Initiative has among its specific goals to:

- improve the conservation and utilisation of the continent's water resources;
- improve the quality and the quantity of water available to rural and urban households;
- strengthen national and regional capacities for water resources management and reduce the impacts of water related disasters; and
- enlarge the range of technologies for water supply and improve access to affordable quality water.



Stellenbosch University is at the forefront of water research.

Sponsored by the East Rand Water Care Company (ERWAT), the Chair in Wastewater Management focuses on innovations in water research, as well as upping water treatment and water management skills in the water sector.

This chair is held by Prof Gideon Wolfaardt, who is a recognised expert and leading researcher in the biological and engineering aspects of water research.

The focus of the ERWAT Chair is on scientific and technical advances in wastewater management, water quality, water use and demand, as well as fostering partnerships to improve the water research and management skills of scientists, engineers and technical personnel.

## Combatting disease

Housed in an old wine cellar on the grounds of the Mostertsdrift Estate, the South African Centre for Epidemiological Modelling and Analysis (SACEMA) is a national research centre established under the Centre of Excellence programme of the national Department of Science and Technology (DST) and the National Research Foundation (NRF).

The centre focuses on research in quantitative modelling of the spatial and temporal patterns of disease. The aim of the research is to understand and predict the development of

various diseases, and thereby to provide advice on how best to combat them.

The research focuses on issues pertaining to HIV, TB and malaria, although not to the exclusion of other epidemiological problems.

The centre follows a "hub-and-spoke" model, with the critical mass of staff at the Stellenbosch head office and various other researchers at sites elsewhere in South Africa.

Closely linked to SACEMA is the SA Research Chair in Mechanistic Modelling of Health and Epidemiology, which Prof Jacky

Snoep currently holds. The focus of this chair is to provide a mechanistic modelling approach with more predictive strength to pharmaceutical drug and intervention steps for individual and public health.

The mathematical models currently used are largely phenomenological, and a prediction of the effect of a pharmaceutical drug for the whole body disease state is not possible. The focus point for application of the mechanistic models is to underpin national scenario modelling for infectious disease epidemiology.

70

JOINT PROJECTS  
WITH OUR NATIONAL  
SCIENCE COUNCILS



# Doctoral studies for a better society

Doctoral students at Stellenbosch University (SU) conduct cutting-edge research of great relevance to society. SU prides itself on the research output of these students across all ten faculties.

In 2013, a total of 240 doctoral degrees were conferred on researchers who investigated a wide range of topics.

Most of these doctoral projects addressed societal challenges.

These included: a study to improve food security among rural people in KwaZulu-Natal; the development of physical, emotional and cognitive tools to help stressed and burnt-out teachers in high-risk schools on the Cape Flats to cope and interact with ill-disciplined

learners; a community health study showing that inadequate sanitation facilities, infectious diseases and environmental pollution are just some of the health risks facing poor people in low-cost housing settlements in Cape Town; and a project highlighting the difficulties disabled people face when looking for work.

To ensure that these projects indeed benefit society, SU decided to equip our best young researchers with science communication skills. The New Voices in Science programme targets graduating PhD students and culminates in an annual competition in which the best science stories are told.

Through the publication *New Voices in Science*, researchers are encouraged to reflect on

their responsibility towards society and engage with the public to create mutual understanding of their work. The talks and articles presented at New Voices are fascinating and informative.

Furthermore, SU's African Doctoral Academy (ADA), a research capacity building programme providing high quality research training and support, assists in producing the next generation of researchers.

The ADA invites scholars in higher education from across the continent to participate in the programme, which includes all fields of science and scholarship.

Its aim is to assist prospective doctoral students with the necessary intellectual and academic tools to become successful scholars

in their respective fields by arranging seminars and dialogues with established and experienced scholars.

Also, the Academy aims to better equip academics for managing and supervising post-graduate students by offering a range of seminars.

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240

PHD DEGREES

CONFERRED IN 2013

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# At the forefront of research

Number of NRF-rated researchers increases each year

Stellenbosch University (SU) currently has the highest number of researchers rated by the National Research Foundation (NRF) in its history – a total of 347. The institution has the second highest number of rated scientists in South Africa.

The NRF rating is used as a national indicator of excellence and is to the advantage of a particular faculty and the University in terms of benchmarking. Also, a successful rating allows researchers the option of applying for incentive funding from the NRF, an amount directly proportional to the researcher's rating.

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2 068

ARTICLES PUBLISHED

IN PEER-REVIEWED

JOURNALS IN 2013

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Over the past 13 years, the number of NRF-rated researchers has consistently grown from 113 in 2001 to 347 in 2014.

Currently, SU has 14 A-rated researchers – three in the Subcommittee A environment (Human and Social Sciences), nine in the Subcommittee B environment (Science, Engineering and AgriSciences) and two in the

Subcommittee C environment (Medicine and Health Sciences).

“With the latest results we currently have 347 rated researchers. This is the most we’ve ever had and a 10% growth from 2013 to 2014. And we expect the number to grow again,” says Ms Maryke Hunter-Hüsselmann, Manager: Research Information and Strategy at SU’s Division for Research Development.

The NRF rating system is a benchmarking system by which individuals, who exemplify the highest standards of research as well as those demonstrating strong potential as researchers, are identified by an extensive network of South African and international peer reviewers. Ratings are based on the quality and impact of recent research outputs (over an eight-year period).

Applications are made either by “established” researchers with a solid track record (categories C, B and A), or by “younger” researchers who show potential to become established within a five-year period (Y), or to become future leaders in their field (P). Ratings are valid for a period of six years.

“The 2014 NRF rating round is now complete and SU has submitted a total of 87 applications. We’ve seen a significant growth in the number of new applications – people who apply for evaluation for the first time; as well as young, up-and-coming researchers who want to direct their research track record in order to apply for rating in a few years’ time,” Hunter-



The work of the DST/NRF Centre of Excellence for Invasion Biology takes researchers literally into the field. Here is Elsje Schreuder filling lizard traps.

Hüsselmann says.

“Researchers regard the NRF evaluation as a benchmark for research excellence and I think the fact that SU offers active support throughout the application process helps that they find the process less intimidating. We’ve also recently started a mentorship programme

through which applications, especially for people applying for the first time, are assisted by rated experts in their field to prepare their application.

“Our success rate is of the highest in the country and we are extremely proud of our NRF-rated researchers.”

## RESEARCHERS IN NUMBERS

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14

A-RATED SCIENTISTS

.....

.....

347

NRF-RATED RESEARCHERS

.....

.....

61%

OF S.U. ACADEMIC STAFF HAS DOCTORAL DEGREES

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## Innovative to our core

Innovation is central to research at Stellenbosch University (SU), with researchers developing cutting-edge technology in fields such as renewable energy and sustainability.

The Centre for Renewable and Sustainable Energy Studies (CRSES), headed by Prof Wikus van Niekerk, focuses on developing and enhancing national capacity in renewable and sustainable energy in support of accelerated and shared economic growth within the area of sustainable energy.

The University’s directional leadership in the high-priority field of energy led to it being awarded this centre, sponsored by the South African National Energy Research Institute and the Central Energy Fund.

The centre makes considerable efforts to involve interested parties in talks on energy provision, in collaboration with the Sustainability Institute on the Spier Estate.

SU also hosts the SA Research Chair in Energy Research, held by Prof Emile van Zyl. The vision for this chair is to establish second-generation technologies for the production of biofuels, specifically through microbial hydrolysis and fermentation, pyrolysis and gasification of lignocellulose.

In support of this vision, the chair has initiated interaction with various role-players

in South Africa to market the activities of the chair, but also to develop partnerships to strengthen the South African biofuels initiative in general.

Recently, South Africa’s renewable energy research capacity has been bolstered through the establishment of the Scatec Solar Chair in Photovoltaic Systems at SU.

The chair is supported by Norwegian global solar energy provider Scatec Solar, which is the first company to supply electricity to South Africa’s national grid under the country’s Renewable Energy Independent Power Producer Programme.

The new chair will enable the University to expand its leading role in renewable energy research in South Africa.

Through SU’s industry interaction and innovation company, InnovUS, technology transfer, entrepreneurial support and development, and innovation is boosted.

The company manages the commercialisation of SU’s innovation and intellectual property



The Concentrating Solar Power (CSP) system with its large mirrors.

portfolio through patenting, licensing and the formation of spin-off companies.

Through the LaunchLab business incubator, InnovUS offers various services to and opportunities for entrepreneurs. InnovUS supports SU’s researchers, students and staff members who wish to commercialise their research output or inventions.

Patents have been registered in the fields of engineering and physical sciences, energy, software and models, life sciences, as well as for medical devices.



# Footprints across the world

## International research collaborations crucial

International research collaboration is a crucial prerequisite for research excellence and research capacity building at Stellenbosch University (SU). Not only do SU researchers play key roles in leading international consortia investigating global issues, but the University is also one of the most successful tertiary institutions partaking in the South African government's bilateral science and technology agreements with more than 30 other countries.

Through activities that focus on the development and management of research partnerships with industry and government, the building and maintenance of international

academic networks, and facilitating access to resources to support research and postgraduate training, SU is continuously expanding its international scope.

Our existing research networks span the globe, and involve public and private sector partners. We have a particularly well-managed and well-documented research network on the African continent, of which the Partnership of Africa's Next Generation of Academics (PANGeA) is a prime example.

PANGeA is a collaborative network of leading African universities developing research capacity and confidence in bringing African expertise to Africa's challenges.

The network aims to develop research capacity on site, offers supervision for and participates in collaborative world class doctoral programmes and advanced research programmes focused on Africa, and offers joint doctoral degree programmes.

Founding partners are the universities of Botswana, Dar es Salaam, Makerere, Malawi, Nairobi and Stellenbosch.

SU is continuously working on further strengthening our strategic and mutually-beneficial global research networks, inter alia through increased participation in research programmes funded through the European Union.

South Africa is already one of the most successful Third World Countries in the EU Framework Programmes, and SU is currently involved in EU Framework Programme partnerships spanning 20 different countries.



*Stellenbosch University's research collaborations span Africa and the rest of the globe.*

Some of our most strategic and ground-breaking work correspond particularly well with the Horizon 2020 focal areas, which include health and wellness; information and communication technologies; energy, environment and sustainability; biotechnology and food; and agriculture.

Horizon 2020 is the EU funding programme for research and innovation for the next six years (2014-2020) with a budget of €70 billion. SU will increase its focus on forming partnerships in order to address some of the major challenges set out in Horizon 2020.

Another international network that was

recently launched is Hope International, which developed out of the notion that institutions of higher education should promote human development and tackle societal challenges through academic and research excellence. The founding members are SU in South Africa, and Dalarna, Gothenburg, Linnaeus and Malmö Universities in Sweden.

Also, launched recently is Hope@Africa, which will see research collaborations for societal change between SU and the Universities of Botswana, Dar es Salaam (Tanzania), Nairobi (Kenya), Namibia, Malawi, and Makerere University in Uganda.

269  
ACTIVE  
COLLABORATIVE  
PROJECTS IN  
36  
AFRICAN COUNTRIES  
WITH  
418  
AFRICAN  
COLLABORATORS

## Building research capacity in Africa

Stellenbosch University (SU) aims to rejuvenate and transform its academic staff cohort over the next decade. It intends to develop its existing early career academic staff members into internationally recognised researchers in their respective fields, and to attract and develop new early-career academics, particularly from the designated groups, to the University.

In achieving this goal, it needs to maintain its reputation as one of the top research universities in the country.

Over the past five years, a focused early research career development programme was

established by SU's Division for Research Development (DRD). This programme currently includes a suite of research skills development workshops (internally funded), a merit awards programme for staff undertaking their doctoral studies in the humanities and social sciences (Andrew W Mellon Foundation funded), several post-graduate and postdoctoral fellowship programmes (various funders), and a mentorship programme for the development of early career researchers (Andrew W Mellon Foundation funded).

SU has recently received a further \$600 000

award over a period of three years from the Andrew W Mellon Foundation. This generous grant is in support of the further expansion of the DRD's early career researcher development programme.

The DRD submitted a proposal for the grant to the foundation following the visit of Dr Earl Lewis, President of the Andrew W Mellon Foundation, to SU in 2013. The grant was awarded in March 2014, and will be used in close collaboration with the academic faculties to develop the research careers of SU's early career academic staff members.

A recent five-year grant of €750 000 awarded to SU by the Gerda Henkel Stiftung (Foundation) in Germany will further support and strengthen intellectual capacity in not only South Africa but across the African continent.

Thanks to this grant, 25 African PhD students will receive three-year full-time scholarships, providing them with broad-based research and scholarship support throughout their studies. SU, through its Graduate School of Arts and Social Sciences, will be the implementing partner of this five-year fellowship grant.

## Making an impact internationally

Among Stellenbosch University's (SU) many international research collaborations, Periperi U represents one of SU's most dynamic academic partnerships, comprising ten universities across Africa. Together, these universities join as Partners Enhancing Resilience for People Exposed to Risks, or Periperi U.

Established in 2006 with five original members, the consortium has grown to ten universities from Algiers to Antananarivo. From the outset the approach has been to work with local capacities in developing local competencies. The Periperi U secretariat is housed at the Research Alliance for Disaster and Risk Reduction (RADAR), a research centre within the Department of Geography at SU.

USAID provides funding and support to Periperi U through its Office of Foreign Disaster Assistance (OFDA).

Periperi U now involves more than 70 academic professionals in a collective effort that:

- establishes new applied bachelors and masters programmes to educate local disaster risk reduction professionals, which has so far produced more than 200 skilled graduates with

a further 400 students on track;

- offers regular, accessible disaster risk-related short courses in local languages to government and civil society practitioners, with over 50 short courses developed and 1 500 practitioners trained;
- performs research on local disaster risks, increasing the knowledge base for disaster risk management planning, including over 100 published articles, theses and reports in French, English and Portuguese; and
- provides opportunities for consortium members to learn from their colleagues' experiences through staff exchange visits.

The original concern and motivation for the establishment of Periperi U was a realisation that in Africa disasters of all kinds and extent undermine development and well-being. Fires, floods and diseases often have severe knock-on effects which are avoidable if the skills, capacity and know-how exist locally.

Periperi U partners are committed to building skilled capacity to reduce these and other local disaster risks. They also recognise that improved risk management is necessary for social and economic development.



### PERIPERI U PARTNERS

- 1 Bahir Dar University, Ethiopia
- 2 Makerere University, Uganda
- 3 Moi University, Kenya
- 4 Ardhi University, Tanzania
- 5 Technical University of Mozambique
- 6 University of Antananarivo, Madagascar
- 7 Stellenbosch University, South Africa
- 8 University of Ghana
- 9 Gaston Berger University, Senegal
- 10 University of Science and Technology Houari Boumediene, Algeria

40 E.U. CONTRACTS

Also read Stellenbosch University's annual *Research at Stellenbosch University* publication, which illustrates exactly how vast the impact of our research is. SU researchers do not only produce excellent academic publications and postgraduate students, but apply their passion for generating new knowledge to make a real difference in the world. To access the virtual copy of this publication, go to: <http://www0.sun.ac.za/research/research-facts/research-related-publications-I.html>. For more information, contact the Division for Research Development at mh3@sun.ac.za or tel: 021 808 4623.