

# ANNUAL REPORT

2015



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# Natural and Agricultural Sciences **Annual Report** **2015**



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Sandbank in dry Caledon river, Tussen-die-Riviere  
Nature Reserve, Bethulie, Free State.

“Twenty-five years ago people could be excused for not knowing much, or doing much, about climate change, today we have no excuse.”  
– Desmond Tutu

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# Message from the Dean

## Foreword

Prof Neil Heideman retired as dean of the faculty in September 2015. We would like to thank him for his endless efforts in taking the faculty forward and we wish him well in resuming his career as an academic. He leaves behind a great legacy, which will not easily be forgotten.

The theme for this annual report is climate change. In 2015, the worst drought in recorded memory occurred in Southern Africa. Globally it was the warmest year since recordkeeping began in 1880. In South Africa, five provinces were declared disaster areas, while the impact of the drought was also felt in the other four provinces. Although El Niño was to blame for the low rainfall, some scientists attributed the higher than normal temperatures to climate change. Although climate change is a natural phenomenon facing the world at large, it is also directly linked to the greenhouse effect stemming from activities related to industries and agricultural food production.

“The theme for this annual report is climate change. In 2015, the worst drought in recorded memory occurred in Southern Africa.”

The UFS Faculty of Natural and Agricultural Sciences makes a valuable contribution to international research on mitigating climate change and its effect on food production. A Memorandum of Agreement in this regard was signed in February 2015 between the University of the Free State (UFS), the Agricultural Research Council (ARC), and the Durban University of Technology (TUT) to establish a Collaborative Consortium entitled “The Development of Underutilised Crops to Broaden the Food Base in Southern Africa”. The main aim of the Consortium, managed by the Department of Plant Sciences, is to fund multidisciplinary research in the development and production of underutilised exotic and indigenous crops and alternative food sources for humans.

Climate change and the consequences thereof are also studied in various other departments in the faculty, some of which are: the economics of climate change adaptation; the influence of climate change on potato production; winter wheat production; the yield decline of coffee plantations in Tanzania; changes and best practices regarding groundwater and water

use; the effect of climate change on agro-ecosystems; and the viability of animal production and livestock economics and the influence thereof on land degradation, poverty, and communities.

As usual, both staff and students excelled in various ways during 2015, winning prestigious awards at conferences and obtaining prominent bursaries and research grants. One of the outstanding achievements is the awarding of the second research chair under the DST/NRF SARChi initiative to the faculty in the division of plant breeding under the leadership of Prof Maryke Labuschagne. Other achievements worth mentioning are:

- Prof Johann du Preez (Department of Plant Sciences) received a Medal of Honour from the South African Academy for Science and Arts for a book co-authored with Profs JG van As, LR Brown, and NJ Smit entitled *Die verhaal van lewe en die omgewing: 'n Afrika-perspektief*.
- Dr Tesfuhoney (Department of Soil, Crop and Climate Sciences) represented the UFS in the Southern Africa Agricultural Model Intercomparison and Improvement Project, which was formed by a multidisciplinary and multi-institutional team from five countries in Southern Africa.
- Ms Wanda Verster (Architecture) was awarded the Erasmus Mundus Mobility Grant, which will allow her to spend the first six months of 2016 at Uppsala University in Sweden.
- Prof Maryke Labuschagne (Department of Plant Sciences) received two Global CEO awards during 2015. She received the “Lifetime Achiever Award: Africa’s Most Influential Women in Business and Government”, as well as the “Continental Lifetime Achiever Award: Education and Training in Africa”.
- Prof Jeanet Conradie (Department of Chemistry) received the South African Chemical Institute Merck Medal in August 2015 for achievement in a specific field of chemistry until 2014. Prof Conradie was also the runner-up in the South African Women in Science Awards.
- Prof André Roodt (Department of Chemistry) was appointed as an international member on the Advisory Board of the Ruđer Bošković Institute (consisting of 14 divisions and centres) in Zagreb, Croatia.
- Prof Paul Grobler (Department of Genetics) was appointed as adjunct professor in the Department of Fish and Wildlife Conservation at Virginia Tech University in the USA, following many years of productive collaboration with the institution.
- Prof Christoph Gauert (Department of Geology) was appointed as a visiting professor at the University of Panzihua (Yunnan, China) in March 2015.
- Prof Max Finkelstein (Department of Mathematical Statistics and Actuarial Science) obtained an A-rating from the NRF.
- Four academic staff members from the Department of Agricultural Economics were selected to join the Prestigious Scholarship Programme of the vice-chancellor, namely Drs Dirk Strydom, Henry Jordaan, Abiodun Ogundeji, and Nicky Matthews.

During 2015, significant academic outputs were recorded by faculty members, with Dr Abdon Atangana from the Institute for Groundwater Studies and Prof Hendrik Swart from Physics as the top performers. In total, 497 articles were published, which resulted in 221 credit units for the faculty. This comprises 38% of the total publication units of the UFS. Unfortunately this is 20 units less than in 2014. However, the number of book and conference contributions rose by eight units to 38.2, with four books and 20 chapters in books being published. Six out of the top seven departments regarding publication outputs are from this faculty, with Chemistry and Physics being the top performers. Staff and students presented their research at 363 national and 222 international conferences, 23 scientific reports were published, and two patents were registered.

A number of initiatives to improve the infrastructure and equipment of the faculty were also completed or launched during 2015 in order to keep up with the demanding international research environment:

- The new Physics building was completed. It hosts four lecture halls that can accommodate 100 students each, but which can also be combined into a single lecture hall to accommodate 400 students. Four new laboratories, several offices, and a video conference room also form part of the new building.
- The office complex for the SADC Groundwater Management Institute (SADCGMI), sponsored by the World Bank, was completed in late 2015.
- Through a joint venture between the faculties of Health Science and Natural and Agricultural Sciences, a Next Generation Sequencer Unit was established at the Medical Faculty. Researchers from different departments will benefit from this Unit, and the prospect of delivering a service to other universities in Africa is also being investigated.
- In order to make the experimental farms economically self-sustainable, a part of the Lengau Agricultural Development Centre will in future be rented to PMI, a private company, for training purposes. Part of the deal includes practical assistance and training offered to students in agriculture.

Well done to everybody who contributed to the academic footprint of the faculty and the UFS as a whole!

It is my pleasure as the new dean to present to you our 2015 annual report. I would like to extend my sincere gratitude to the staff and students for their selfless commitment to make this faculty and university great. I trust that the next few years during my stay in office will be a fantastic experience and I am truly humbled by the trust that was put in me to lead this great science faculty. I want to conclude with the words of S James Shand in 1916: "A university is not a lecture theatre, or a library or a laboratory; it is not a building or a place at all; its essence is a frame of mind ... Where two or three are gathered together in the name of knowledge, there is a university."



Prof Danie Vermeulen

Prof Danie Vermeulen  
Dean of the Faculty of Natural and Agricultural Sciences





# Agricultural Sciences

# Department of Agricultural Economics

## Overview

Training and research activities continued in a number of established fields. The Department of Agricultural Economics offers a variety of modules in three fields – Agricultural Economics, with a scientific foundation; Agricultural Economics, with focus on business; and Agricultural Management. Research activities mainly centre around the fields of sustainable freshwater use for food production, and livestock economics, where the staff and students worked on existing research projects.

From a knowledge dissemination perspective, 2015 was an exciting year for the Department of Agricultural Economics. Staff and students actively participated in international and national activities to strengthen the academic footprint of the department. Members from the department participated in five international conferences, as well as the annual conference of the Agricultural Economics Association of South Africa (AEASA), where research findings were presented as contributed papers. Regular articles were also published in the popular scientific press. Through these activities the department made substantial progress towards achieving its vision of increasing its academic footprint towards becoming the academic department of choice for the industry and the scientific agricultural economics community.

## Achievements

Dr Dirk Strydom, a member of the Vice-Chancellor's Prestige Scholars' Programme (PSP) was presented with the title of 2015 Free State Agriculturalist of the Year. Dr Strydom received the award on 23 October 2015 from the Agricultural Writers' Central Region, a professional association which promotes the image and standards of agricultural journalism in South Africa.

Dr Strydom also received an award in 2015 from the Brahman breeders for his outstanding scientific contribution to their industry.

Prof Johan Willemse won the Rosestad Agricultural award during 2015.

## Student Achievements

Mr Morné Scheepers won the prize for the second best master's thesis at the AEASA conference in 2015.

Mr Moses Lubinga, Drs Abioden Ogundeji, and Henry Jordaan were awarded the prize for the best contributed paper at the AEASA conference in 2015.

## Conferences

The 15<sup>th</sup> World Water Congress was held in Edinburgh, Scotland, from 25–29 May 2015, where one paper was presented.

The beef and sheep conference was hosted by Agri Benchmark in Colombia from 11–18 June 2015. Two staff members participated in the conference.

The 20<sup>th</sup> International Farm Management Congress was held in Quebec, Canada, from 12–17 July 2015, where 17 delegates from the department presented peer-reviewed papers.

The 29<sup>th</sup> International Conference of Agricultural Economists was hosted in Milan, Italy, from 8–14 August 2015. Agricultural Economics staff presented three peer-reviewed papers, as well as one poster.

The 5<sup>th</sup> World Sustainability Forum was hosted in Basel, Switzerland, from 7–9 September 2015, where 11 delegates from Agricultural Economics presented ten peer-reviewed papers.

The 54<sup>th</sup> AEASA conference was held from 29 September to 2 October 2015 at Parys in the Free State. Two papers were presented by delegates from Agricultural Economics. The theme of the conference was "Structure, conduct and performance of the South African Agricultural Economy in a fast changing social, political, and economic environment".

## Research

The research endeavours in the department centre around two broad themes: water-related research, funded by the Water Research Commission (WRC), and research on livestock economics, funded mainly by industry partners. Dr Henry Jordaan is leading a research project which explores the water footprints of selected field and forage crops to inform policy makers, water managers, and water users regarding sustainable freshwater use for food production. Prof Bennie Grové is leading two projects. The first is concerned with the optimisation of electricity and water use for sustainable management of irrigation farming systems. The second is concerned with long-run hydrologic and economic risk simulation and optimisation of water curtailments.

The Unit for Livestock Economics in the Department of Agricultural Economics held an Industry Day on 28 October 2015 to highlight the following research conducted by the Unit:

- Agri-benchmark networking
- The economic impact of predation
- Forecasting the future protein requirements of the animal feed sector
- Establishing cattle future contracts on the JSE/SAFEX
- Price transmission in the red meat value chain

- Precision feedlotting of different cattle breeds for profit maximisation
- The economic impact of stock theft and the economic comparison of cattle production systems
- Establishing a traceability system for red meat products in South Africa
- The importance of Water Footprint research in the livestock sector

The Sernick Research Project was based on Precision Feedlotting by Phillip Oosthuizen for his master's thesis. This project entailed research on feedlot experiments with 11 different cattle breeds regarding types of feed and mass gained by the different breeds. The project was sponsored by Mr Nick Serfontein of Sernick Farm. A Sernick Industry Day was also held on the farm on 29 September 2015 at Edenville, where farmers and agri-businesses could see the cattle used in the feedlot research.

Prof Johan Willemse and Ms Ané Calitz are involved in a research project on traceability systems to develop a framework for an effective, voluntary traceability system for the red meat industry of South Africa.

## Community Service

Quarterly Agricultural Outlook workshops are held by Prof Johan Willemse, where farmers and corporate delegates meet and participate in lively discussions regarding the future market. These Agricultural Workshops started in 2006 and are still very well attended.

South African Futures Exchange (SAFEX) courses are presented by Dr Dirk Strydom to banks, farmers, students, and other agricultural enterprises, and an average of two workshops are held each year. Workshops are also held in other parts of the country where the need arises.

## National and International Collaboration

Dr Henry Jordaan represented the UFS as founding member of the Water Footprint Research Alliance (WFRA) at the launch event of the WFRA at the XV<sup>th</sup> World Water Congress in Edinburgh, Scotland. The WFRA includes leading scientists on Water Footprint Assessment from universities and research institutes from the Netherlands, China, Spain, and South Africa. Together with the Water Footprint Network and University of Twente from the Netherlands, and Northwest Agriculture and Forestry University from China, Dr Henry Jordaan represented the UFS as co-convener of a special session on Water Footprint Assessment at the 15<sup>th</sup> World Water Congress in Edinburgh, Scotland.

## Postgraduate Students

The 2015 registration of postgraduate students totalled 36 honours, 25 master's, and seven PhD students in Agricultural Economics, while eight MSc and MAgri students graduated in December.

## Research Outputs

### Research Articles

**Bahta, Y.T. & Groenewald, J.A.** 2015. The potential of a Southern African common external tariffs regime on the economy of Lesotho. *International Journal of Food and Agricultural Economics* 3(2): 75-89.

**Bergman, M.M., Berger, L., Leisinger, K., Zhang, J., Liu, B. & Bergman, Z.** 2015. How well do Chinese corporate responsibility expectations map onto an international corporate responsibility scale? *Umwelt Wirtschafts Forum (UWF)* 23(4): 191-196.

**Bergman, Z. & Bergman, M.M.** 2015. The imaginary of the train of the future in South Africa: from public access to social exclusion. *World Transport Policy and Practice* 21(3): 23-34.

**El Chami, D. & Daccache, A.** 2015. Assessing sustainability of winter wheat production under climate change scenarios in a humid climate: An integrated modelling framework. *Agricultural Systems* 140: 19-25.

**Huang, J., Xu, C., Ridoutt, B.G. & Chen, F.** 2015. Reducing agricultural water footprints at the farm scale: A case study in the Beijing Region. *Water* 7: 7066-7077.

**Maré, F., Grové, B. & Willemse, B.J.** 2015. Estimating the maximum value of crop hail insurance under stochastic yield and price risk. *Agrekon* 54(4): 28-44.

**Strydom, D.B. & Grove, B.** 2015. Enhancing decision support through calculating utility weighted contract prices: A potato study in South Africa. *Outlook on Agriculture* 44(3): 187-194.



Agricultural workshop held on 10 November 2015, sponsored by Nedbank: Agriculture. From left to right: Dr Dirk Strydom, Prof Johan Willemse, and Mr Marius Volschenk, Area Manager: Agriculture, Nedbank.

### Conference Contributions

**Badenhorst, C.G., Van Niekerk, H.N., Jordaan, H. & Strydom, D.B.** 2015. Factors affecting large livestock predation in the North West Province of South Africa. In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.

**Bahta, Y.T. & Strydom, D.B.** 2015. Measuring the contribution of agriculture to the economy of the Free State province of South Africa. In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.

**Bahta, Y.T., Strydom, D.M. & Donkor, E.** 2015. *Women access to credit: An empirical evidence from Eritrea*. Poster presented at the 29<sup>th</sup> International Conference of Agricultural Economists (ICAE2015), Milan, Italy. 8-14 August.

**Deme, S., Matthews, N. & Henning, J.I.F.** 2015. Analysis of factors affecting technical efficiency of smallholder maize farmers in Ethiopia. In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.

**Durr, J.A., Van Zyl, J.H., Strydom, D.B., Beelders, T.R. & Wium, D.J.** 2015. Branding and packaging of South African White Maize Meal, an eye-tracking case study. In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.

**El Chami, D. & Daccache, A.** 2015. *Sustainability of irrigation wheat under climate change scenarios in a humid climate: A study in the east of England*. Paper delivered at the 5<sup>th</sup> World Sustainability Forum (WSF5), Basel, Switzerland. 7-9 September.

**Henning, J.I.F. & Jordaan, H.** 2015. *Determinants of financial sustainability for farm credit applications: A Delphi study*. Paper delivered at the 5<sup>th</sup> World Sustainability Forum (WSF5), Basel, Switzerland. 7-9 September.

**Henning, J.I.F. & Jordaan, H.** 2015. Investigating factors considered in agricultural credit applications, what are currently considered by commercial bank? In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.

**Hlophe, L.C., Ogundeji, A.A. & Jordaan, H.** 2015. Analyzing the impact of EU trade policy reform on the sustainability of smallholders sugarcane farming in Swaziland. In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.

**Jordaan, H.** 2015. *Water Footprint Assessment towards the sustainable use of freshwater in South Africa*. Paper delivered at the XV<sup>th</sup> World Water Congress of the International Water Resources Association (IWRA): Global water, a resource for development: Opportunities, challenges and constraints, Edinburgh, Scotland. 25-29 May.

**Jordaan, H., Bahta, Y.T. & Sabastain, G.** 2015. Management practices that affect technical efficiency and coping strategies of smallholders maize irrigation farmers in Zimbabwe. In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.



Group photo of delegates from Africa, including staff members from the Department of Agricultural Economics, attending the IFMA conference in Quebec City.



**Jordaan, H., Grové, B. & Matthews, N.** 2015. *Benchmarking freshwater used by smallholder raisin producers: A sub-vector efficiency analysis.* Paper delivered at the 5<sup>th</sup> World Sustainability Forum (WSF5), Basel, Switzerland. 7-9 September.

**Jordaan, H., Grove, B. & Matthews, N.** 2015. Determinants of cost efficiency of smallholder farmers: The case of raisin producers from South Africa. In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.

**Lombard, W.A. & Maré, F.A.** 2015. *The effect of genetic selection on Feedlot profitability: A case study of Sernick Feedlot.* Proceedings of the 20<sup>th</sup> International Farm Management Congress (IFMA2015), Quebec, Canada. 12-17 July. pp. 242-249.

**Lombard, W.A., Van Niekerk, H.N., Geyer, A.C. & Jordaan, H.** 2015. *Variables affecting sheep theft in the Free State of South Africa.* Paper delivered at the 5<sup>th</sup> World Sustainability Forum (WSF5), Basel, Switzerland. 7-9 September.

**Lubinga, M.H., Verschoor, A., Ogundeji, A.A. & Jordaan, H.** 2015. *The impact of the EU-GSP scheme on horticultural exports from Kenya, Tanzania and Uganda: A preference margin approach.* Paper delivered at the 54<sup>th</sup> conference of the Agricultural Economics Association of South Africa (AEASA): Parys, South Africa. 30 September – 2 October.

**Maré, F.A. & Grové, B.** 2015. *Evaluating alternative risk transfer against short term crop insurance as a hail risk management strategy.* Proceedings of the 20<sup>th</sup> International Farm Management Congress (IFMA2015), Quebec, Canada. 12-17 July. pp. 259-267.

**Mare, F.A. & Mare, H.P.** 2015. *Applying a decision support model to investigate the influence of precision agriculture practices on sustainable crop production.* Paper delivered at the 5<sup>th</sup> World Sustainability Forum (WSF5), Basel, Switzerland. 7-9 September.

**Mare, F.A., Grove, B. & Willemse, B.J.** 2015. *Evaluating alternative risk transfer as a crop insurance policy under stochastic yields and prices.* Paper delivered at the 29<sup>th</sup> International Conference of Agricultural Economists (ICAE2015), Milan, Italy. 8-14 August.

**Maré, H.P. & Maré, F.A.** 2015. *A decision support model for the adoption of precision agriculture practices.* Proceedings of the 20<sup>th</sup> International Farm Management Congress (IFMA2015), Quebec, Canada. 12-17 July. pp. 268-280.

**Matthews, N., Jordaan, H. & Grove, B.** 2015. Efficient resource use and farmer-to farmer skill transfers: The case of Eksteenskuil raisin producers, South Africa. In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.

**Matthews, N. & Grove, B.** 2015. *Economic-environmental trade-offs and the conservativeness of the upper partial moment.* Paper delivered at the 29<sup>th</sup> International Conference of Agricultural Economists (ICAE2015), Milan, Italy. 8-14 August.

**Matthews, N. & Grové, B.** 2015. *Evaluating sustainable use of nitrogen fertiliser in Maize production: A South African case study.* Paper delivered at the 5<sup>th</sup> World Sustainability Forum (WSF5), Basel, Switzerland. 7-9 September.

**Mdungela, N., Bahta, Y.T. & Jordaan, A.J.** 2015. *Farmers choice of drought coping strategies to sustain productivity in the Eastern Cape Province of South Africa.* Paper delivered at the 5<sup>th</sup> World Sustainability Forum (WSF5), Basel, Switzerland. 7-9 September.

**Mokhethi, N.I., Bahta, Y.T. & Ogundeji, A.A.** 2015. Trade structure and pattern of wool and mohair export of Lesotho. In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.

**Nieuwoudt, S., Henning, J.I.F. & Jordaan, H.** 2015. Exploring entrepreneurial characteristics of smallholder producers: The case of Eksteenskuil raisin producers. In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.

**Ogundeji, A.A.** 2015. Causality and asymmetry in price transmission mechanism: The case of Namibia mutton market. In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.

**Ogundeji, A.A., Jordaan, H. & Groenewald, J.A.** 2015. *Economics of climate change adaptation: A case of Ceres, Western Cape, South Africa.* Paper delivered at the 29<sup>th</sup> International Conference of Agricultural Economists (ICAE2015), Milan, Italy. 8-14 August.

**Ogundeji, A.A., Jordaan, H. & Groenewald, J.A.** 2015. *The impact of climate change on crop water use and chill unit accumulation.* Paper delivered at the 5<sup>th</sup> World Sustainability Forum (WSF5), Basel, Switzerland. 7-9 September.

**Oosthuizen, P.L. & Maré, F.A.** 2015. *A decision support model to assist cattle feedlots in determining the profit maximizing feeding period for different breed types.* Proceedings of the 20<sup>th</sup> International Farm Management Congress (IFMA2015), Quebec, Canada. 12-17 July. pp. 274-383.

**Scheepers, M., Jordaan, H. & Barnard, J.H.** 2015. *Water footprint of milk production in the Free State Province of South Africa.* Paper delivered at the 5<sup>th</sup> World Sustainability Forum (WSF5), Basel, Switzerland. 7-9 September.

**Strydom, D.B., Meyer, F. & Briedenhann, E.** 2015. Macro analysis of sorghum ethanol production in South Africa. In *Proceedings I, Healthy Agriculture for a Healthy World*, edited by H. Watson, M. Lipari, S. Gendron, M-C. Bouchard, S. Couture and N. Nadeau. Paper delivered at the 20<sup>th</sup> International Farm Management Congress, Quebec City, Canada. 12-17 July.

**Van der Walt, L., Strydom, D.B. & Matthews, N.** 2015. *Stochastic efficiency analysis of alternative white maize post-harvest storage strategies.* Paper delivered at the 54<sup>th</sup> conference of the Agricultural Economics Association of South Africa (AEASA): Parys, South Africa. 30 September – 2 October.

**Van Niekerk, H.N. & Maré, F.A.** 2015. *Agri-benchmark, South African Beef and Sheep Network.* Paper delivered at the Beef and Sheep conference of Agri Benchmark, Vilia Dupa, Colombia. 11-18 June.

**Van Niekerk, H.N. & Strydom, D.B.** 2015. *Sustainability of South African Agricultural Crop Residue Collection for Bio-Energy.* Paper delivered at the 5<sup>th</sup> World Sustainability Forum (WSF5), Basel, Switzerland. 7-9 September.

## Staff

**Professor:** Prof B Grové.

**Affiliate Associate Professor:** Prof M Berman.

**Senior Lecturers:** Drs H Jordaan, N Matthews, A Ogundeji, AC Geyer, DB Strydom, and Mr JJ van Staden.

**Lecturers:** Messrs JIF Henning, WA Lombard, FA Maré, P Mokhatla, HN van Niekerk, and Ms M Venter.

**Junior Lecturer:** Ms P Madende.

**Researchers/Research Assistants:** Messrs J Bezuidenhout, J du Preez, M Ferreira, TW Flanagan, BO Haile, HJ Linde, FJ Loggerenberg, Mss D Bougard, PO Calitz, M Gadisi, JZ Gwebu, VM Letsuku, and MP Mohlotsane.

**Secretary:** Ms LP Hoffman.

**Senior Officers: Professional Services:** Mss C van der Merwe and SC Combrinck.

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# Department of Animal, Wildlife and Grassland Sciences

## Overview

The year 2015 will be remembered in Agriculture circles as the year in which the worst drought in recorded memory occurred in Southern Africa. In South Africa, five provinces were declared disaster areas while several others also felt the impact of the drought. Although El Niño is to blame for the lowest rainfall ever recorded, 2015 was also the hottest year ever recorded. This is a continuous pattern where climate change is the cause of ever higher annual temperatures. The era of climate change, as well as the drought, highlight the importance of expertise in the field of Animal and Grassland Sciences. The impact of the drought will be felt for at least the next five years and staff and postgraduate students of this department are actively involved to try to lower the consequences of both these natural disasters on the viability of animal production.

The year 2015 will also be remembered as the start of the genomic era in animal breeding in South Africa. This department played a leading role in the planning and securing of funds from both government and industry for the initiation of genomics in animal improvement. Nearly all the beef and dairy cattle breeds, as well as all the major universities and the Agriculture Research Council (ARC) are involved in perhaps the biggest breed improvement project ever undertaken in this country. All the data generated through this project will be available to the department.

Research by Dr Francois Deacon involves the equipping of giraffes with GPS collars and will be broadcasted in early 2016 as part of a documentary on National Geographic (DSTV channel 182). The documentary is the first of two on his team's research. Dr Deacon and the team of researchers working with him were the first in the world to equip giraffes with GPS collars, and to conduct research on this initiative. The group of researchers



Students and personnel who attended Grain SA's NAMPO Harvest Day in 2015. They were sponsored by the Animal Nutrition & Health Feed Company (Photo by BB Janecke).

Several research projects in collaboration with the industry are trying to find solutions to ensure food security in the era of climate change. This includes the search for alternative natural food sources and production systems, as well as the development of adapted genotypes and alternative markets to help with the profitability of animal production. Technology and information transfer form an important part of this exercise.

were able to follow the animals night and day by means of the GPS collars, while monitoring their movements from a distance on a computer screen and seeing the world from a giraffe's perspective. Besides their local research on giraffes, Dr Deacon and his team also assist in other projects and research in Namibia, Botswana, Zambia, Kenya, the Democratic Republic of the Congo, and Uganda. Dr Deacon has also been invited to deliver a keynote address in Texas on his innovative research.

## Staff Achievements

Two staff members, Drs Francois Deacon and Paul Malan, received their PhD's during 2015.

Prof FWC Nesor was appointed as a permanent committee member of the World Congress on Genetics Applied to Livestock Production (WCGALP).

The article, "Breeding objectives for Holstein cattle in South Africa" by Dr C Banga, Profs FWC Nesor, and D Garrick, published in the South African Journal of Animal Science, received the David Uys Trophy for the best article published in 2014. This is the second time that an article by Prof Nesor has received this honour.

The article, "Quantifying drylands' drought resistance and recovery: The importance of drought intensity, dominant life history and grazing regime" by Profs J Ruppert, A Linstadter, HA Snyman, Drs K Harmony, Z Henkin, M Sternberg, and W Willms was listed as one of the top 5% best papers published in Global Change Biology.

## Student Achievements

Two master's students, Ms Lené Pienaar and Mr Motshabi Mokolobate, each received an award from the South African Society for Animal Science (SASAS) for an outstanding research project completed. Both these students studied Animal Breeding.

The team from the UFS came fourth in the student quiz held at the SASAS congress in Empangeni, KwaZulu-Natal.

Dr Pieter Swanepoel, a PhD student of Prof Hennie Snyman (co-supervisor), was awarded the best platform presentation at the 49<sup>th</sup> Annual Congress of the Grassland Society of Southern Africa (GSSA).

## Activities

The department is actively involved in both research and technology transfer in the industry it serves. Lectures and presentations on several farmers' days in South Africa and Namibia were made, while research trials sponsored by companies such as Voermol, Molatek, Nutri Feeds, Supreme Chicken, Sernick, and the ARC were completed.

Members of the department are also judges for several competitions held country-wide. Profs Johan Greyling and Hennie Snyman are the judges for the Voermol National Cattle and Sheep Farmer of the Year, while Prof Frikkie Nesor is a judge for the Pick n Pay National Stud Farmer of the Year, the Molatek Commercial Farmer of the year, and the Pick n Pay award for most progress made in the last decade.

Several staff members attended local and international congresses. Profs Frikkie Nesor and Japie van Wyk, as well as Dr Mike Fair attended the European Federation of Animal Science (EAAP) congress in Warsaw,

Poland, where each delivered a presentation. Prof Nico Smit and Dr Paul Malan attended the 23<sup>rd</sup> International Grassland Congress (2015IGC) in New Deli, India, where each delivered a presentation.

Prof Nesor accompanied a group of breed directors and farmers on invitation from Breedplan, South Africa, to Australia, where they visited research facilities at the University of New England, as well as several excellent stud farms.

The congress of the South African Society for Animal Science (SASAS) at Empangeni, KwaZulu-Natal, was also well attended by staff members and students, and 15 oral presentations and posters were made. Several students and members of this department also received awards from SASAS (see Achievements).



Dr Beanelri Janecke and a fieldworker (Jeremy) doing fieldwork in the Kruger Park, accompanied by two game wardens (Moffat and Velly).

Three staff members, Prof Johan Greyling, Dr Paul Malan, and Mr Willie Combrinck accompanied the final-year Animal Science students on a practical tour to the Northern Cape from 28 September to 1 October 2015. Several places were visited (Beefmaster, Christiana; Tri-Star Custom Feeders, Hartswater; Cotton Factory, Hartswater; Pecan & Peanut Factory, Hartswater; Feedpro Animal Feed Factory, Vryburg; Woodside Safaris, Mareetsane; and several farmers). Positive feedback from the students was received.

As part of the practical content of their training, Applied Nutrition of Wild Herbivores and Carnivores students annually gain practical experience during field demonstrations of the natural habitats as well as the identifications of plants, scat (faeces), spoor (tracks), and in situ feeding behaviour of wild herbivores and carnivores. This field experience is in addition to the practical experience gained by the students when studying the ex situ feeding management of indigenous wild animals in the Bloemfontein Zoological Gardens.

## Community Service

Several community projects are supervised by Prof HO de Waal. The first is the two Nguni Cattle projects (Northern Cape and Free State province) which have been effective in the training of black farmers for the past nine years, in conjunction with the Industrial Development Corporation (IDC) and respective provincial departments of agriculture. This project involves more than 90 farmers and more than 1 000 head of registered Nguni cattle

ARC also funded some of the research. The two institutions (UFS and ARC) also share several students. Local collaboration was also extended to other organisations such as the universities of Pretoria and Stellenbosch, the Department of Agriculture (Glen, Elsenburg, and Grootfontein), the majority of breeding societies, Artificial Insemination (AI) stations, Breedplan SA, South African Studbook, and feed companies.



International advisors with Prof HO de Waal and members of the Cactus Pear team at the Agriculture Building, UFS, before departing to Oppermansgronde.

(cows and bulls). The recognition received has been very positive. The use of spineless cactus pear (*Opuntia ficus-indica*) as an important source of animal feed is also being investigated. More than 52 hectares of spineless cactus pear orchards have been established on 26 farms to use as an alternative feed source and also to help resource-poor farmers. Prof HO de Waal and the Cactus Pear team organised and hosted two successful international workshops (Bilateral Mexico-South Africa Workshop, and Development of a cactus pear agro-industry for sub-Saharan Africa workshop) during January 2015.

Research into the impact of predators (black-backed jackal and caracal) on the livestock industry in South Africa is currently being conducted. This problem is estimated to cost the livestock industry in South Africa more than R2 billion annually. An MSc student (Agricultural Economics), with Prof HO de Waal as co-supervisor, graduated in 2014 using the data generated in this project. Prof H Snyman was actively involved in the community with surveys regarding the encroacher bush *Seriphium plumosum* (Slangbos, Vaalbos, or Bankrupt bush) and the impact of fire on plant productivity in arid and semi-arid grasslands, and earned international recognition.

## National and International Collaboration

The collaboration with especially the ARC led to the publishing of three peer-reviewed articles and 11 congress contributions during 2015. The

International collaboration with the National Institute for Agricultural Research (INRA) in France yielded a final report on GXE in Holstein cattle that will be transformed into an article that will be submitted to Genetic Selection Evolution. Dr Vincent Ducrocq from INRA is the co-study leader for a PhD student from this institution.

Most of the researchers in the department acted as reviewers for scientific articles from local and international journals. Prof Johan Greyling served as the Editor-in-Chief for an American research journal (Small Ruminant Research).

## Postgraduate Students

Apart from the postgraduate students who graduated, there are approximately 25 registered postgraduate students (MSc and PhD) in the different disciplines (Animal Nutrition, Animal Physiology, Animal Breeding, and Grassland Science and Wildlife Management) who are in various stages of progress. Research in the department is mostly driven by the postgraduate students. Research primarily focuses on applied research, as identified in collaboration with the relevant industries.

## Research

The department focuses on several broad topics, namely animal breeding, monogastric nutrition (pigs, poultry, hindgut fermenting herbivores, and wild carnivores) and ruminant nutrition (cattle, sheep, goats, and wild

antelopes), animal physiology, grassland science, and wildlife science. Research topics are quite diverse and are applicable to the current problems farmers, producers, and wildlife ranchers face.

Dr Beanelri Janecke leads a group of researchers from seven departments at this university in collaboration with SANParks in a large multidisciplinary project. This research is being conducted in the Kruger National Park on the granite hill slopes, and aims to connect the abiotic and biotic components and processes that drive the catena ecosystem. The Strategic Research Fund of the UFS funded a part of the project during 2015. The project already delivered three postgraduate students, three conference presentations, several unpublished reports, and four publications that are in preparation.

## Staff Matters

Two senior staff members left the university. Dr Gerrie Scholtz resigned on 30 September 2015, while Prof Johan Greyling (Head of the Department) retired at the end of December 2015.

## Research Outputs

### Research Articles

**Deacon, F. & Bercovitch, F.** 2015. Gazing at a giraffe gyroscope: Where do we go from here? *African Journal of Ecology* 53: 135-146.

**Du Plessis, J., Avenant, N.L. & De Waal, H.O.** 2015. Quality and quantity of the scientific information available on black-backed jackal and caracals: Contributing to human-predator conflict management. *South African Journal of Wildlife Research* 45(2): 138-157.

**Imbayarwo-Chikosi, V., Dzama, K., Halimani, T., Van Wyk, J.B., Maiwashe, A. & Banga, C.** 2015. Genetic prediction models and heritability estimates for functional longevity in dairy cattle. *South African Journal of Animal Science* 45(2): 105-126.

**Janecke, B.B. & Smit, G.N.** 2015. Faecal nitrogen of browser and mixed feeder game species during different seasons. *African Journal of Range & Forage Science* 32(3): 203-212.

**Maciel, S.A., Fair, M.D., Scholtz, M.M. & Naser, F.W.C.** 2015. Factors influencing the reproduction and production performance of the Nguni cattle ecotypes in South Africa. *Tropical Animal Health & Production* 48(1): 75-85.

**Pienaar, G.H., Einkamerer, O.B., Van der Merwe, H.J., Hugo, A. & Fair, M.D.** 2015. The effect of an active live yeast product on the digestibility of finishing diets for lambs. *Small Ruminant Research* 123: 8-12.

**Pienaar, L., Naser, F.W.C., Grobler, J.P., Scholtz, M.M. & MacNeil, M.** 2015. Pedigree analysis of the Afrikaner cattle breed. *Animal Genetic Resources* 57: 51-56.

**Ruppert, J., Harmoney, K., Henkin, Z., Snyman, H.A., Sternberg, M., Willms, W. & Linstadter, A.** 2015. Quantifying drylands' drought resistance and recovery: The importance of drought intensity, dominant life history and grazing regime. *Global Change Biology* 21(3): 1258-270.

**Snyman, H.A.** 2015. Fire and the dynamics of two unpalatable grass species (*Cymbopogon pospischillii* and *Elionurus muticus*) in a semi-arid climate. *African Journal of Range & Forage Science* 32(1): 1-12.

**Snyman, H.A.** 2015. Short-term responses of southern African semi-arid rangelands to fire: A review of impact on soil. *Arid Land Research & Management* 29: 222-236.

**Snyman, H.A.** 2015. Short-term responses of southern African semi-arid rangelands to fire: A review of impact on plants. *Arid Land Research & Management* 29: 237-254.

**Swanepoel, P., Du Preez, C.C., Botha, P. & Snyman, H.A.** 2015. A critical view on the soil fertility status of minimum-till kikuyu-ryegrass pastures in South Africa. *African Journal of Range & Forage Science* 32(2): 113-124.

**Swanepoel, P.A., Botha, P.R., Du Preez, C.C., Snyman, H.A. & Labuschagne, J.** 2015. Managing cultivated pastures for improving soil quality in South Africa: Challenges and opportunities. *African Journal of Range & Forage Science* 32(2): 91-96.

**Swanepoel, P.A., Du Preez, C.C., Botha, P.R., Snyman, H.A. & Habig, J.** 2015. Assessment of tillage effects on soil quality of pastures in South Africa with indexing methods. *Soil Research* 53: 274-285.

**Theron, J. & Snyman, H.A.** 2015. Productivity evaluation of *Medicago sativa* cultivars under irrigation in a semi-arid climate. *African Journal of Range & Forage Science* 32(2): 161-171.

**Truter, W., Botha, P., Dannhauser, C., Maasdorp, B., Miles, N., Smith, A., Snyman, H.A. & Tainton, N.** 2015. Southern African pasture and forage science entering the 21st century: Past to present. *African Journal of Range & Forage Science* 32(2): 73-89.



Prof Michiel Scholtz, Mr Motshabi Mokolobate, Ms Lené Pienaar, and Prof Frikkie Naser. Motshabi and Lené received awards from SASAS for outstanding research projects completed.

### Conference Contributions

**Buitendach, G.C., De Witt, F.H., Hugo, A., Van der Merwe, H.J. & Fair, M.D.**

2015. *Long term effect of dietary lipid saturation on eggshell quality and bone characteristics of laying hens*. Poster presented at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.

**Butler, V.P., Smit, G.N. & Janecke, B.B.** 2015. *Relationship between woody canopy cover and habitat utilisation by kudu (*Tragelaphus strepsiceros*) in the central Free State*. Paper delivered at the Southern African Wildlife Management Association (SAWMA) Conference, Kimberley, South Africa. 6-10 September.

**Cadet, A., Patry, C., Van Wyk, J.B., Pienaar, L., Neser, F.W.C. & Ducrocq, V.** 2015. *Comparison of two approaches to account for GxE interactions in South African Holstein cattle*. Paper delivered at the 66<sup>th</sup> Annual Meeting of the European Federation of Animal Science, Warsaw, Poland. 31 August – 4 September.

**De Waal, H.O.** 2015. *Advances in using sun-dried spineless cactus pear (*Opuntia ficus-indica*) as animal feed*. Paper delivered at the Bi-lateral Mexico-South Africa Workshop, University of the Free State, Bloemfontein, South Africa. 23-24 January.

sector. Report delivered to the Bi-lateral Mexico-South Africa Workshop, University of the Free State, Bloemfontein, South Africa. 23-24 January.

**De Waal, H.O., Louhaichi, M., Taguchi, M., Fouché, H.J. & De Wit, M.** 2015. *Development of a cactus pear agro-industry for the sub-Sahara Africa Region*. Paper delivered at the International Cactus Pear Workshop: Development of a cactus pear agro-industry for the sub-Sahara Africa region, University of the Free State, Bloemfontein, South Africa. 27-28 January.

**Deacon, F.** 2015. *South Africa's giraffe status, management principles and the way forward*. Paper delivered at the 3<sup>rd</sup> International Giraffe Indaba of the Giraffe Conservation Foundation (GCF) and the IUCN SSC Giraffe & Okapi Specialist Group (GOSG): Sticking our necks out for giraffe conservation in Africa, Southern Africa Wildlife College, Hoedspruit, South Africa. 23-28 August.

**Deacon, F. & Smit, G.N.** 2015. *Findings from the GPS fitted giraffe on spatial ecology and habitat use in the Kalahari*. Paper delivered at the Southern African Wildlife Management Association (SAWMA) Conference, Kimberley, South Africa. 6-10 September.

**Deacon, F. & Smit, G.N.** 2015. *Findings from the GPS fitted giraffe on spatial ecology and habitat use in the Kalahari*. Paper delivered at the



Students and Prof H.O. de Waal, Drs Nico Avenant, Alarik Jooste, and Mr Willie Combrinck on top of a hill during the annual three-day field excursion to the Tussen-die-Riviere Reserve at the confluence of the Gariep and Caledon rivers in the south of the Free State province.

**De Waal, H.O.** 2015. *Spineless cactus pear (*Opuntia ficus-indica*) fruit preserved on hay and straw as kuilmoes – an animal feed*. Paper delivered at the Bi-lateral Mexico-South Africa Workshop, University of the Free State, Bloemfontein, South Africa. 23-24 January.

**De Waal, H.O.** 2015. *Spineless cactus pear as livestock feed in South Africa*. In: *Development of a cactus pear agro-industry for the sub-Sahara Africa Region*, edited by H.O. de Waal; M. Louhaichi; M. Taguchi; H.J. Fouché and M. De Wit. Proceedings of the International Cactus Pear Workshop: Development of a cactus pear agro-industry for the sub-Sahara Africa region, University of the Free State, Bloemfontein, South Africa. 27-28 January. pp. 30-39.

**De Waal, H.O., Fouché, H.J., De Wit, M., Coetzer, G., Du Toit, A., Swart, A., Rademeyer, R. & Combrinck, W.** 2015. *Sun-dried cactus pear cladodes have the potential to provide some 25% of the basic feed resources required by South Africa's commercial ruminant feed manufacturing*

3<sup>rd</sup> International Giraffe Indaba of the Giraffe Conservation Foundation (GCF) and the IUCN SSC Giraffe & Okapi Specialist Group (GOSG): Sticking our necks out for giraffe conservation in Africa, Southern Africa Wildlife College, Hoedspruit, South Africa. 23-28 August.

**Ducrocq, V., Cadet, A., Patry, C., Van Wyk, J.B., Pienaar, L. & Neser, F.W.C.** 2015. *Two approaches to account for GxE interactions for production traits in South African Holstein*. Paper delivered at the 2015 Interbull Annual Meeting, Interbull Centre, Orlando, Florida. 9-11 July.

**Fair, M.D., Neser, F.W.C. & Van Wyk, J.B.** 2015. *Estimation of genetic parameters of type and production traits for Namibian Brahman beef cattle*. Poster presented at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.

**Foster, L., Fourie, P. & Neser, F.W.C.** 2015. *Effect of different levels of supplementation on the reproduction and profitability of a cow/calf*



*production system in the south-eastern Free State.* Poster presented at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.

**Foster, L., Fourie, P. & Nesar, F.W.C.** 2015. *Effect of different levels of supplementation on beef heifer development in the south-eastern Free State.* Poster presented at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.

**Greyling, J.P.C.** 2015. *Controlled breeding in small stock.* Paper delivered at the 2<sup>nd</sup> International Conference on the Modern Approaches in Livestock's Production Systems (ICMALPS), Alexandria, Egypt. 12-14 October.

**Grobler, S., Scholtz, M.M., Van Rooyen, H. & Nesar, F.W.C.** 2015. *Methane yield from pregnant heifers grazing natural veld and forage sorghum as measured with a Laser Methane Detector.* Poster presented at the 50<sup>th</sup> Annual Congress of the Grassland Society of Southern Africa (GSSA): Advancing Rangeland Ecology and Pasture Management in Africa, Pietermaritzburg, KwaZulu-Natal, South Africa. 21-23 July.

**Horn-Lodewyk, J., Rossouw, S.L., Otto, A.C., Wagener, J., Zeevaart, J., Engelbrecht, G.H.J. & Jooste, A.M.** 2015. *Normal bio-distribution of 99mTc in rabbits and baboons.* Paper delivered at the Faculty Research Forum, Bloemfontein, South Africa. 27-28 August.

**Imbayarwo-Chikosi, V., Ducrocq, V., Banga, C., Halimani, T., Van Wyk, J.B., Maiwashe, A. & Dzama, K.** 2015. *Evaluating the impact of non-genetic factors on functional longevity of South African Holsteins with a Weibull PH model.* Paper delivered at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.

**Janecke, B.B.** 2015. *Variation between seasons and height strata in availability of browse to browsing game species.* Paper delivered at the 50<sup>th</sup> Annual Congress of the Grassland Society of Southern Africa (GSSA): Advancing Rangeland Ecology and Pasture Management in Africa, Pietermaritzburg, KwaZulu-Natal, South Africa. 21-23 July.

**Jonker, G.D., Butler, H.J.B. & Deacon, F.** 2015. *Introduced giraffes outside their comfort zone? Feeding behaviour of giraffes (*Giraffa camelopardalis*) in contrasting habitats.* Paper delivered at the 3<sup>rd</sup> International Giraffe Indaba of the Giraffe Conservation Foundation (GCF) and the IUCN SSC Giraffe & Okapi Specialist Group (GOSG): Sticking our necks out for giraffe conservation in Africa, Southern Africa Wildlife College, Hoedspruit, South Africa. 23-28 August.

**Jordaan, F.J., Scholtz, M.M., Nesar, F.W.C. & Maiwashe, A.** 2015. *Phenotypic changes in the cow productivity of landrace beef breeds and its environmental impact.* Poster presented at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.

**Matebesi-Ranthimo, P., Cloete, S., Van Wyk, J.B. & Olivier, J.** 2015. *Genetic parameters of ewe reproduction, body weight and scrotal traits in the Elsenburg Merino flock.* Poster presented at the 66<sup>th</sup> Annual Meeting of the European Federation of Animal Science, Warsaw, Poland. 31 August – 4 September.

**Mey, J., De Witt, F.H., Einkamerer, O.B. & Fair, M.D.** 2015. *Evaluating the efficiency of two exogenous 6-phytase enzymes on broiler production.* Poster presented at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.

**Mokolobate, M.C., Scholtz, M.M. & Nesar, F.W.C.** 2015. *Genetic parameter for kilogram calf weaned per large stock unit as trait of the dam to improve beef cow efficiency.* Paper delivered at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-

Natal, South Africa. 21-23 September.

**Motolwana, A.S., Fourie, P.J., De Witt, F.H. & Fair, M.D.** 2015. *Effect of dietary inclusion level of diatomaceous earth on production and carcass characteristics of broilers.* Poster presented at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.

**Myburgh, T., Malan, P.J. & Snyman, H.A.** 2015. *Soil seed bank study on abandoned fields in semi-arid rangeland of South Africa.* Poster presented at the 23<sup>rd</sup> International Grassland Congress (2015IGC), New Delhi, India. 20-24 November.

**Ngayo, M., Fair, M.D., Nesar, F.W.C. & Scholtz, M.** 2015. *Factors affecting beef cow longevity.* Poster presented at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.

**Paulse, J., Cupido, C., Couldridge, V. & Deacon, F.** 2015. *The diet and ecology of introduced giraffe in subtropical thicket vegetation within the Little Karoo region of South Africa.* Paper delivered at the 3<sup>rd</sup> International Giraffe Indaba of the Giraffe Conservation Foundation (GCF) and the IUCN SSC Giraffe & Okapi Specialist Group (GOSG): Sticking our necks out for giraffe conservation in Africa, Southern Africa Wildlife College, Hoedspruit, South Africa. 23-28 August.

**Paulse, J., Cupido, C., Couldridge, V. & Deacon, F.** 2015. *The diet and ecology of introduced giraffe in subtropical thicket vegetation within the Little Karoo region of South Africa.* Paper delivered at the 50<sup>th</sup> Annual Congress of the Grassland Society of Southern Africa (GSSA): Advancing Rangeland Ecology and Pasture Management in Africa, Pietermaritzburg, KwaZulu-Natal, South Africa. 21-23 July.



Prof FWC Nesar, Dr C Banga, and Prof D Garrick received the David Uys Trophy for the best article published in the South African Journal of Animal Science in 2014.

**Pienaar, L., Macneil, M., Scholtz, M.M. & Nesar, F.W.C.** 2015. *Estimating breed purity for six cattle breeds in South Africa.* Paper delivered at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.

**Scholtz, M.M., Nesar, F.W.C. & Mokolobate, M.C.** 2015. *The farm gate water footprint of beef production systems in South Africa.* Paper delivered at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.

- Smit, G.N. & Janse van Rensburg, G.** 2015. *Vegetation dynamics in relation to land use within the high altitude alpine grasslands of Lesotho, southern Africa*. Paper delivered at the 23<sup>rd</sup> International Grassland Congress (2015IGC), New Delhi, India. 20-24 November.
- Smit, G.N., Janse van Rensburg, G., Deacon, F. & Smit, Z.M.** 2015. *Vegetation monitoring on the property of the Sishen South (Kolomela) mine, Postmasburg*. Paper delivered at the Southern African Wildlife Management Association (SAWMA) Conference, Kimberley, South Africa. 6-10 September.
- Smit, G.N., Smit, Z.M. & Du Preez, P.J.** 2015. *The importance of stocking rate, habitat and feeding preferences of game species for effective veld management in a semi-arid environment*. Paper delivered at the Southern African Wildlife Management Association (SAWMA) Conference, Kimberley, South Africa. 6-10 September.
- Snyman, H.A. & Malan, P.J.** 2015. *Defoliation impact on the above- and belowground productivity of Festuca arundinaceae Schreb.* Poster presented at the 23<sup>rd</sup> International Grassland Congress (2015IGC), New Delhi, India. 20-24 November.
- Swanepoel, P.A., Botha, P., Du Preez, C.C. & Snyman, H.A.** 2015. *Evaluation of tillage effects and soil quality of kikuyu-ryegrass pasture*. Paper delivered at the 50<sup>th</sup> Annual Congress of the Grassland Society of Southern Africa (GSSA): Advancing Rangeland Ecology and Pasture Management in Africa, Pietermaritzburg, KwaZulu-Natal, South Africa. 21-23 July.
- Swanepoel, P.A., Botha, P., Du Preez, C.C. & Snyman, H.A.** 2015. *Impact of fertilization on the chemical quality of cultivated pasture soil*. Paper delivered at the 50<sup>th</sup> Annual Congress of the Grassland Society of Southern Africa (GSSA): Advancing Rangeland Ecology and Pasture Management in Africa, Pietermaritzburg, KwaZulu-Natal, South Africa. 21-23 July.
- Swanepoel, P.A., Botha, P., Du Preez, C.C. & Snyman, H.A.** 2015. *Benefits and challenges of no-tillage pasture systems: Lessons from soil quality assessment*. Paper delivered at the International Soil Management Symposium, Stellenbosch, South Africa. 5-6 November.
- Swanepoel, P.A., Botha, P.R., Du Preez, C.C. & Snyman, H.A.** 2015. *Evaluation of tillage effects and soil quality of kikuyu-ryegrass pastures*. Paper delivered at the 50<sup>th</sup> Annual Congress of the Grassland Society of Southern Africa (GSSA): Advancing Rangeland Ecology and Pasture Management in Africa, Pietermaritzburg, KwaZulu-Natal, South Africa. 21-23 July.
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- Swanepoel, P.A., Botha, P.R., Du Preez, C.C. & Snyman, H.A.** 2015. *Benefits and challenges of no-tillage pasture systems: Lessons from soil quality assessments*. Paper delivered at the International Soil Management Symposium, Stellenbosch, South Africa. 5-6 November.
- Swanepoel, P.A., Botha, P.R., Du Preez, C.C. & Snyman, H.A.** 2015. *Nutrient loading of pasture soil in the temperate dairy production region of South Africa*. Paper delivered at the International Soil Management Symposium, Stellenbosch, South Africa. 5-6 November.
- Swanepoel, P.A., Du Preez, C.C., Botha, P.R. & Snyman, H.A.** 2015. *A soil quality index for pastures in South Africa*. Paper delivered at the Combined Congress of the Soil Science Society of South Africa (SSSSA), the South African Society of Crop Production (SASCP), the South African Society of Horticulture Sciences (SASHS), and the Southern African Weed Science Society (SAWSS), George, South Africa. 19-22 January.
- Taylor, J.M., Smit, G.N. & Taylor, R.** 2015. *Acacia nilotica bush encroachment in KwaZulu-Natal's savannas: using science to guide management*. Paper delivered at the Southern African Wildlife Management Association (SAWMA) Conference, Kimberley, South Africa. 6-10 September.
- Theunissen, A., Macneil, M., Scholtz, M.M. & Neser, F.W.C.** 2015. *Crossbreeding to increase beef production: Breed-specific effects on sensory properties*. Paper delivered at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.
- Thutwa, K., Van Wyk, J.B., Cloete, S., Scholtz, A., Cloete, J. & Dzama, K.** 2015. *Breed effects and (co)variance ratios for early live weight and tick count in sheep*. Poster presented at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.
- Thutwa, K., Van Wyk, J.B., Cloete, S., Scholtz, A., Cloete, J. & Dzama, K.** 2015. *Breed effects and genetic parameters for early live weight and tick count in sheep*. Poster presented at the 66<sup>th</sup> Annual Meeting of the European Federation of Animal Science, Warsaw, Poland. 31 August – 4 September.
- Van Wyk, J.B., Cloete, S., Matebesi, P.A. & Olivier, J.** 2015. *Genetic parameters of ewe reproduction, body weight and scrotal traits in the Elsenburg Merino flock*. Poster presented at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.
- Williams, R., Scholtz, M.M., Fair, M.D. & Neser, F.W.C.** 2015. *Identifying suitable future South African areas for milk production of Holstein cows on pastures*. Poster presented at the 66<sup>th</sup> Annual Meeting of the European Federation of Animal Science, Warsaw, Poland. 31 August – 4 September.



## Staff

**Professors:** Profs JPC Greyling, HO de Waal, FWC Nesor, HA Snyman, GN Smit, and JB van Wyk.

**Senior Lecturer:** Dr AM Jooste.

**Lecturers:** Drs F Deacon, MD Fair, PJ Malan, GDJ Scholtz, Messrs FH de Witt, and OB Einkamerer.

**Junior Lecturers:** Dr BB Janecke and Mr MB Raito.

**Affiliated Professors:** Profs M MacNeil, A Maiwashe, TL Nedambale, and MM Scholtz.

**Technician:** Mrs JAM van der Merwe.

**Chief Officer:** Mr WJ Combrinck.

**Officer: Professional Services:** Mr G Janse van Rensburg.

**Senior Officers:** Mss HMF Linde and EJC Nel.

**Assistant Officer:** Ms NAK Green.

**Technical Assistants:** Messrs NK Long and SA Rowles.

**Messenger:** Mrs MV Moses.

**Cleaner:** Mrs NM Mokoallo.

## Contact Details

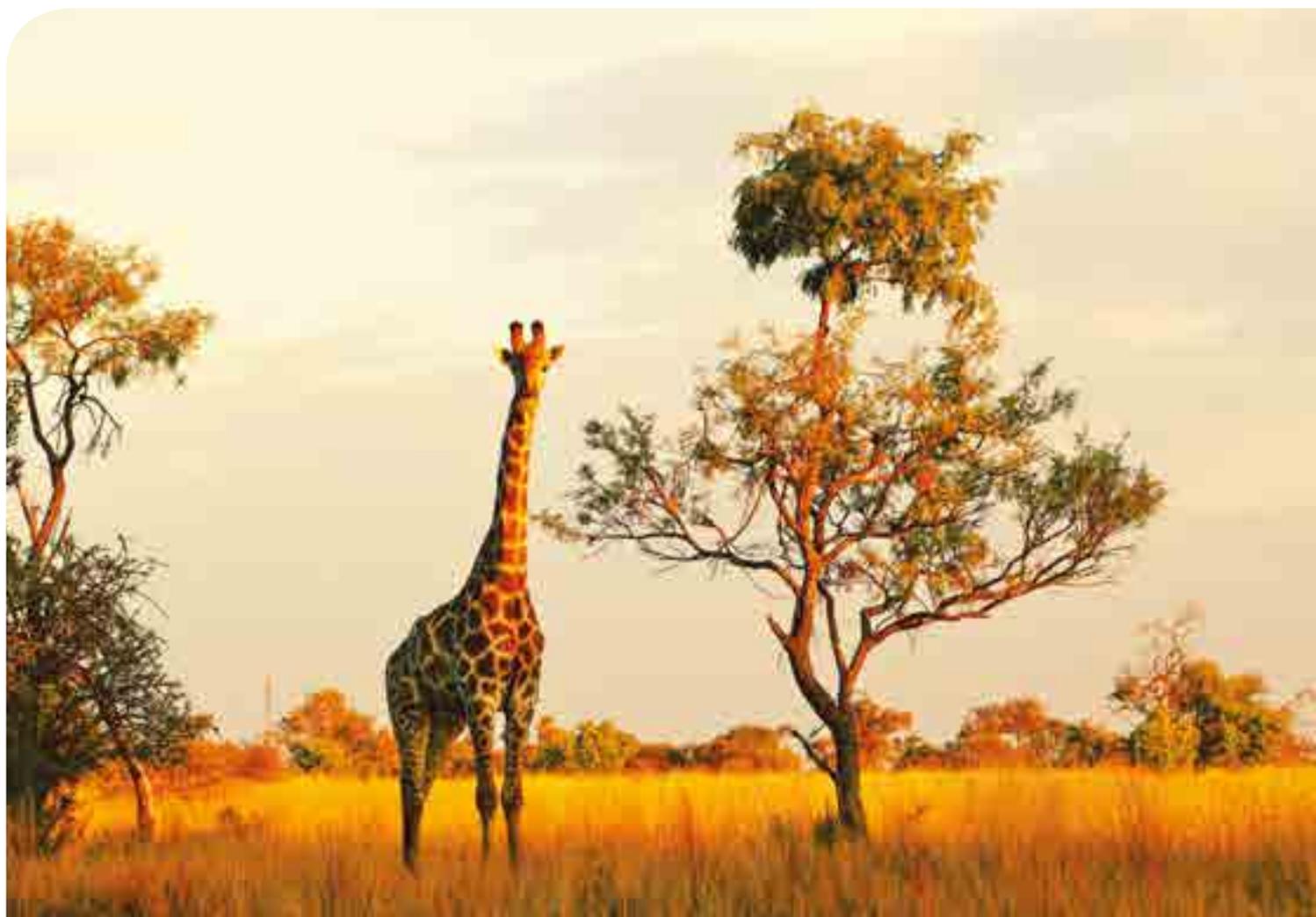
**Prof Frikkie Nesor**

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# Department of Plant Sciences

## Overview

The Department of Plant Sciences consists of three disciplines, namely Botany, Plant Breeding, and Plant Pathology. All three divisions offer both undergraduate (BSc and BScAgric) and postgraduate training in an enabling environment for global competitiveness and local relevance. Personnel are involved in research programmes in various fields of specialisation, where they collaborate with a cadre of both local and international researchers. Students and personnel visited various institutes in Africa, Australia, Europe, Asia, and the Far East, and also hosted researchers and exchange students from various countries around the world. The commitment of the department to teaching and training is manifested in the achievements of both students and lecturers, as well as the research outputs in various national and international peer-reviewed journals. In 2015, the department hosted 101 postgraduate students, of whom 17 obtained their BScHons degrees, nine their MSc degrees, and six were conferred doctoral degrees.

## Staff Achievements

Prof Maryke Labuschagne received two Global CEO awards during 2015. She received the “Lifetime Achiever Award: Africa’s Most Influential Women in Business and Government”, as well as the “Continental Lifetime Achiever Award: Education and Training in Africa”.

Prof Johann du Preez received a Medal of Honour from the South African Academy for Science and Arts for a book co-authored with Profs JG van As, LR Brown, and NJ Smit entitled *Die verhaal van lewe en die omgewing: 'n Afrika perspektief*.

In February 2015, a Memorandum of Agreement (MoA) was signed between the UFS, the Agricultural Research Council (ARC), and the Durban University of Technology (DUT) to establish a Collaborative Consortium (CC). In terms of this agreement, the ARC will collaborate with the UFS and DUT in addressing certain priority areas of the ARC and the National Development Plan of South Africa. The three partners will fund multidisciplinary research within the context of the fourth priority area of the ARC, which focuses on the development of underutilised crops to address climate change. A Steering Committee consisting of senior researchers from the three institutions was established to oversee and direct the activities of the CC. Prof Wijnand Swart was appointed as the Principal Investigator responsible for managing the CC. The title of the project is “The Development of Underutilised Crops to Broaden the Food Base in southern Africa”.

## Student Achievements

- Ms Nicola Theron (final-year student in Plant Pathology) attended the World Youth Summit in Australia.
- Mr Linde de Jager won the medal for best MSc presentation and Mr Williams Esuma won the medal for best PhD presentation at the 11<sup>th</sup> Annual Postgraduate Symposium hosted by the Department of Botany and Plant Biotechnology at the University of Johannesburg on 27 October 2015.
- Mr Howard Castelyn attended the 14<sup>th</sup> International Cereal Rusts and Powdery Mildew Conference (ICRPMC) in Helsingør, Denmark. He received a bursary and an invitation to present a paper at the ICRPMC in Denmark.
- Ms Ansori Maré was awarded the Captain Scott Medal for best MSc dissertation in Plant Sciences from the South African Academy for Science and Arts.
- Ms Lisa Coetzee attended the International Student Festival in Trondheim, Norway.
- Ms Ingrid Allemann was awarded a joint first place in the MSc dissertation category during the national Three Minute Thesis Competition.
- Mr Tonny Selinga acted as president of the UFS Postgraduate School Council and Ms Kamogelo Dithebe was elected as the new president of the UFS Postgraduate School Council.

## Activities

### Botany: Plant Physiology/Biochemistry and Molecular Biology

Research emphasis in this section is on molecular and physiological aspects of plant disease resistance and enhanced plant growth. The main body of Dr Botma Visser’s research addresses the genotypic characterisation of rusts of wheat, namely stem, stripe, and leaf rust. He employs both microsatellites and quantitative polymerase chain reaction (qPCR) techniques to determine the genetic relationships between individual races, as well as field isolates that represent the general South African population. A related project involves the distribution of the alternate host of stem and stripe rusts in the country, namely *Berberis* spp. Dr Visser’s research team is performing a general survey to investigate which of the susceptible *Berberis* species occur in South Africa and whether that could pose a future problem for the wheat industry.

Dr Lintle Mohase and her research group continued work on plant defence mechanisms in wheat to insect (aphid) infestations. Her study focuses on the impact of aphid infestations on yield and quality, as well as the effect of commercial plant activators on priming plants for enhanced resistance to the Russian wheat aphid (*Utraphis noxia*).



Dr Marieta Cawood's research focuses on extraction, identification, and utilisation of plant secondary metabolites in agricultural and medicinal fields.

Dr Gerhard Potgijter focuses his research on the fields of seed physiology and the evaluation of bio-catalytic compounds in hydroponic setups. His research on seed physiology entails the control of reserve mobilisation in lipid-rich seeds, focusing on the role of oxygen in lipid degradation. His research also focuses on the evaluation of natural compounds from different plants for potential bio-catalytic activity using controlled hydroponic setups. Currently, the effect of secondary metabolites excreted by the symbiotic soil fungus *Trichoderma* on the capacity and function of photosynthesis on hydroponically grown crops are being investigated.

#### **Botany: Plant Taxonomy and Molecular Systematics**

The Plant Taxonomy and Molecular Systematics research group is headed by Drs Lize Joubert and Mariëtte Jackson. Research in this group focuses on the phylogenetic relationships between certain groups or genera mostly within the family Asteraceae. The Southern African species of genus *Senecio* are currently being investigated in collaboration with Dr M Koekemoer (South African National Biodiversity Institute). Additionally, the genus *Crabbea* (Acanthaceae) is being revised with regard to its taxonomy and molecular classification.

#### **Botany: Paleo-Botany and Ecology**

Prof Louis Scott continued his research in Paleo-botany. Due to his world-renowned research in this field, he once again hosted an exchange student from Canada.

Prof Johann du Preez is a member of the VEGMAP committee which is responsible for updating the vegetation map of South Africa. He has been busy refining the vegetation map of the Free State. His research continues to focus on vegetation science with emphasis on the classification of the plant communities in the Grassland, Nama-Karoo, and Savanna biomes of the interior of South Africa. The project will have a significant impact on the knowledge and management of the biodiversity of the South African interior.

#### **Plant Breeding: Molecular Plant Breeding**

Prof Liezel Herselman's research continued to make progress towards the introgression of different rust resistance genes (stem, stripe, and leaf rust), as well as *Fusarium* head blight (FHB) resistance into South African wheat cultivars. This research was presented by Prof Herselman and one of her doctoral students, Ms Ansori Maré, at three international conferences focusing on wheat rusts held in Helsingør, Denmark, and Sydney, Australia. Resistance breeding is accomplished using marker-assisted backcrossing, fungal gene expression analyses, and phenotypic evaluations in the greenhouse and field, production of doubled haploid plants, and biochemical screening of breeding lines. New promising lines are continuously being developed and identified for use in other breeding programmes.

Dr Adré Minnaar-Ontong's research focuses on the genetic variation of *Sclerotinia sclerotiorum* populations in South Africa (National Research Foundation-Thuthuka funded project). This project is a continuation of a previous project on the population genetics of *Sclerotinia sclerotiorum* on different hosts. The outcome of the project will be valuable towards the

development of a breeding programme for resistance to this pathogen in economically important oil crops. She also collaborated with Dr Rouxlène van der Merwe on breeding for resistance to pod dehiscence in a vegetable-type soybean (in collaboration with the Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences).

#### **Plant Breeding: Wheat Quality and Crop Nutritional Value Research**

Prof Maryke Labuschagne continued with her research on wheat quality and the influence of environmental conditions on gluten proteins. Postdoctoral fellow Dr Joyce Moloï completed the analysis of proteins under abiotic stress conditions using reverse phase high performance liquid chromatography. Drs Moloï and Van Biljon as well as Prof Labuschagne are in the process of finalising a project on the screening of iron and zinc content in South African commercial bread wheat cultivars. Dr Angeline van Biljon continued her research on nutritional value and beta-carotene analysis of staple crops. Prof Labuschagne and Dr van Biljon spent a few days at the International Institute of Tropical Agriculture (IITA) in Nigeria and interacted with scientists on beta-carotenoid research. Dr van Biljon



Dr Van der Merwe visiting soybean trials in KwaZulu-Natal with visitors from China. From right to left: Mr Armand Smit (PhD Student), Dr Rouxlène van der Merwe (front), and Chinese soybean breeders from the Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences.

started a project that focuses on the identification of genetic diversity for nutritional value in amaranth and cleome in collaboration with Mr W Janse van Rensburg and Dr S Mavengahama from the ARC-Vegetable and Ornamental Plants Institute (ARC-VOPI).

Dr Rouxlène van der Merwe continued her research on the newly initiated breeding programme on soybeans for human consumption, called Edamame, in collaboration with Dr M Smit of the Edamame Development Project in Durban and the Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences.

#### **Plant Pathology: Cereal Rust Diseases**

Prof Zakkie Pretorius had an eventful year with attendance of the South African Society for Plant Pathology (SASPP) conference in Bloemfontein and international cereal rust meetings in Denmark and Australia. In addition,

he was part of an international team that presented a course on the “Art and science of rust pathology and applied plant breeding” in Kathmandu, Nepal. Two of his students, Mr Howard Castelyn (promoter) and Ms Hester van Schalkwyk (co-promoter), excelled in being awarded oral presentations at the Helsingør and Sydney conferences respectively. The rust group completed another year of successful risk assessment of South African wheat varieties to rust infection and made substantial progress in research projects funded locally or by international agencies. His group continued their greenhouse and field studies on the three primary rust diseases of wheat. Projects included genetic mapping of stripe rust and stem rust resistance, remote sensing techniques to optimise phenotyping of field plots, assessment of rust response in recombinant lines with resistance derived from *Aegilops* and *Thinopyrum* spp., evaluation of South African and Australian wheat and triticale germplasm to Ug99 stem rust, and inheritance studies of stem rust resistance in local varieties.

#### **Plant Pathology: Mycology**

Dr Gert Marais leads the mycology group that focuses mainly on the biodiversity of fungi and their possible application and economic exploitation. Studies are also conducted on *Penicillium* species associated with the maize-milling process to understand the possible production of mycotoxins and how levels of these fungi and their toxins can be controlled.

Dr Mariëka Gryzenhout continued her research on disease- and mycotoxin-producing fungi of the *Fusarium* and *Alternaria* genera in plants. Her focus is on the diagnostics of these various species and she is developing identification schemes to rapidly identify these groups.

#### **Plant Pathology: Epidemiology**

The Field Crops Epidemiology Programme is led by Prof Neal McLaren. In collaboration with the Norman Borlaug Institute for International



Staff and postgraduate students attending the 11<sup>th</sup> Annual Postgraduate Symposium hosted by the Department of Botany and Plant Biotechnology at the University of Johannesburg. From left to right: Williams Esuma, Linde de Jager, Jared Osando, Palesa Mmereki, Rinette Labuschagne, Drs Botma Visser, and Rouxlène van der Merwe.

#### **Plant Pathology: Soil Microbial Ecology**

The Soil Microbial Ecology Programme is led by Prof Wijnand Swart. The focus of this programme is on adopting a total system or phytobiome approach to plant health management by utilising the functional diversity of fungi and bacteria, above and below ground, as bio-indicators of soil and plant health. Students in his lab continued to investigate qualitative and quantitative responses of microbial diversity to various agricultural practices that impact plant and soil health. Various biochemical- and molecular-based techniques were utilised by the group to monitor and assess the diversity of microbes in the soil, with emphasis on the rhizosphere microbiome.

Agriculture and Texas A&M Agrilife Research, the programme focuses on the root health of sorghum and optimum utilisation of resources in rotation with bambara, cowpea, dry bean, and soybean cropping systems. A second collaborative programme with these institutions focuses on the adaptation of sorghum germplasm to local environmental and production conditions, with emphasis on the selection of sources of resistance to primary sorghum diseases. These collaborations have formed the basis of an MSc study and three PhD studies. Further research support is received from the Sorghum Trust and this supported project emphasises sorghum plant and grain characteristics and their relationship with grain colonisation by grain mould pathogens and mycotoxigenic *Fusarium* spp. The stability of these relationships and the expression of resistance under



changing environments are being studied using genotype x environment analyses and disease prediction modelling.

The Sorghum Trust project also includes prediction modelling and intervention technology optimisation for sorghum leaf blight, which is a growing local production constraint. Prediction modelling is also being applied to Sclerotinia stem and head rot of soybean and sunflower, the latter project funded by the Sasol Trust. Dry bean and soybean cultivars are being evaluated for disease resistance, primarily to Sclerotium rot caused by *Sclerotium rolfsii*, with a focus on the interactions with nematodes and potential disease suppression with nematicides, as well as the potential of mycorrhizal fungi in induced resistance to infection. During the season, collaborators from Texas A&M visited the trials, including Dr Jamie Foster (Principal Investigator (PI) for cow pea), Dr BB Singh (cowpea breeder), Dr J Asiwa (food scientist), Dr F Workneh (plant pathologist), and Dr G Peterson (PI sorghum programme and sorghum breeder). Dr M Chisi (ZamSeeds sorghum breeder) from Zambia is also a collaborator, a regular visitor to the trial sites and UFS, and has also included germplasm from his programme in the local sorghum programme.

## Community Service

Dr Marieta Cawood assisted Ms Bianca Hamilton on a project entitled “Keep your blood flowing freely with Rooibos tea”. The project was presented at the Regional Expo for young scientists and won the award for the best girl’s project and the best project on the floor. Bianca received a bursary worth R10 000 from the UFS and was invited to participate in the International Science Fair in Boksburg, where she received a silver award.

Dr Lintle Mohase was a member of the adjudication team for the science projects in the Eskom Expo for Young Scientists 2015, held 13–14 August 2015.

## National and International Collaboration

### National

Dr Gert Marais monitors plant pathogenic fungi in pecan orchards in collaboration with the South African Pecan Producers’ Association (SAPPA). He also screens *Penicillium* species from South African environments for their ability to produce flavours and fragrances, as well as pigments, in collaboration with Mr Du Toit Schabert from the Department of Microbiology, Biochemistry and Food Biotechnology at the UFS.

Dr Mohase continued her collaborative research with entomologists from the UFS (Prof S vdM Louw) and the Agricultural Research Council Small Grain Institute (ARC-SGI) in Bethlehem (Dr A Jankielsohn) on the spread of the Russian wheat aphid (*Diuraphis noxia*) and the impact of commercial plant activators on wheat performance during aphid infestations.

Dr Marieta Cawood collaborates with various national scientists, including Drs J Alleman (Soil, Crop and Climate Sciences, UFS), A Jankielsohn (ARC-

SGI), S Bonnet (Chemistry, UFS), W Janse van Rensburg (Haematology and Cell Biology, UFS), and Prof ZA Pretorius (Plant Pathology, UFS).

Dr Rouxléne van der Merwe collaborates with Dr Michiel Smit, Pannar Seed Company, and the ARC-Grain Crops Institute (ARC-GCI) on the soybean breeding project through the Edamame Development Programme.

Dr Angeline van Biljon collaborates with Mr Willem Janse van Rensburg and Dr Sydney Mavengahama (ARC-VOPI) on a project funded by the ARC-CC, and continued her collaborative research with various scientists at the Southern African Grain Laboratory, ARC-SGI, and ARC-GCI.



Dr Marieta Cawood assisted Ms Bianca Hamilton on a project presented at the Regional Expo for young scientists. From left to right: Dr Marieta Cawood, Bianca Hamilton, and Dr Cronje.

Prof Zakkie Pretorius and Dr Botma Visser collaborate with Prof Johannes van Staden, Director of the Research Centre for Plant Growth and Development at the University of KwaZulu-Natal in Pietermaritzburg, on smoke and growth regulators. Prof Zakkie Pretorius’ other projects were conducted in collaboration with CenGen, ARC-SGI, Sensako, and Pannar. Prof Van Staden visited the department on 30 September 2015 to strengthen collaboration and to present a talk entitled “Growth ‘regulators’ produced by fire”, thereby emphasising the positive regenerative capacity of veld fires which are generally thought to be only destructive.

Prof Wijnand Swart collaborated with Drs Pia Addison, Mathew Addison, and Prof Des Conlong (Professor Extraordinary) in the Department of Conservation Ecology and Entomology at Stellenbosch University on general soil ecology to secure a grant from the Ekhaga Foundation in Sweden.

Prof Swart is also in close collaboration with various researchers such as Drs Sonja Venter and Dean Oelofse at the ARC-VOPI and Dr Eric Amonsou at the DUT on aspects pertaining to soil microbial ecology and the cultivation of underutilised crops.

Prof Neal McLaren collaborates with Pannar Seed Company (Mr Dries Booyens) in screening for cold tolerance in relation to pollination efficiency

of sorghum and ergot resistance to ensure that susceptible cultivars do not enter the commercial market. Collaboration with the ARC-GCI in Potchefstroom (Prof Bradley Flett, Drs Belinda Janse van Rensburg, and Maryke Craven) focuses on root rot and leaf blight of sorghum, leaf blight, and weather modelling of cob rots and concomitant mycotoxins of maize.

and gave a presentation on wheat quality improvement at CIMMYT. The talk focused on quality selections for segregating and advanced wheat material, rheology, electrophoresis, and marker-assisted selection.

Prof Pretorius' projects were conducted in collaboration with Cornell



Prof Johann du Preez (right) received a Medal of Honour from the South African Academy for Science and Arts for a book co-authored with Profs JG van As (second from the left), LR Brown, and NJ Smit.

### International

Dr Marieta Cawood collaborates with Prof B Moerschbacher (Westfälische Wilhelms-Universität Münster, Germany) on the utilisation of plant secondary metabolites.

Drs Rouxlène van der Merwe and Adré Minnaar-Ontong cooperated with the Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences, on a soybean breeding project.

Dr Visser visited the laboratory of Dr RF Park at the Plant Breeding Institute, University of Sydney, Australia. During the visit, he worked on a collaborative project that aims to confirm the earlier movement of stem rust urediospores from Africa to Australia across the Indian Ocean.

Prof Maryke Labuschagne and the rest of the Plant Breeding team actively collaborated with the Agricultural University of Sweden on wheat quality, and with the University of Tuscia in Italy on gluten protein. They further collaborated with the International Centre for the Improvement of Wheat and Maize (CIMMYT) in Kenya and Zimbabwe on various projects and with scientists from IITA, Ibadan, Nigeria.

Dr Carlos Guzman Garcia, Head of the Wheat Chemistry and Quality Laboratory at CIMMYT, El Batán, Mexico, visited South Africa on 27 January,

University, the Chinese Academy of Sciences (Beijing), CIMMYT (Mexico), the National Institute of Agricultural Botany (UK), Tel Aviv University (Israel), the University of Minnesota (UM) and ARS-USDA (USA), and the University of Sydney (US) (Australia).

Prof McLaren and his postgraduate students collaborated with the Norman E. Borlaug Institute for International Agriculture of Texas A&M AgriLife Research on two projects, namely Cowpea Focus Group: Improved Cowpea Varieties, and Pulse Legume-Based Cropping Systems to Reduce Biotic and Abiotic Stress in Sub-Saharan Africa (Drs Jamie Foster and F Workneh, Pls); and Sorghum Focus Group: Sorghum Production and End-Use Product Development for Increased Food Security (Dr Gary Peterson, PI). The Pls and their co-workers visited Prof McLaren's group on three occasions during 2015 to evaluate collaborative field trials. These trials also formed the basis of Ms Lisa Coetzee's MSc study and Ms Danelle van Rooyen's PhD study with contributions to the PhD studies of Mr Michael Chung and Mrs Anette Allemann in Prof Wijnand Swart's lab.

Prof McLaren further collaborated with the South Asian Association for Regional Cooperation (SAARC) Surveillance Training Workshop on wheat rust monitoring and disease management in Kathmandu, Nepal, from 16–25 March 2015. A course was presented on the application of statistics in the analysis and interpretation of field data related to disease

assessment. This statistics course was also presented locally for Plant Pathology staff and students at the University of Stellenbosch and ARC-CGI, Potchefstroom.

Prof Johan Grobbelaar was invited by the Institute of Bio- and Geosciences - IBG-2 at Forschungszentrum Jülich GmbH to conduct research on algae to replace fossil fuels for the aviation industry in Germany from 8 June 2015 to 4 September 2015. The work included cultivation of algae in the laboratory, outdoors, and in the greenhouse, mentoring of local scientists, as well as assistance in and planning of experiments for green algae cultivation.

Prof Wijnand Swart was in close collaboration with Prof Pedro Crous, Director at the Centraalbureau voor Schimmelcultures (CBS) Fungal Biodiversity Centre at the University of Utrecht, the Netherlands, during 2015. Prof Crous, who is also a Professor Extraordinaire in the Department of Plant Sciences, visited Prof Swart's laboratory in January 2015 and November 2015 to successfully negotiate with Dr Glen Taylor (Senior Director: Directorate of Research Development, UFS) to establish postdoctoral fellowships in the division of Plant Pathology for scientists from various parts of the world.

Collaboration between Profs Swart and Nahum Marban-Mendoza from the Department of Agricultural Parasitology at the University of Chapingo in Mexico over the past five years culminated in Prof Swart inviting and hosting Prof Marban-Mendoza during January 2015, where he presented two papers at the International Cactus Pear Workshop held on the Bloemfontein campus of the UFS.

Prof Swart also collaborated with Prof Klaus Birkhofer from the Department of Biology, Biodiversity and Conservation Science at Lund University in Sweden, and Dr Regina Lindborg from Stockholm University on securing a large research grant from the Ekhaga Foundation in Sweden to investigate the influence of microbes and insects on above- and belowground ecosystem services in apple orchards.

## Staff Matters

- Mr Gerald Moshodi resigned.
- Dr Lize Joubert became a member of the Prestige Scholar Programme (PSP) of the UFS.
- Dr Chrisna Steyn was awarded a PhD in Plant Pathology.

## Research Outputs

### Research Articles

**Akinbo, O., Labuschagne, M.T. & Fregene, M.** 2015. Introgression of root protein and yield traits from backcross hybrids between cassava and its wild progenitor (*Manihot esculenta ssp flabellifolia*). *Journal of Plant Breeding and Crop Science* 7: 1-8.

**Brand, R.F., Collins, N. & Du Preez, P.J.** 2015. A phytosociology survey and vegetation description of inselbergs in the uKhahlamba-Drakensberg Park World Heritage Site, South Africa. *Koedoe* 57(1): Art. #1233, 12 pages.

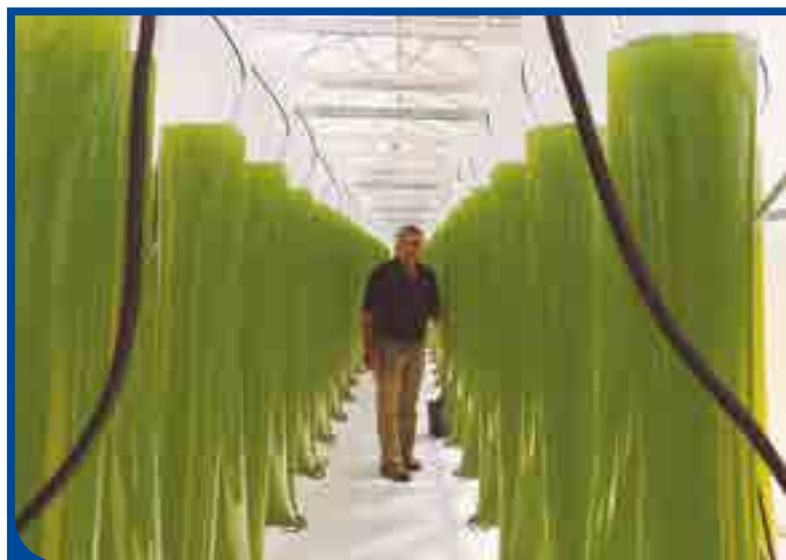
**Brook, G., Railsback, B., Scott, L., Voarintsoa, N. & Liang, F.** 2015. Late

Holocene Stalagmite and Tufa climate records for Wonderwerk Cave: Relationships between archaeology and climate in Southern Africa. *African Archaeological Review* 12: 669-700.

**Castelyn, H.D., Appelgryn, J.J., Mafa, M.S., Pretorius, Z.A. & Visser, B.** 2015. Volatiles emitted by leaf rust infected wheat induce a defence response in exposed uninfected seedlings. *Australasian Plant Pathology* 44: 245-254.

**Cawood, M.E., Pretorius, J., Van der Westhuizen, J.H. & Van Heerden, F.** 2015. A saponin isolated from *Agapanthus africanus* differentially induces apoplastic peroxidase activity in wheat and displays fungicidal properties. *Acta Physiologiae Plantarum* 37(246): 1-8.

**Combrink, N.K., Bijzet, Z., Sippel, A.D., Booysse, M. & Labuschagne, M.T.** 2015. Genotypic variation of rind colour in citrus Tangor Kiyomy families. *Acta Horticulturae* 1065: 439-447.



Prof Johan Grobbelaar visited the Institute of Bio- and Geosciences - IBG-2 at Forschungszentrum Jülich GmbH to conduct research on algae to replace fossil fuels for the aviation industry in Germany.

**Ertiro, B.T., Ogugo, V., Worku, M., Das, B., Olsen, M., Labuschagne, M. & Semagn, K.** 2015. Comparison of Kompetitive Allele Specific PCR (KASP) and genotyping by sequencing (GBS) for quality control analysis in maize. *BMC Genomics* 16: 908.

**Gryzenhout, M.** 2015. The need to engage with citizen scientists to study the rich fungal biodiversity in South Africa. *IMA Fungus* 6: 58-64.

**Jami, F., Slippers, B., Wingfield, M., Loots, M. & Gryzenhout, M.** 2015. Temporal and spatial variation of *Botryosphaeriaceae* associated with *Acacia karroo* in South Africa. *Fungal Ecology* 15: 51-62.

**Janse van Rensburg, B., McLaren, N.W., Flett, B. & Schoeman, A.** 2015. Fumonisin producing *Fusarium* spp. and fumonisin contamination in commercial South African maize. *European Journal of Plant Pathology* 141: 491-504.

**Labuschagne, M.T. & Moloi, M.J.** 2015. The influence of abiotic stress conditions on dough mixing characteristics of two hard red spring wheat cultivars. *Journal of Cereal Science* 63: 134-139.

**Laurie, S.M., Booysse, M. & Labuschagne, M.T.** 2015. Multi-environment performance of new orange-fleshed sweet potato varieties in South Africa. *Crop Science* 55: 1585-1595.

**Laurie, S.M., Tjale, S.S., Van den Berg, A.A., Mtileni, M.M. & Labuschagne, M.T.** 2015. Agronomic performance of new cream to yellow-orange sweet potato varieties in diverse environments across South Africa. *South African Journal of Plant and Soil* 32: 147-155.

**Marais, E., Scott, L., Gil-Romera, G. & Carrion, J.** 2015. The potential of palynology in fossil bat-dung from Arnhem Cave, Namibia. *Transactions of the Royal Society of South Africa* 70: 109–115.

**Mohase, L. & Taiwe, B.** 2015. Saliva fractions from South African Russian wheat aphid biotypes induce differential defence responses in wheat. *South African Journal of Plant and Soil* 32: 235–240.

**Muedi, H., McLaren, N.W. & Fourie, D.** 2015. Distribution and severity of bacterial brown spot on dry beans in South Africa: An update. *South African Journal of Science* 111: 52–57.

**Muedi, H., McLaren, N.W. & Fourie, D.** 2015. Reaction of selected common bean germplasm accessions to bacterial brown spot in South Africa. *Crop Protection* 77: 87–93.

**Mweta, D., Kalenga-Saka, J. & Labuschagne, M.T.** 2015. A comparison of functional properties of native Malawian cocoyam, sweet potato and cassava starches. *Scientific Research Essays* 10: 580–592.

**Nagel, J., Slippers, B., Wingfield, M. & Gryzenhout, M.** 2015. Multiple *Phytophthora* species associated with a single riparian ecosystem in South Africa. *Mycologia* 107: 915–925.

**Rossmann, A.Y., Adams, G.C., Cannon, P.F., Castlebury, L.A., Crous, P.W., Gryzenhout, M., Jaklitsch, W.M., Mejia, L.C., Stoykov, D., Udayanga, D., Voglmayr, H. & Walker, D.M.** 2015. Recommendations of generic names in *Diaporthales* competing for protection or use. *IMA Fungus* 6: 145–154.

**Scott, L. & Thackeray, J.F.** 2015. Palynology of holocene deposits in Excavation 1 at Wonderwerk Cave, Northern Cape (South Africa). *African Archaeological Review* 32: 839–855.

**Singh, R.P., Hodson, D.P., Jin, Y., Lagudah, E.S., Ayliffe, M.A., Bhavani, S., Rouse, M.N., Pretorius, Z.A., Szabo, L.J., Huerta-Espino, J., Basnet, B.R., Lan, C. & Hovmøller, M.S.** 2015. Emergence and spread of new races of wheat stem rust fungus: Continued threat to food security and prospects of genetic control. *Phytopathology* 105: 872–884.

**Van Aardt, A.C., Bousman, C., Brink, J.S., Brook, G., Jacobs, Z., Du Preez, P.J., Rossouw, L. & Scott, L.** 2015. First chronological, palaeoenvironmental, and archaeological data from the Baden-Baden fossil spring complex in the western Free State, South Africa. *Palaeoecology of Africa* 33: 117–152.

**Van der Merwe, R., Labuschagne, M.T., Herselman, L. & Hugo, A.** 2015. Effect of heat stress on seed yield components and oil composition in high- and mid-oleic sunflower hybrids. *South African Journal of Plant and Soil* 32: 121–128.

#### Conference Contributions

**Acevedo, M., Zurn, J.D., Rouse, M.N., Jin, Y., Chao, S., Aoun, M., Wanyera, R., Macharia, G., Njau, P., Pretorius, Z.A., Bonman, J.M. & Brueggeman, R.** 2015. *Characterization of stem rust resistance in two spring wheat landraces*. Poster presented at the 9<sup>th</sup> International Wheat Conference (IWC 2015), Four Seasons Hotel, Sydney, Australia. 21–26 September.

**Adendorff, J., Mohase, L., Louw, S.vdM. & Jankielsohn, A.** 2015. *Screening for three different categories of host plant resistance to Russian wheat aphid (*Diuraphis noxia*) in alexin® treated wheat varieties*. Paper delivered at the 19<sup>th</sup> Congress of the Entomological Society of Southern Africa (ESSA) and the 37<sup>th</sup> Congress of the Zoological Society of Southern Africa (ZSSA), (ESSA/ZSSA 2015), Rhodes University, Grahamstown, South Africa. 12–17 July.

**Adendorff, J., Mohase, L., Louw, S.vdM. & Jankielsohn, A.** 2015. *Alexin™-treatment boosts defence responses in wheat against Russian wheat aphid (*Diuraphis noxia*) infestation*. Poster presented at the 41<sup>st</sup> Annual Conference of the South African Association of Botanists (SAAB), Tshipise Forever Resort, Limpopo, South Africa. 11–15 January.

**Allemann, I., Cawood, M.E. & Allemann, J.** 2015. *Effect of *Amaranthus cruentus* L. residues and extracts on lettuce (*Lactuca sativa* L.) seed germination and seedling growth*. Paper delivered at the Combined Congress of the Soil Science Society of South Africa (SSSSA), the South African Society of Crop Production (SASCP), the South African Society of Horticulture Sciences (SASHS), and the Southern African Weed Science Society (SAWSS), George, South Africa. 19–22 January.

**Baloyi, T.A., Labuschagne, M.T., Van Biljon, A. & Tsilo, T.** 2015. *Should breeding efforts also focus on breeding for nutritional quality in South African bread wheat cultivars?* Paper delivered at the Combined Congress of the Soil Science Society of South Africa (SSSSA), the South African Society of Crop Production (SASCP), the South African Society of Horticulture Sciences (SASHS), and the Southern African Weed Science Society (SAWSS), George, South Africa. 19–22 January.

**Botha, G.A. & Du Preez, P.J.** 2015. *A description of the wetland and riparian vegetation of the Nxamasere palaeo-river's backflooded section, Okavango Delta, Botswana*. Paper delivered at the 41<sup>st</sup> Annual Conference of the South African Association of Botanists (SAAB), Tshipise Forever Resort, Limpopo, South Africa. 11–15 January.



Prof Maryke Labuschagne received two excellence awards in 2015.

**Ndhlela, T., Herselman, L., Semagn, K., Magorokosho, C., Mutimaamba, C. & Labuschagne, M.T.** 2015. Relationships between heterosis, genetic distances and specific combining ability among CIMMYT and Zimbabwe developed maize inbred lines under stress and optimal conditions. *Euphytica* 204: 635–647.

**Parkes, E., Fregene, M., Dixon, A., Okogbenin, E., Boakye-Peprah, B. & Labuschagne, M.** 2015. Developing Cassava Mosaic Disease resistant cassava varieties in Ghana using a marker assisted selection approach. *Euphytica* 203: 549–556.

**Pretorius, Z.A., Bender, C.M. & Visser, B.** 2015. The rusts of wild rye in South Africa. *South African Journal of Botany* 96: 94–98.

**Pretorius, Z.A., Prins, R., Malaker, P.K., Barma, N.C.D., Hakim, M.A., Thapa, D., Bansal, U., Cisar, G.L. & Park, R.F.** 2015. Assessing the vulnerability of wheat germplasm from Bangladesh and Nepal to African stem rust. *Phytoparasitica* 43: 637–645.

**Pretorius, Z.A., Visser, B., Terefe, T., Herselman, L., Prins, R., Soko, T., Siwale, J., Mutari, B., Selinga, T.I. & Hodson, D.P.** 2015. Races of *Puccinia triticina* detected on wheat in Zimbabwe, Zambia and Malawi and regional germplasm responses. *Australasian Plant Pathology* 44: 217–224.



**Castelyn, H.D., Visser, B. & Pretorius, Z.A.** 2015. *Adult plant resistance in wheat: Microscopic observation of stem rust colonization*. Paper delivered at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18-21 January.

**Castelyn, H.D., Visser, B. & Pretorius, Z.A.** 2015. *An integrated approach to understanding adult plant resistance: histology and molecular features of stem rust on wheat*. Paper delivered at the 14<sup>th</sup> International Cereal Rusts and Powdery Mildew Conference (ICRPMC), Helsingør, Denmark. 8 July.

**Castelyn, H.D., Visser, B. & Pretorius, Z.A.** 2015. *The timing and molecular features of adult plant resistance in wheat against stem rust*. Paper delivered at the 41<sup>st</sup> Annual Conference of the South African Association of Botanists (SAAB), Tshipise Forever Resort, Limpopo, South Africa. 11-15 January.

**Cloete, I., Louw, S.vdM. & Gryzenhout, M.** 2015. *Possible causal agents of falls induction on native Acacia species in the Northern Cape Province South Africa*. Poster presented at the 19<sup>th</sup> Congress of the Entomological Society of Southern Africa (ESSA) and the 37<sup>th</sup> Congress of the Zoological Society of Southern Africa (ZSSA), (ESSA/ZSSA 2015), Rhodes University, Grahamstown, South Africa. 12-17 July.

**Cloete, I., Louw, S.vdM. & Gryzenhout, M.** 2015. *The discovery of a new malformation disease of native Acacia trees in South Africa*. Poster presented at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18-21 January.

**Da Costa, A.G. & Swart, W.J.** 2015. *Trichoderma strains as biocontrol agents of soil-borne pathogenic fungi of carrot seedlings*. Poster presented at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18-21 January.

**Du Preez, P.J.** 2015. *Korannaberg – Viervoetberg mountain range (Ladybrand, Eastern Free State) – A floristic hub of the north-western Drakensberg*. Paper delivered at the 41<sup>st</sup> Annual Conference of the South African Association of Botanists (SAAB), Tshipise Forever Resort, Limpopo, South Africa. 11-15 January.

**Du Preez, P.J. & Brown, L.R.** 2015. *The peatlands of the Highlands of Lesotho - a unique aquatic system under threat*. Paper delivered at the 27<sup>th</sup> International Congress for Conservation Biology (ICCB), Montpellier, France. 2-6 August.

**Du Preez, P.J., Le Roux P.A.L. & Theron, E.** 2015. *The impact of hill-slope water on the distribution of plant species along a granite catena ecosystem*. Paper delivered at the 2<sup>nd</sup> African Water Symposium in conjunction with the 6<sup>th</sup> Orange River Basin Symposium, University of the Free State, Bloemfontein, South Africa. 7-8 October.

**Greyling, S.M., McLaren, N.W., Schoeman, A., Janse van Rensburg, B. & Flett, B.** 2015. *Detection of Fusarium graminearum species complex (FGSC) and F. verticillioides in maize roots, crowns, stems and ears in South Africa*. Poster presented at the 1<sup>st</sup> African Symposium on Mycotoxicology (ASM2015), Livingstone, Zambia. 26-28 May.

**Greyling, S.M., Schoeman, A., Flett, B., McLaren, N.W. & Janse van Rensburg, B.** 2015. *Distribution of Fusarium graminearum species complex (FGSC) in maize roots, crowns, stems and grain in South Africa*. Paper delivered at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18-21 January.

**Gryzenhout, M., Khoza, B.D. & Landman, L.** 2015. *First report of Fusarium boothii from pecab (Carya illinoensis) and camel thorn (Acacia erioloba) trees in South Africa*. Paper delivered at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18-21 January.

**Herselman, L., Marè, A., Van Biljon, A. & Wentzel, B.S.** 2015. *Biochemical and molecular evaluation of rust resistant bread wheat lines*. Poster presented at the 14<sup>th</sup> International Cereal Rusts and Powdery Mildew Conference (ICRPMC), Helsingør, Denmark. 8 July.

**Hodson, D.P., Park, R.F., Grønbech-Hansen, J., Lassen, P., Nazari, K., Jin, Y., Hovmøller, M., Szabo, L., Pretorius, Z.A., Fetch, T., Meyer, M., Cox, J.A., Gilligan, C.A., Burgin, L. & Hort, M.** 2015. *A decade of stem rust surveillance: How far have we come and where are we going?* Paper delivered at the 7<sup>th</sup> Borlaug Global Rust Initiative Technical Workshop, Sydney, Australia. 17-20 September.

**Keet, J.-H., Jackson, M., Cindi, D., Du Preez, P.J. & Visser, B.** 2015. *Identification of naturalized and cultivated Berberis species in South Africa*. Paper delivered at the 7<sup>th</sup> Borlaug Global Rust Initiative Technical Workshop, Sydney, Australia. 17-20 September.

**Labuschagne, M.T.** 2015. *Managing the peer review process: Challenges and opportunities*. Invited paper delivered at 3<sup>rd</sup> Annual Peer Review and Research Publishing Summit: Improving the quality and accessibility of African research, Johannesburg, South Africa. 19-21 August.

**Labuschagne, M.T., Lindeque, R.C. & Van Biljon, A.** 2015. *The relationship between Mixsmart characteristics and loaf volume in three production areas in South Africa*. Paper delivered at the 65<sup>th</sup> Australasian Grain Science Association (AGSA) Conference, Sydney, Australia. 16-18 September.

**Labuschagne, M.T., Moloi, M.J. & Van Biljon, A.** 2015. *The influence of heat, cold and drought stress on protein quality and quantity in two hard red bread wheat cultivars*. Paper delivered at the 12<sup>th</sup> International Gluten Biotechnology (IGB 2015) Workshop, Perth, Australia. 13-15 September.

**Le Roux, P.A.L., Jacobs-Venter, A. & Gryzenhout, M.** 2015. *Selected Fusarium species isolated from grazing lawn soils in the Kruger National Park*. Poster presented at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18-21 January.

**Lindeque, R., Labuschagne, M., Van Biljon, A., Wentzel, B., Miles, C. & Booyse, M.** 2015. *Protein fractions in South African wheat: relationships with baking quality and yield*. Poster presented at the 9<sup>th</sup> International Wheat Conference (IWC 2015), Four Seasons Hotel, Sydney, Australia. 21-26 September.

**Lindeque, R., Labuschagne, M., Van Biljon, A., Wentzel, B.S., Miles, C. & Booyse, M.** 2015. *Relating the quality and quantity of protein in wheat developed for the summer rainfall regions of South Africa*. Paper delivered at the Combined Congress of the Soil Science Society of South Africa (SSSSA), the South African Society of Crop Production (SASCP), the South African Society of Horticulture Sciences (SASHS), and the Southern African Weed Science Society (SAWSS), George, South Africa. 19-22 January.

**Mabunda, B.D.X., Louw, S.vdM. & Gryzenhout, M.** 2015. *Wood-boring insects and possible fungal associates from Acacia karroo (sweet thorn) in the Bloemfontein area*. Poster presented at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18-21 January.

**Malan, A., Booyse, M., Labuschagne, M., Miles, C., Barnard, A., De Villiers, C., Terefe, T. & Von Well, E.** 2015. *Progress in breeding spring irrigation bread wheat (Triticum aestivum L) for South Africa for the last 20 years (1995-2014)*. Poster presented at the 9<sup>th</sup> International Wheat Conference (IWC 2015), Four Seasons Hotel, Sydney, Australia. 21-26 September.

**Marè, A. & Herselman, L.** 2015. *Development of wheat lines with complex resistance to rusts and Fusarium head blight*. Poster presented at the 7<sup>th</sup> Borlaug Global Rust Initiative Technical Workshop, Sydney, Australia. 17-20 September.

- Maré, A., Herselman, L. & Pretorius, Z.** 2015. *Evaluation of wheat lines containing different combinations of stem, leaf or stripe rust resistance genes.* Poster presented at the 9<sup>th</sup> International Wheat Conference (IWC 2015), Four Seasons Hotel, Sydney, Australia. 21–26 September.
- Maree, G.J., Bender, C.M., Prins, R., Negussie, T.G. & Pretorius, Z.A.** 2015. *Microphenotype of stripe rust infection in wheat lines containing different resistance loci.* Poster presented at the 14<sup>th</sup> International Cereal Rusts and Powdery Mildew Conference (ICRPMC), Helsingør, Denmark. 8 July.
- Maree, G.J., Bender, C.M., Prins, R., Tadesse, N. & Pretorius, Z.A.** 2015. *Stripe rust development in wheat lines with different resistance loci.* Poster presented at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18–21 January.
- McLaren, N.W., Chung, H., Coetzee, L.A. & Van Rooyen, D.** 2015. *Root rot, grain molds and mycotoxins of sorghum in a crop rotation system in Limpopo.* Paper delivered at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18–21 January.
- Mtshali, L., Zhou, M., Albertyn, J. & Labuschagne, M.T.** 2015. *Optimising flow cytometry for the characterisation of sugarcane introgression crosses.* Paper delivered at the 11<sup>th</sup> Germplasm and Breeding and 8<sup>th</sup> Molecular Biology Workshop (ISSCT), Saint-Gilles, Reunion Island. 1–5 June.
- Mwenye, O.J., Van Biljon, A., Van Rensburg, L.D. & Van der Merwe, R.** 2015. *Proline accumulation as a biochemical marker for drought stress tolerance of South African soybean genotypes.* Poster presented at the Eucarpia International Symposium on Protein Crops, Pontevedra, Spain. 4–7 May.
- Ngobesi, I., Labuschagne, M. & Ramburan, S.** 2015. *Determining genetic coefficients for crop model refinement: tiller and leaf phenology.* Poster presented at the Combined Congress of the Soil Science Society of South Africa (SSSSA), the South African Society of Crop Production (SASCP), the South African Society of Horticulture Sciences (SASHS), and the Southern African Weed Science Society (SAWSS), George, South Africa. 19–22 January.
- Potgieter, G.P., Van der Merwe, M. & Bouwer, R.** 2015. *Evaluation of a Trichoderma isolate's bio-catalytic potential on growth and yield of hydroponically grown tomato and spinach plants.* Paper delivered at the 41<sup>st</sup> Annual Conference of the South African Association of Botanists (SAAB), Tshipise Forever Resort, Limpopo, South Africa. 11–15 January.
- Pretorius, Z.A., Maree, G., Bender, C.M. & Visser, B.** 2015. *Phenotypic and genotypic characterization of South African Pgt race 2SA55.* Poster presented at the 7<sup>th</sup> Borlaug Global Rust Initiative Technical Workshop, Sydney, Australia. 17–20 September.
- Pretorius, Z.A., Wessels, E., Smit, C., Bender, C.M., Boshoff, W.H.P. & Prins, R.** 2015. *Expanding the QTL toolbox for adult plant stripe rust resistance in wheat.* Paper delivered at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18–21 January.
- Prins, R., Dreisigacker, S., Pretorius, Z., Wessels, E., Van Schalkwyk, H.J., Smit, C., Bender, C., Singh, D. & Boyd, L.** 2015. *Stem rust resistance QTL validation of marker-trait associations detected by GWAS.* Poster presented at the 9<sup>th</sup> International Wheat Conference (IWC 2015), Four Seasons Hotel, Sydney, Australia. 21–26 September.
- Prins, R., Martin, A., Agenbag, G.M., Potgieter, F.G., Smit, F. & Pretorius, Z.A.** 2015. *Stem rust resistance in South African barley.* Poster presented at the 17<sup>th</sup> Australian Barley Technical Symposium, Manly, Australia. 13–16 September.
- Santchurn, D., Badaloo, M., Zhou, M. & Labuschagne, M.T.** 2015. *Contribution of sugarcane wild relatives in the Mauritian sugarcane breeding programme.* Paper delivered at the 11<sup>th</sup> Germplasm and Breeding and 8<sup>th</sup> Molecular Biology Workshop (ISSCT), Saint-Gilles, Reunion Island. 1–5 June.
- Selinga, T.I., Terefe, T.G., Herselman, L., Pretorius, Z.A. & Visser, B.** 2015. *Monitoring the South African leaf rust population through a combined phenotyping and SSR genotyping approach.* Poster presented at the 7<sup>th</sup> Borlaug Global Rust Initiative Technical Workshop, Sydney, Australia. 17–20 September.
- Smit, A., Smit, M., Labuschagne, M.T. & Van der Merwe, R.** 2015. *Seed yield potential of vegetable type soybean genotypes in South Africa.* Paper delivered at the Eucarpia International Symposium on Protein Crops, Pontevedra, Spain. 4–7 May.
- Smit, G.N., Smit, Z.M. & Du Preez, P.J.** 2015. *The importance of stocking rate, habitat and feeding preferences of game species for effective veld management in a semi-arid environment.* Paper delivered at the Southern African Wildlife Management Association (SAWMA) Conference, Kimberley, South Africa. 6–10 September.
- Smith, K., Craven, M., McLaren, N.W. & Berner, J.** 2015. *Fungicide effects on yield, plant mass and leaf blight severity of sorghum in South Africa.* Paper delivered at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18–21 January.
- Soko, T., Prins, R. & Pretorius, Z.A.** 2015. *Are Zimbabwean wheat cultivars protected against Pgt race Ug99?* Poster presented at the 7<sup>th</sup> Borlaug Global Rust Initiative Technical Workshop, Sydney, Australia. 17–20 September.
- Swanepoel, J., Westcott, M. & Gryzenhout, M.** 2015. *Fusarium spp. associated with decayed and healthy tissue of Amaranthus cruentus and three weevil species in South Africa.* Poster presented at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18–21 January.
- Swart, W.J.** 2015. *A holistic perspective of strategies for managing cactus pear diseases.* Paper delivered at the International Cactus Pear Workshop: Development of a cactus pear agro-industry for the sub-Saharan Africa region, University of the Free State, Bloemfontein, South Africa. 27–28 January.
- Swart, W.J.** 2015. *The Rhizosphere microbiome as a driver of multi-trophic interactions that influence plant health.* Invited paper delivered at the 25<sup>th</sup>



Annual Interdisciplinary Symposium hosted by the Agricultural Research Council – Plant Protection Research Institute, Vredenburg Research Centre, Stellenbosch, South Africa. 16–18 September.

**Terefe, T., Visser, B. & Pretorius, Z.A.** 2015. *Variation among Puccinia graminis f. sp. tritici and Puccinia triticina isolates from wheat in South Africa during 2007–2013*. Poster presented at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain’s Game Lodge, Bloemfontein, South Africa. 18–21 January.

**Van Aardt, A.C., Scott, L. & Du Preez, P.J.** 2015. *Combining palaeo-ecology and modern vegetation science: a western Free State perspective*. Paper delivered at the 41<sup>st</sup> Annual Conference of the South African Association of Botanists (SAAB), Tshipise Forever Resort, Limpopo, South Africa. 11–15 January.

**Van Aardt, A.C., Scott, L. & Du Preez, P.J.** 2015. *Towards addressing the disjunction between palaeo- and modern ecology in the western Free State*. Paper delivered at the Inaugural African Quaternary (AFQUA) Conference and Workshop, University of Cape Town, Cape Town, South Africa. 30 January – 8 February.

**Van Rooyen, D. & McLaren, N.W.** 2015. *Sorghum grain characteristics, severity of grain molds and associated mycotoxins*. Poster presented at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain’s Game Lodge, Bloemfontein, South Africa. 18–21 January.

**Van Schalkwyk, H.J., Prins, R., Pretorius, Z.A., Boyd, L.A., Uauy, C. & Saunders, D.G.O.** 2015. *Placement of South African stripe rust in a global context and development of diagnostic tools for genotyping field samples*. Invited paper delivered at the 7<sup>th</sup> Borlaug Global Rust Initiative Technical Workshop, Sydney, Australia. 17–20 September.

**Van Schalkwyk, H.J., Prins, R., Pretorius, Z.A., Boyd, L.A., Uauy, C. & Saunders, D.G.O.** 2015. *South African stripe rust: The trace, the race and the chase!* Poster presented at the Sainsbury Laboratory – Wheat diseases day, Norwich, UK. 22 May.

**Van Schalkwyk, H.J., Prins, R., Pretorius, Z.A., Boyd, L.A., Uauy, C. & Saunders, D.G.O.** 2015. *Plant Wars Episode I: The Fungal Menace*. Paper delivered at the Crop Genetics Departmental Seminar Series, John Innes Centre, Norwich, UK. 17 December.

**Vermeulen, M., Swart, W.J. & Gryzenhout, M.** 2015. *Fusarium species associated with decayed and healthy tissue of Amaranthus cruentus and three weevil species in South Africa*. Paper delivered at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain’s Game Lodge, Bloemfontein, South Africa. 18–21 January.

**Viljoen, R., Mokheseng, K.E., Kemp, G., Pretorius, J. & Visser, B.** 2015. *A Lupinus albus seed suspension affects photosynthesis in wheat seedlings*. Paper delivered at the 41<sup>st</sup> Annual Conference of the South African Association of Botanists (SAAB), Tshipise Forever Resort, Limpopo, South Africa. 11–15 January.

**Viljoen, R., Mokheseng, K.E., Kemp, G., Pretorius, J. & Visser, B.** 2015. *The molecular and photosynthetic response of wheat treated with a biostimulant derived from a South African legume*. Paper delivered at the

2<sup>nd</sup> World Congress on the use of Biostimulants in Agriculture, Florence, Italy. 17–19 November.

**Visser, B., Herselman, L. & Pretorius, Z.A.** 2015. *Microsatellite characterization of South African Puccinia striiformis races*. Poster presented at the 14<sup>th</sup> International Cereal Rusts and Powdery Mildew Conference (ICRPMC), Helsingør, Denmark. 8 July.

**Visser, B., Selinga, T.I., Terefe, T., Herselman, L. & Pretorius, Z.A.** 2015. *Genetic analysis of the Puccinia graminis f. sp. tritici population in South Africa*. Paper delivered at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain’s Game Lodge, Bloemfontein, South Africa. 18–21 January.

**Visser, B., Selinga, T.I., Terefe, T., Herselman, L. & Pretorius, Z.A.** 2015. *Genetic diversity in Puccinia triticina causing wheat leaf rust in South Africa*. Paper delivered at the 41<sup>st</sup> Annual Conference of the South African Association of Botanists (SAAB), Tshipise Forever Resort, Limpopo, South Africa. 11–15 January.

#### Chapter in Book

**Van Aardt, A.C., Bousman, C.B., Brink, J.S., Brook, G.A., Jacobs, Z., Du Preez, P.J., Rossouw, L. & Scott, L.** 2015. *First chronological, palaeoenvironmental, and archaeological data from the Baden-Baden fossil spring complex in the western Free State, South Africa*. In *Changing Climates, Ecosystems and Environments within Arid Southern Africa and Adjoining Regions: Palaeoecology of Africa*, edited by Juergen Runge. USA: CRC Press. pp. 117–152.

#### Reports

**Cawood, M.** 2015. *Biochemistry of resistance in wheat to biotic stresses*. Progress report (WCT/W/2004/03) to the Winter Cereal Trust, South Africa.

**Herselman, L.** 2015. *Marker-assisted introgression of different rust resistance genes as well as Fusarium head blight resistance into SA wheat cultivars*. Progress report (WCT/W/2006/02) to the Winter Cereal Trust, South Africa.

**McLaren, N.W.** 2015. *Sorghum pathology research: University of the Free State*. Research report to the Sorghum Trust, Pretoria, South Africa.

**McLaren, N.W.** 2015. *Ukulima farm research and technology development proposal: Improved cowpea varieties and pulse legume-based cropping systems to reduce biotic stress in sub-Saharan Africa*. Research report to the Norman E. Borlaug Institute for International Agriculture of Texas, A&M AgriLife Research, College Station, Texas.

**McLaren, N.W.** 2015. *Ukulima farm research and technology development proposal: Sorghum production and end-use product development for increased food security*. Research report to the Norman E. Borlaug Institute for International Agriculture of Texas, A&M AgriLife Research, College Station, Texas.

## Staff

**Distinguished Professor:** Prof ZA Pretorius.

**Professors:** Profs MT Labuschagne, NW McLaren, and WJ Swart.

**Associate Professors:** Profs PJ du Preez and L Herselman.

**Professor Extraordinaire (contract):** Prof PW Crous.

**Affiliated Associate Professors:** Profs JJ van Rensburg and M Zhou.

**Affiliated Researchers:** Drs R Prins, T Tsilo, JHT Venter, and A Venter.

**Senior Lecturers:** Drs M Gryzenhout, GJ Marais, GP Potgieter, A van Biljon, and B Visser.

**Lecturers:** Drs ME Cawood, M Jackson, L Joubert, A Minnaar-Ontong, L

Mohase, and R van der Merwe.

**Junior Lecturer:** Ms M Westcott.

**Contract Staff:** Profs JU Grobbelaar, L Scott, and AJ van der Westhuizen.

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**Research Assistants:** Mss A Allemann, MC Bester, LA Coetzee, A Maré, D van Rooyen, and Mr C Rothmann.

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# Department of Soil, Crop and Climate Sciences

## Overview

The Department of Soil, Crop and Climate Sciences specialises in the disciplines of Agrometeorology, Agronomy, and Soil Science, contributing to the agricultural programme of the Faculty of Natural and Agricultural Sciences of the UFS. In addition to undergraduate and postgraduate teaching in the four disciplines, the department also contributes to teaching at the centres for Sustainable Agriculture, Rural Development and Extension, Environmental Management, Disaster Management, and the Department of Quantity Surveying and Construction Management at the UFS.

Over the past few years, the department has shown a gradual growth not only in the number of undergraduate students but also in the number of postgraduate students. In 2015 an average of 40 postgraduate students were enrolled. Approximately 40% of these students come from Botswana, Eritrea, Ethiopia, Germany, Kenya, Lesotho, Malawi, Mauritius,

Nigeria, Swaziland, the United States of America, Zambia, and Zimbabwe. We are proud of 20 honours, six master's, and five doctoral students who obtained their degrees.

Research in the department is aimed at various aspects of the soil-crop-atmosphere system. Approximately R5 million was spent on research in 2015, of which only 10% came from the Central Research Fund of the UFS. The rest of the funding came from institutions such as the National Research Foundation (NRF), Water Research Commission (WRC), German Research Foundation (GRF), Agriculture Research Council (ARC), Protein Research Trust (PRT), Winter Grain Trust (WGT), Kumba Iron Ore, SAB Miller, Bayer, Monsanto, Syngenta, Omnia Fertilizer Ltd., Pecan South Africa, Kelpak South Africa, Potatoes SA, and Agraforum. Research findings were published in scientific journals as outlined in the Research Outputs. Furthermore, a wide range of either oral or poster presentations were also made, which amounted to 24 at national conferences and eight at international conferences.

## Activities and Achievements

### Agrometeorology

Due to problems with obtaining a valid work visa, we had to say goodbye to Dr Laszlo Lakatos, who has now joined the Eszterhazy Karoly University in Hungary. Although Dr Lakatos was only with us for three years, we trust that this relationship can form the basis for future collaborations between the two universities.

Dr Weldemichael Tesfuhuney, previously employed as a postdoc within the section, joined Agrometeorology as an academic staff member. Dr Tesfuhuney's research focuses on micrometeorological measurements under field conditions, as well as the use of crop modelling to aid community adaptation to climate change. He will take over a portion of the Micrometeorology module formerly presented by Dr Lakatos. Dr Tesfuhuney also represents the UFS in the Southern Africa Agricultural Model Intercomparison and Improvement Project (SAAMIIP), which was formed by a multidisciplinary and multi-institutional team from five countries in Southern Africa. During the first phase (2012–2014), model projections of future changes in climate for Southern Africa showed an increase in temperature, together with increased variability in rainfall, thus increasing the risk of crop failure and food insecurity in the region. Building on the solid integration assessment methodology developed during the previous phase, the second phase (2015–2016) aims to advance the locally based regional assessment of Southern African agricultural systems and work towards the understanding and definition of scale relevant and efficient management practices and policy options to adapt to climate change impacts. As part of the larger global Agricultural Model Intercomparison and Improvement Project (AgMIP), some of the previous



Glauconite (a reduced iron oxide mineral) that develops in wetland soils.



findings were incorporated in a series of books on climate change and agroecosystems, published with top agricultural scientists from around the world. The project also provides funding for several postgraduate students.

The WRC-funded project entitled “Quantifying and managing agricultural non-point source (NPS) nutrient pollution from field to catchment scale” started in 2015 and will run until 2019. The UFS component of this project is managed by Dr Linus Franke. The project supported the funding for an honours and a doctoral student in 2015, with funding for additional capacity development available in subsequent years. Moreover, the project will facilitate extensive fieldwork in agricultural fields with advanced agrometeorological equipment, such as lysimeters and eddy-covariance meters. The work is implemented together with the University of Pretoria (UP). Dr Franke also obtained funding from Potatoes SA to initiate new studies around the impact of climate change on potato production and water use efficiency in all 16 potato-producing regions of South Africa. Dr Franke also visited Wageningen University twice in 2015 to discuss progress regarding joint doctoral student supervision and the writing up of scientific papers. Moreover, he visited Uganda in 2015 with Prof Sue Walker (affiliated professor) to assess the field trials and the general work progress of a Ugandan doctoral student registered at the UFS. As a result of the intensive collaboration with the UP, Dr Franke visited Pretoria several times in 2015.

Two staff members received an NRF rating in 2015. Dr Franke received a C2 rating and Prof Walker a C1 rating. This allowed them to apply for incentive funding from the NRF, which the UFS supplemented.

Ms Linda de Wet was approached by the ARC to participate in a project wherein she will aid with the calculation of heat units for cactus pears.

Mr Stephan Steyn visited the Climate Systems Analysis Group (CSAG) at the University of Cape Town (UCT) and Council for Scientific and Industrial Research (CSIR) Meraka Institute for climate projection and burn area data relevant to his doctoral study. Another visit was paid to his supervisor, Prof Stigter, in the Netherlands.

Prof Stigter (affiliated professor) also visited the UFS in January and February, where he presented a short course on “Reaching farmers in a changing climate”, as well as some guest lectures on “Microclimate manipulation”. Prof Stigter was also joined by Mr Steyn and Dr Franke in his visit to the National University of Lesotho (NUL) to lay the groundwork for future collaboration between the NUL and UFS.

### **Agronomy**

Personnel of this section delivered five papers and exhibited three posters at the 2015 Combined Congress of the Soil Science Society of South Africa (SSSSA), the Southern African Society for Horticultural Science (SAHS), the South African Society for Crop Production, and the Southern African Weed Science Society (SAWSS) held in George. Dr James Allemann was awarded the CropLife Trophy for best paper in the field of weed science with a paper entitled “Effect of mesotrione residues on some dry bean cultivars”, as well as the Monsanto Trophy for best poster in the field of weed science with his poster entitled “Evaluation of some pre-emergence herbicides for volunteer potato control”. This is the first time that a single author has won both these prizes at the same conference. It was also the first time

in the history of the SAWSS that two generations of the same family (Dr James Allemann and Ms Ingrid Allemann) presented papers at the same conference.

Ms Anri Allen presented a poster (“DNA fingerprinting of pecan cultivars”) at the International Plant Biology Congress held in Stockholm, Sweden. Dr Elmarie van der Watt presented a poster (“Impact of biostimulants on herbicide stress: A preliminary study”) at the Second World Congress on the Use of Biostimulants in Agriculture, which was held in Florence, Italy. At the same congress, Dr Riana Viljoen presented a paper (“The molecular and photosynthetic response of wheat treated with a biostimulant derived from a South African legume”) based on work conducted in the department.



An endorheic wetland in the Graspan nature reserve used in a master's study.

Dr Gert Ceronio was elected onto the board of the South African Society for Crop Production, and Dr James Allemann was elected a fellow of the SAWSS.

Contract research is being undertaken for Potatoes SA on identifying a suitable systemic herbicide for the control of volunteer potatoes, which is a major problem for potato producers, particularly seed producers as

they can cause major problems in follow-up crops. Personnel from the Agronomy section are also involved in research projects for the WRC being conducted in both other sections, as well as in other departments of the UFS. Collaborative research is also being conducted with the Department of Plant Science on the allelopathy of *A. cruentus* and effect of glyphosate on Rhizobia in RR soya bean.

A research project on cactus pears (*Opuntia ficus-indica* and *O. robusta*) is conducted in collaboration with the ARC with the aim of evaluating the genetic resources of this crop in South Africa. A field gene bank has been established at the UFS, which will be used for genetic fingerprinting and breeding. A project with the aim of distinguishing between various South African pecan cultivars has been started due to demand from the South



Hematite (an oxidised iron oxide mineral) that develops in wetland soils under a fluctuating water table.

African pecan industry. This will be achieved through DNA fingerprinting of the various cultivars available in the country in order to establish a reference database.

A research project on the development of natural products for use as insecticides, herbicides, and biostimulants in the health and agricultural industries is being conducted in collaboration with CUT (Entomology and Botany).

## Soil Science

Ms Elmarie Kotze obtained her PhD and Ms Makhosazana Aghoghovwia joined the department.

The research group of Prof Leon van Rensburg consists of Drs Johan Barnard, Sabelo Mavimbela, Zaid Bello, Phepheya Dlamini, Andries Gouws (Barari Forest, UAE), Pieter van Heerden (PICWAT partnership), Willem de Clercq (University Stellenbosch), Mr Frans Joseph (Department of Agriculture, Free State), Prof Rianto van Antwerpen (SASRI), Mr Ashiel Jumman (SASRI), as well as a number of master's and doctoral students. Dr Sabello leads the research on the hydro-physical properties of selected ecotopes at the Kolomela iron mine near Postmasburg, aiming to provide answers on how rainfall is partitioned between runoff, drainage, evaporation, transpiration, and deep drainage since farmers are complaining that the dewatering of the mine impacts negatively on the groundwater supply and hence on their farming activities. Dr Gouws is applying the new forest water balance model for managing the irrigation of trees using poor-quality water in arid parts of Abu Dhabi. Dr Bello focuses on the water footprint of beer, a project sponsored by the Winter Cereal Trust and SAB Miller. This project focuses on the irrigation scheduling of barley and consist of glasshouse and field studies. The rest of the team members focus on a new WRC-funded project, namely "Management guidelines for technology transfer to reduce salinisation of irrigated land with precision agriculture water and salinity management of irrigated crops".

A study was initiated by Prof Cornie van Huyssteen and Ms Mariet Verster to determine the possible relationship between soil properties and the spread of Rift Valley fever. Rift Valley fever is a viral zoonosis that is present in domestic ruminants (sheep, cattle, and goats), camels, and humans, is found throughout Africa and Madagascar. It is spread by the bite of the infected *Aedes* mosquito. An outbreak occurred from 2008 to 2010 in South Africa, which had an enormous economic impact due to abortions and deaths among livestock and humans. Twenty-two study sites, among which Bloemfontein, Bultfontein, Brandfort, Kimberley, and Luckhoff, were selected and are being monitored for one year.

The hydropedology research team of Prof Pieter le Roux finalised several research projects on Hydropedology. These projects resulted in several students completing their MSc and PhD Studies. Hydropedology is driven by Dr Johan van Tol, while Dr George van Zijl drives the application of this technique.

## Research Outputs

### Research Articles

**Allemann, J., Matikiti, A. & Icishahayo, D.** 2015. Cropping patterns, cultural practices and constraints to production and utilization of cocoyam (*Colocasia esculenta*) in Manicaland province, Zimbabwe. *Academia Journal of Biotechnology* 4: 47-54.

**Baer, S., Bach, E., Meyer, C., Du Preez, C.C. & Six, J.** 2015. Belowground ecosystem restoration during grassland restoration: South African highveld compared to US tallgrass prairie. *Ecosystems* 18: 390-403.

**Barnard, J.H., Bennie, A.T.P., Van Rensburg, L.D. & Du Preez, C.C.** 2015. SWAMP: A soil layer water supply model for simulating macroscopic crop water uptake under osmotic stress. *Agricultural Water Management* 148: 150-163.

**Bosekeng, G. & Coetzer, G.M.** 2015. Response of onion (*Allium cepa* L.) to sowing date and plant population in the Central Free State, South Africa. *African Journal of Agricultural Research* 10: 179-187.

**Bouwer, D., Le Roux, P.A.L., Van Tol, J.J. & Van Huyssteen, C.W.** 2015. Using ancient and recent soil properties to design a conceptual hydrological response model. *Geoderma* 241-242: 1-11.

**Clark, J.H.A., Tredoux, M. & Van Huyssteen, C.W.** 2015. Heavy metals in the soils of Bloemfontein, South Africa: Concentration levels and possible sources. *Environmental Monitoring and Assessment* 187: 436-448.

**Coetzer, G.M. & Fouche, H.J.** 2015. Fruit yield and quality of cactus pear (*Opuntia* spp.) cultivars in the Central Free State, South Africa. *Acta Horticulturae* 1067: 89-95.

**Fouche, H. & Coetzer, G.M.** 2015. Response of cactus pear (*Opuntia* spp.) biomass production to fruit load. *Acta Horticulturae* 1067: 199-204.

**Haregeweyn, N., Tesfaye, S., Tsunekawa, A., Tsubo, M., Meshesha, D., Adgo, E. & Elias, A.** 2015. Dynamics of land use and land cover and its effects on hydrologic responses: Case study of the Gilgel Tekeze catchment in the highlands of Northern Ethiopia. *Environmental Modeling & Assessment* 187: 4090-1 - 4090-14.

**Haregeweyn, N., Tsunekawa, A., Nyssen, J., Tsubo, M., Meshesha, D., Schutt, B., Schutt, B., Adgo, E. & Tegegne, F.** 2015. Soil erosion and conservation in Ethiopia: A review. *Progress in Physical Geography* 39: 750-774.

**Mardamootoo, T., Du Preez, C.C. & Sharpley, A.** 2015. Phosphorus mobilization from sugarcane soils in the tropical environment of Mauritius under simulated rainfall. *Nutrient Cycling in Agroecosystems* 103: 29-43.

**Mavimbela, S.S.W. & Van Rensburg, L.D.** 2015. Effect of water regime and runoff strip width on soil water balance for an integrated in-field rainwater harvesting. *Arid Land Research and Management* 29: 141-166.

**Mbatha, A.N., Ceronio, G.M. & Coetzer, G.M.** 2015. Response of carrot (*Daucus carota* L.) yield and quality to organic fertiliser. *South African Journal of Plant and Soil* 31: 1-6.

**Meshesha, D., Tsunekawa, A., Tsubo, M., Haregeweyn, N. & Adgo, E.** 2015. Evaluating spatial and temporal variations of rainfall erosivity, case of Central Rift Valley of Ethiopia. *Theoretical and Applied Climatology* 119: 515-522.

**Paterson, G., Turner, D., Wiese, L., Van Zijl, G.M., Clarke, C. & Van Tol, J.J.** 2015. Spatial soil information in South Africa: Situational analysis, limitations and challenges. *South African Journal of Science* 111: 1-7.

**Rantoo, P.N., Van Huyssteen, C.W. & Du Preez, C.C.** 2015. Organic carbon content in the soil master horizons of South Africa. *Vadose Zone Journal* 14: 1-12.

**Sandhage-Hofmann, A., Kotze, E., Van Delden, L., Dominiak, M., Fouche, H.J., Van der Westhuizen, H., Oomen, R., Du Preez, C.C. & Amelung, W.** 2015. Rangeland management effects on soil properties in the savanna biome, South Africa: A case study along grazing gradients in communal and commercial farms. *Journal of Arid Environments* 120: 14-25.

**Stigter, C.J.** 2015. Assessing relevant climate data for agricultural applications: Peer review report. *Agricultural and Forest Meteorology* 201: 461-462.

**Stigter, C.J.** 2015. Peer review report 1 on Coffea arabica yields decline in Tanzania due to climate change: Global implications. *Agricultural and Forest Meteorology* 201: 15-16.

**Stigter, C.J.** 2015. Spatio-temporal effects of forest canopy on understory microclimate in a long-term experiment in Switzerland: Peer review report. *Agricultural and Forest Meteorology* 201: 37-38.

**Stigter, C.J., Dawei, Z., Jing, L., Chunqian, L., Dominguez-Hurtado, I., Mohammed, A., Abdalla, A., Bakheit, N., Al-Amin, N., Yurong, W. & Kinama, J.** 2015. Meeting farmers' needs for agrometeorological services: A review with case studies. Part IV: Historical Case Studies. *Italian Journal of Agrometeorology - Rivista Italiana di Agrometeorologia* 1: 59-66.

**Swanepoel, P., Botha, P., Du Preez, C.C., Snyman, H.A. & Labuschagne, J.** 2015. Managing cultivated pastures for improving soil quality in South Africa: Challenges and opportunities. *African Journal of Range & Forage Science* 32: 91-96.

**Swanepoel, P., Du Preez, C.C., Botha, P. & Snyman, H.A.** 2015. A critical view on the soil fertility status of minimum-till kikuyu-ryegrass pastures in South Africa. *African Journal of Range & Forage Science* 32: 113-124.



Lime accumulation in an endorheic wetland.

**Swanepoel, P., Du Preez, C.C., Botha, P., Snyman, H.A. & Habig, J.** 2015. Assessment of tillage effects on soil quality of pastures in South Africa with indexing methods. *Soil Research* 53: 274-285.

**Tesfahuney, W.A., Van Rensburg, L.D., Walker, S. & Allemann, J.** 2015. Quantifying and predicting soil water evaporation as influenced by runoff strip lengths and mulch cover. *Agricultural Water Management* 152: 7-16.

**Van Aardt, A.C., Bousman, C., Brink, J.S., Brook, G., Jacobs, Z., Jacobs, Z., Du Preez, P.J., Rossouw, L. & Scott, L.** 2015. First chronological, palaeo environmental, and archaeological data from the Baden-Baden fossil spring complex in the western Free State, South Africa. *Palaeoecology of Africa* 33: 117-152.

**Van Rensburg, L.D. & Mavimbela, S.S.W.** 2015. In situ evaluation of internal drainage in duplex soils of the Tukul, Sepane and Swartland forms. *South African Journal of Plant and Soil* 32: 209-220.

**Van Tol, J.J., Van Zijl, G.M., Riddell, E. & Fundisi, D.** 2015. Application of hydro-pedological insights in hydrological modelling of the Stevenson-Hamilton Research Supersite, Kruger National Park, South Africa. *Water SA* 41: 525-533.

**Zhang, B., Tsunekawa, A. & Tsubo, M.** 2015. Identification of dust hot spots from multi-resolution remotely sensed data in Eastern China and Mongolia. *Water Air and Soil Pollution* 226: 117-18.

## Staff

**Professors:** Profs CC du Preez, PAL le Roux, and LD van Rensburg.

**Associate Professors:** Prof CW van Huyssteen.

**Senior Lecturers:** Drs J Allemann, GM Ceronio, GM Coetzer, and AC Franke.

**Lecturers:** Drs JH Barnard, E Kotze, WA Tesfahuney, E van der Watt, Mss MP Aghoghovwia, L de Wet, and Mr AS Steyn.

**Affiliate Professors:** Profs JC Pretorius, CJ Stigter, and S Walker.

**Affiliate Associate Professors:** Profs M Tsubo and R van Antwerpen.

**Senior Officers: Professional Services:** Mss YM Dessels and L Henning.

**Officer: Professional Services:** Ms N Radebe.

**Senior Assistant Officers:** Mss A Moffat, R Etzebeth, and GC van Heerden.

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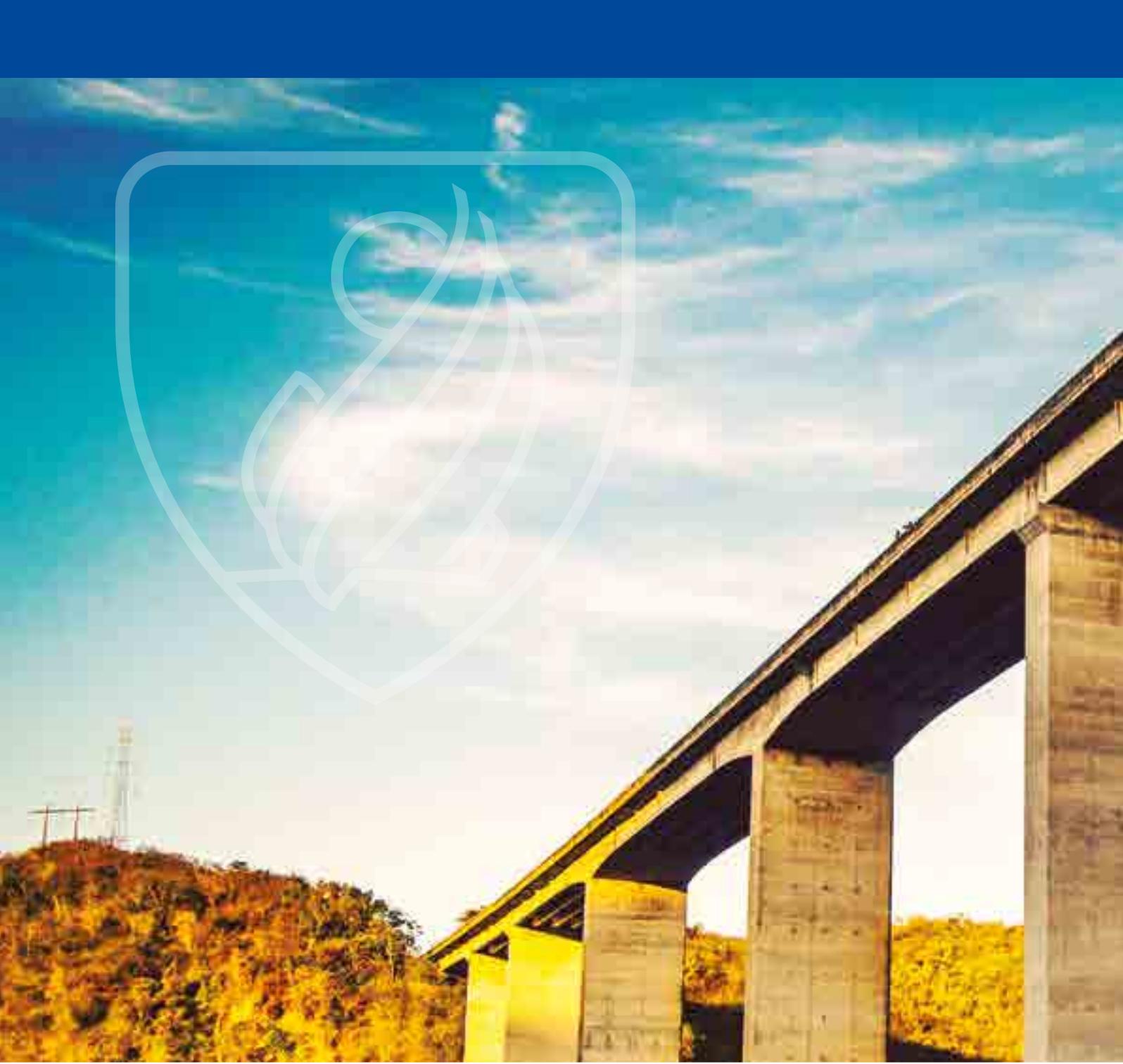
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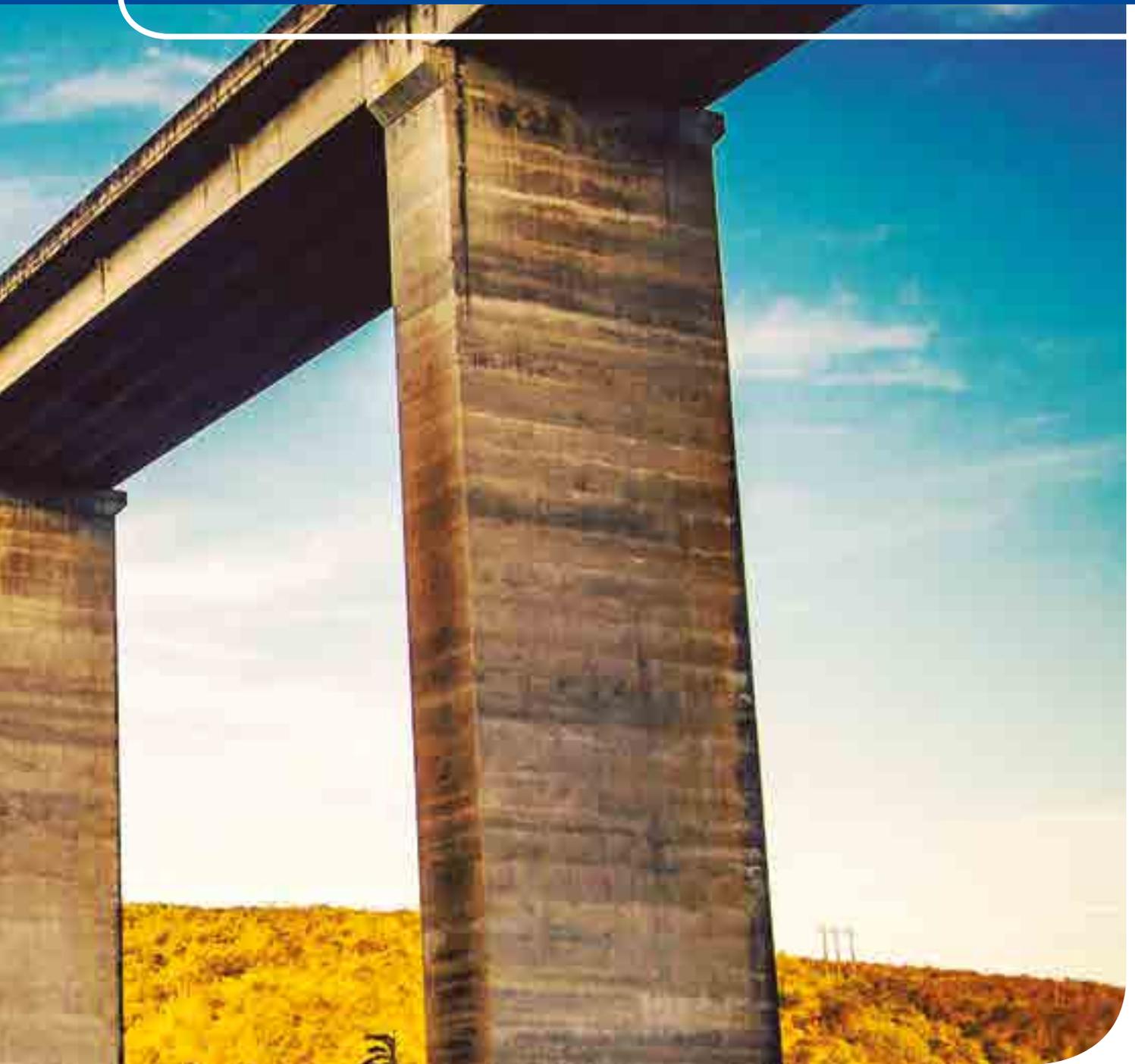
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# Building Sciences

# Department of Architecture

## Overview

The year 2015 marked the 60<sup>th</sup> anniversary of the Department of Architecture at the UFS. The highlight of 2015 was the 27<sup>th</sup> Sophia Gray Memorial Lecture and Exhibition presented by Anton Roodt of Roodt Architects based in Bloemfontein. Roodt's award-winning oeuvre is mainly focused locally and includes projects in restoration of well-known historical buildings, to smaller domestic designs. The lecture entitled "Big dreams in a small city" was hosted in the Civic Theatre in Bloemfontein and was attended by more than 200 professionals and 260 students and members of the public. The annual exhibition in Oliewenhuis, which accompanied the lecture, was extended with three weeks. The international speaker of Meccanoo Architects in the Netherlands was sponsored by the South African Institute of Steel Construction. This lecture preceded the Sophia Gray lecture.



Restoration of the Fourth Raadsaal in Bloemfontein by Roodt Architects.

## Student Activities

In 2015 the department received 98 applications for first-years to the BArch degree, of which 50 first-years could be accommodated.

The students successfully undertook their annual design education tours in different year groups to Johannesburg, Clarens, Durban, and Cape Town.

Second-year students designed proposals for a container park for the UFS Main Campus to be used during the Vryfees arts festival. The project proposals were exhibited in the Architecture building. In collaboration with Ricardo Peach, students from the department developed concept designs for exhibitor stalls at the Vryfees.

The third-year students participated in the annual national PG Bison student competition. Mr Jacques Steyn received the third prize.

Mr Greg McQueen was one of the three winners of the prominent Carl & Emily Fuchs Prestige Competition in Architecture. This marks the fourth time that a student from the department received a prize at this competition.

Master's student Ms Nilene van Niekerk was the regional winner of the annual Corobrik Master's in Architecture Student Competition and will represent the UFS in 2016 with her design at Constitution Hill in Johannesburg.

During the annual recirculation process, the department gave special attention to the honours programme by introducing a new research module. The module aims at the integration of studio-based research and theoretical texts, and has received positive feedback from students.

## Staff Activities

### Conferences

Ms Tumubweinee was a keynote speaker at the TedxUFS event. Prof Walter Peters presented papers at conferences in Valencia. Dr Gerhard Bosman presented papers in Perth and in Pretoria. Ms Wanda Verster presented a paper in Istanbul. Dr Bosman, Prof Peters, Dr Madelein Stoffberg, Dr Henderik Auret, Messrs Jako Olivier, and Hein Raubenheimer all presented papers at the 9<sup>th</sup> national conference of the South African Journal of Art History with the theme "Situated Experience" hosted by the department.

### Panels

Mr Kobus du Preez served as a judge for the Free State Institute of Architects (FSIA) Awards, as well as on the permit committee of Free State Heritage and on the Names Committee of the UFS. Ms Tumubweinee served on the judging panel for PPC Imagirium National Competition. Mr Du Preez and Ms Verster served on the Organising Committee of the 9<sup>th</sup> Annual Conference of the South African Journal of Art History. Dr Bosman served on the Aesthetic Committee of Mangaung Metropolitan Municipality and on the panel for the Vernacular Heritage VERSUS2014-2016 Sustainable Architecture Congress (VERSUS2014-2016) and the XII<sup>th</sup> World Congress on Earthen Architecture (TERRA 2016) scientific committees. Prof Peters served on the KwaZulu-Natal Institute for Architecture (KZNIA) Awards jury.

### Special Achievements

Ms Verster was awarded the Erasmus Mundus Mobility Grant which allows her to spend the first six months of 2016 at Uppsala University in Sweden. Mr Henry Pretorius received a Merit Award from the FSIA for the new Visitors' Centre on the UFS Main Campus.

honours level Theory of Architecture module. Dr Bosman attended the annual Archi-Terre festival, an initiative of the Algerian Ministry of Culture, from 18–29 April in Algiers, Algeria. He assisted in the presentation of compressed earth block workshops for learners, students, and professionals in the building industry.



Roodt Residence in Bloemfontein designed by Roodt Architects.

### Community

The Annual Winter School was once again a success. Grade 11 and 12 learners attended the two-day course designed to expose potential students to the architectural profession. The department, in association with the FSIA, hosted the Second Annual Bloembuild Expo on the UFS Main Campus. The Expo has grown significantly since 2014.

### Exhibitions

Mr Du Preez, in association with Roodt Architects, curated the 27<sup>th</sup> Sophia Gray Memorial Lecture and Exhibition at Oliewenhuis. Third-year History of Architecture students built models of the projects completed by Roodt Architects in Bloemfontein. This formed part of the exhibition.

### Workshops

Third-year students were involved in the construction of a visitors' centre for the Qala Phelang Tala Community Service Learning Project at Lebone Village in Bloemfontein. A variety of earth-building techniques were used in this building. Mr Raubenheimer and Dr Bosman presented a Community Service Learning Project entitled "An earth-constructed dwelling in Mangaung". Students across the different degrees were enthusiastic about their involvement on-site in the production of stabilised sun-dried earth blocks (adobe). The project progressed well, with completion expected in 2016.

The Earth Unit continued with responsibilities as a UNESCO Earth Architecture member by acting in the scientific committees of international conferences hosted by UNESCO partners.



Qala Phelang Tala and Community Service Learning Project at Lebone Village.

## National and International Collaboration

The collaboration with the Department of Art History and Visual Culture continued in 2015. Prof Suzanne Human was involved with the redesigned

## Postgraduate Students

Mr Jako Olivier completed his BA Honours degree in Applied Ethics at Stellenbosch University and registered for his masters' degree in Philosophy at the same institution in 2015.

Three students completed their PhD theses in Architecture. The last time a PhD thesis was conferred was in 1987 by Prof Leon Roodt. Drs Stoffberg, Bosman, and Auret's doctoral degrees were conferred at the winter graduation ceremony. This is the first time that three PhD's in architecture were conferred at the same time in the history of the UFS.

Prof Peters examined two MPhil degrees, while several staff members acted on panels for the moderation of architecture students at national universities.



Service Learning Project of earth-constructed dwelling in Mangaung.

## Staff Matters

- Mr Jan Ras was elected as the Vice Treasurer for the South African Institute of Architects.
- Mr Rudolf Bitzer completed his last commitments at the department and now focuses on private practice and sculpture.
- Ms Martie Bitzer held a successful solo exhibition of pewter work at Gallery on Levisour.

## Research Outputs

### Research Articles

**Auret, H.** 2015. Architectural phenomenology and the tyranny of the lived experience. *The South African Journal of Art History* 30(3):112-122.

**Bosman, G.** 2015. Situated neighbourhood safety and fence decoration. *The South African Journal of Art History* 30(3): 74-86.

**Peters, W.H.** 2015. Absorbing the influences of Le Corbusier: Roelof Uytendogaardt and the architecture of the Werdmuller Centre, Claremont, Cape Town. *The South African Journal of Art History* 30(2): 45-68.

**Peters, W.H.** 2015. Max Kirchoffer and the new town of Sasolburg. Creating the spatial and architectural framework. *The Journal of the South African Institute of Architects* July/August: 55-61.

**Stoffberg, M.** 2015. Situating through representation: Two community centres investigated through Lefebvre's Spatial production. *The South African Journal of Art History* 30(3): 99-111.

### Chapter in Book

**Verster, W.** 2015. Depicting the traumatic past: Museums as narrative devices. In *Not ever absent: Storytelling in arts, culture and identity formation*, edited by S. Moenandar & N. Miller. Oxford: Inter-Disciplinary Press. pp. 67-78.

### Conference Contributions

**Bosman, G. & Salzmänn-McDonald, K.** 2015. Contemporary soil-cement and rammed earth in South Africa. Rammed Earth Construction. In *Rammed Earth Construction*, edited by D. Ciancio and C. Beckett. Proceedings of the 1<sup>st</sup> International Conference on Rammed Earth Construction (ICREC2015), Perth, Australia. 10 February. pp. 47-50.

**Bosman, G. & Steyn, J.J.** 2015. Greening of stabilized brickyard industry for supporting sustainable building in Kuruman in the Northern Cape Province. In *Smart and Sustainable Built Environment (SASBE) 2015 Conference Proceedings*, edited by J. Gibbert & D.C.U. Conradie. Proceedings of the 5<sup>th</sup> International Conference on Smart and Sustainable Built environments (SASBE), University of Pretoria, Pretoria, South Africa. 9-11 December. pp. 93-99.

**Olivier, J.I.** 2015. *Towards an Ethos of Dwelling with Pre-democratic Things*. Paper delivered at the ArchTheo'15 – Theory of Architecture Conference, Istanbul, Turkey. 5-7 November.

**Olivier, J.I.** 2015. *The role of the magical real and care in the South African In-Between Place: An ethical attitude towards the making of public architecture*. Paper delivered at the 9<sup>th</sup> Annual Conference of the South African Journal of Art History (SAJAH), Bloemfontein, South Africa. 28-29 August.

**Peters, W.H. & Olivier, A.** 2015. *Urban morphology & academic writing: A pedagogical experiment*. Paper delivered at the 3<sup>rd</sup> International REUSO Conference: Documentation and Restoration of Architectural Heritage and Landscape Protection, Valencia, Spain. 22-24 October.

**Raubenheimer, H. & Peters, W.H.** 2015. *A situated modernism: Selected aspects of the residential architecture Bloemfontein's 1950s and '60s architect: Henk de Bie*. Paper delivered at the 9<sup>th</sup> Annual Conference of the South African Journal of Art History (SAJAH), Bloemfontein, South Africa. 28-29 August.

**Verster, W.** 2015. *Framing the museum: Urban thresholds and embodied experience*. Paper delivered at CONTEMPART '15: Urban identity, space studies and contemporary arts, 4<sup>th</sup> International Art Conference, Nâzım Hikmet Cultural Center, Istanbul, Turkey. 8-9 June. pp. 50-56.



## Staff

**Academic Department Head:** Mr HB Pretorius.

**Professor:** Prof WH Peters.

**Associate Professor:** Prof JD Smit.

**Senior Lecturers:** Mr JL Du Preez, Mss MM Bitzer, PN Tumubweinee, and A Wagener.

**Lecturers:** Drs G Bosman, M Stoffberg, Messrs JW Ras, JH Nel, JO Olivier, H

Raubenheimer, DFP Venter, Z Wessels, and Ms KNE Salzmann-McDonald.

**Secretary:** Ms Y Pretorius.

**Officer: Professional Services:** Ms W Verster.

**Assistant Officer:** Mr LT Kewsa and Ms Z Bronkhorst.

**Messenger:** Ms TJ Mohatlane.

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# Department of Quantity Surveying and Construction Management

## Overview

The year 2015 was quite a challenging one for the Department of Quantity Surveying (QS) and Construction Management (CM). Much time and effort went into redressing student curriculum challenges, benchmarking and rearticulation, and redeveloping of programmes as well as module reviews to enhance the quality of teaching and learning. Consequently, the research did not perform at the expected level. Strategies are being put in place to enhance research activities and outputs of the department.

The main research highlight of the department was the successful hosting of the 8<sup>th</sup> Annual Quantity Surveying Research Conference in October 2015 by the department. The conference was held in Bloemfontein for the first time and was well attended by about 230 delegates comprising academics, industry practitioners, and students. This is a prestigious national conference at which the department also presented four papers.



The 8<sup>th</sup> Annual Quantity Surveying Research Conference, October 2015, Bloemfontein: Mr Ole Litheko, Senior Officer: Finance, with a group of third-year students who assisted with conference organisation.

A total of 13 prizes were awarded to undergraduate and honours students in the department at the April 2016 faculty prize-giving ceremony for their outstanding 2015 performance. The best BSc graduating student in the faculty for 2015, Mr John Thatcher, hails from the Department of Quantity Surveying and Construction Management.

## National and International Collaboration

Ms E Jacobs' research collaboration with Appalachian State University, North Carolina, is still ongoing. The research involves the monitoring of several houses in the Mangaung district in respect of temperature and relative humidity. The data is obtained by means of loggers that were installed in these houses a few years ago, and sent to Prof Jeff Ramsdell's team and processed by means of computer software. 3-D models are then created and variables are applied to the models in order to establish the energy efficiency of various construction materials and methods. Costs are attributed to these variables and a link can thus be identified between construction materials and methods, cost, and energy efficiency.

## Research Specialisation Areas of the Department

The specialisation research areas include, but are not limited to, the following:

- Construction Management and Quantity Surveying Practices;
- Dispute Resolution;
- Ethics;
- Land and Property Development;
- Procurement and Supply Chain Management;
- Project Management;
- Sustainability;
- Technology; and
- Training and Education.

## Postgraduate Students

Five students completed their Master by Course work (Master in Land and Property Development Management). They will graduate in June 2016.

## Staff Matters

Staff matters included the promotion of Dr MS Ramabodu to senior lecturer and Mrs E Jacobs to lecturer. Ms Matshediso Sepheka was appointed as senior assistant at the Distance Learning Unit of the department.

## Research Outputs

### Research Articles

**Jacobs, E.** 2015. The status quo of green-building education in South Africa. *Acta Structilia* 22(2): 110-133.

**Zulch, B., Burger, M. & Verster, B.** 2015. The construction project manager in South Africa: Analysis of industry-specific knowledge. *Acta Structilia* 22(1): 48-72.

### Conference Contributions

**Botsane, M.L. & Kajimo-Shakantu, K.** 2015. *Challenges of artisan skills development in the construction industry.* Paper delivered at the 9<sup>th</sup> Built Environment Conference of the Association of Schools of Construction of Southern Africa (ASOCSA), Durban, South Africa, 2-4 August.

**Dhliwayo Ringisai, A. & Kajimo-Shakantu, K.** 2015. *Examining inefficiencies in the Public Sector Procurement Systems of Construction Projects in Zimbabwe: An exploratory study.* Paper delivered at the 2<sup>nd</sup> International Conference on Development and Investment in Infrastructure (DII-2015): Strategies for Africa, Livingstone, Zambia. 16-18 September.

**Els, M-M.** 2015. *Educational aspects to support a lifelong career as professional in the property industry.* Paper delivered at the Construction, Building and Real Estate Research Conference (RICS COBRA AUBEA), Sydney, Australia, 8-10 July.

**Froise, T.** 2015. *Revealing construction project communications using social network analysis.* Paper delivered at the 8<sup>th</sup> Annual Quantity Surveying Research Conference 2015: Cementing the future, Bloemfontein, South Africa, 15-16 October.

**Landman, G. & Kajimo-Shakantu, K.** 2015. *Effects of time delays on cost claims and disputes.* Paper delivered at the 8<sup>th</sup> Annual Quantity Surveying Research Conference 2015: Cementing the future, Bloemfontein, South Africa, 15-16 October.

**Letsie, M.** 2015. *Evaluation of the causes for the decreasing numbers of artisans in South Africa.* Paper delivered at the 8<sup>th</sup> Annual Quantity Surveying Research Conference 2015: Cementing the future, Bloemfontein, South Africa, 15-16 October.

**Mabasa, H. & Kajimo-Shakantu, K.** 2015. *Causes and effects of variation orders on construction projects: A case of the Limpopo Provincial Government.* Paper delivered at the 8<sup>th</sup> Annual Quantity Surveying Research Conference 2015: Cementing the future, Bloemfontein, South Africa, 15-16 October.

**Xhala, N.C. & Kajimo-Shakantu, K.** 2015. *Improving procurement management practices in the public sector: A study of Eastern Cape Province.* Paper delivered at the 9<sup>th</sup> Built Environment Conference of the Association of Schools of Construction of Southern Africa (ASOCSA), Durban, South Africa, 2-4 August.



Gerhard Landman, a BSc Hons student (2014), delivering a paper at the 8<sup>th</sup> Annual Quantity Surveying Research Conference, with his study leader, Prof K Kajimo-Shakantu.



Faculty prize-giving ceremony. Ms C Greyling (left), the Chair of the Free State chapter of the Association of South African Quantity Surveyors, presenting the Best First-Year BSc QS award to Ms X Mangese.

# Staff

**Departmental Head:** Prof K Kajimo-Shakantu.

**Senior Lecturer:** Dr BG Zulch.

**Lecturers:** Dr T Froise, Mr PM Oosthuizen, Mss M-M Els, T Bremer, and E Jacobs.

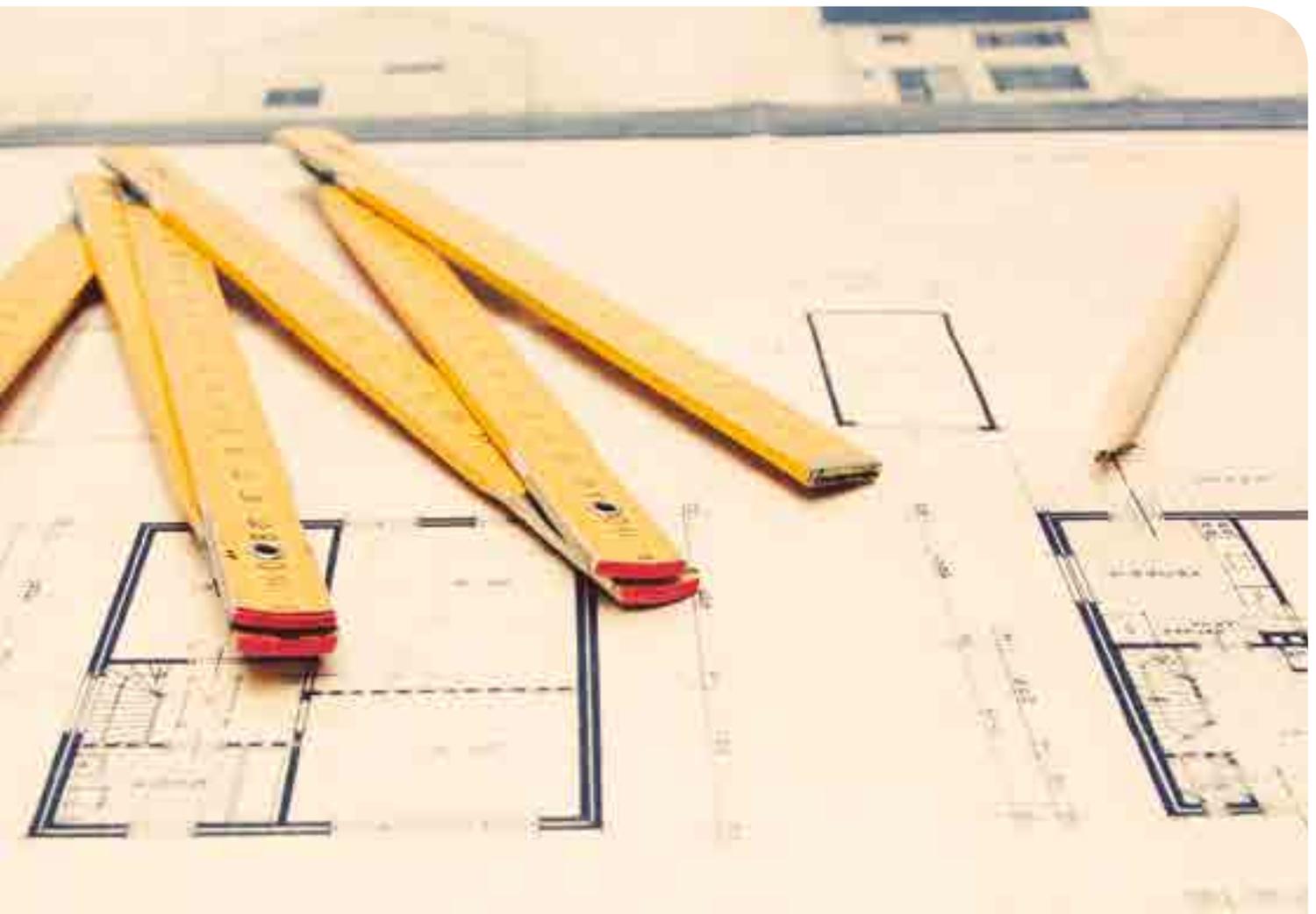
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# Department of Urban and Regional Planning

## Overview

This annual report outlines the achievements of the Department of Urban and Regional Planning for the year 2015. A major accomplishment was the outcome of our accreditation visit conducted on 28 and 29 May 2015. The Planning Profession Act, 36 of 2002, requires the South African Council for Planners (SACPLAN) to conduct accreditation visits at least every five years; the programme put forward for accreditation was the Master of Urban and Regional Planning (MURP) (4762 / 47448). The MURP and the Bachelor Honours in Spatial Planning (BHons SP) degrees are closely linked as the latter is an essential element in the competency set required by graduates of the MURP to meet the registration requirements of the SACPLAN. The content and process of the BHons SP therefore formed part of the documentary evidence evaluated by the Accreditation Panel. The Visiting Committee ruled that the MURP (4762 / 47448) complied with and in certain instances exceeded the minimum standards. The MURP is therefore accredited. Any person wishing to register with the SACPLAN with a MURP must have completed the BHons SP that feeds into the MURP.



The Eastern Cape tour for the Honours in Spatial Planning students, consisting of Mr Marhulumba, Dr Massey, Mr Ntshikilana, Mr Dikwayo, and Ms Ramahuma.

The Accreditation Panel made a number of observations of the programme. These included:

- Good communication and an open-door policy between lecturers and students;
- A constructive and bold programme design in response to competencies;
- Clear articulations of and between programmes;
- All aspects of previous accreditation were addressed; and

- A good balance between academic and practical experience among academic staff (in both private and government sectors).

## Staff Achievements

- Dr Maléne Campbell was awarded the Vice-Rector's Award for Community Engagement.
- Dr Mphambukeli was selected as a Prestige Scholar in the Vice-Chancellor's Prestige Scholars Programme (PSP), 2015 cohort. The PSP is led by the Vice-Chancellor of the UFS and seeks to identify, develop, and promote the next cohort of the most promising and talented UFS academic members of staff who obtained doctoral degrees within the last five years. These are young scholars who have chosen academic careers and who are focused on and determined to becoming senior academics in their respective disciplines.

## Student Achievements

Ms Emma Ramaila was selected to be an NRF intern and hosted at the department from April 2015 to April 2016.

## Eastern Part of the Karoo Student Tour

To expose our students to current realities that have implications for urban and regional planning, the students toured to the eastern part of the Karoo. The tour was arranged and facilitated by Messrs Thomas Stewart, Kgosi Mocwagae, Stuart Denoon-Stevens, and Dr Thulisile Mphambukeli. The tour group comprised 55 honours and master's students who visited Philippolis, Nieu-Bethesda, Graaff-Reinet, and Port Elizabeth (including Coega).

The students conducted a land use survey assignment in Philippolis to assess which land uses were present there in comparison to those in the surrounding areas. A business survey was undertaken in Nieu-Bethesda. At the Coega Development Agency (CDA), a presentation was delivered by Dr Keith du Plessis from the Business Development section of the CDA. At the Imizi social housing project located in Walmer, Port Elizabeth, Mr Ndaba Ndzombane, an urban and regional planning consultant of the Nelson Mandela Bay Municipality, addressed the students on the impact of politics on the housing system. The night before their departure, Dr Thulisile Mphambukeli and Mr Stuart Denoon-Stevens, amongst other speakers, presented at a function held at the Department of Housing at the Nelson Mandela Bay University (NMBU) for the UFS and NMBU students. On the morning of our departure, Mr Luvuyo Bangazi from the



N8 Corridor Maseru Project for the Regional Project module, with Mr Kgosi Mocwagae and master's students.

Mandela Bay Development Agency (MBDA) gave a talk which included a discussion of the agency's mandate to revitalise Mandela Bay through urban regeneration.

In addition, the department hosted a seminar with Free State Agriculture and the Centre for Environmental Management on the draft Preservation and Development of Agricultural Land Framework Bill in April 2015. This seminar led to comments on the draft bill being submitted to the Department of Agriculture after the workshop.

UFS, addressed the students. The industrial and residential areas of the city were visited before returning to Bloemfontein.

The honours students were required to develop proposals for Nieu-Bethesda, based on desktop analyses and observations made on tour. The proposals are currently being synthesised into a document that will be handed to the community and municipality of Nieu-Bethesda at the end of 2016 as a community outreach project as part of the departmental strategy to provide guidance on future local socioeconomic development interventions.

## Research

In collaboration with the Centre for Development Support, Department of Economics, and others, the department assisted with data collection of a household survey of 1 000 households in Postmasburg, a mining town in the Northern Cape. This research has carried over into 2016, and it is intended that this will result in the publication of an academic book in 2017.

## Community Service

Dr Thulisile Mphambukeli and Mr Kgosi Mocwagae took the master's students on a field trip with the aim of determining the viability of a development axis along the N8 road between Bloemfontein and Maseru. The exercise commenced with students being taken on an educational drive around the Mangaung township in Bloemfontein and to the earmarked central location of the Airport Development Node. Students were then introduced to the economic and social complexities of Botshabelo and Thaba 'Nchu, with the trip ending in Lesotho. The first stop was at the Maseru City Council, where the Chief Town Planner, Mrs Palesa Lekau, an alumna of the Department of Town and Regional Planning,



Honours in Spatial Planning students and staff engaging with NMMU students and staff during the Eastern Cape tour.



Two PhD students graduated during December 2015. From left to right: Dr A Williams, Prof Verna Nel, and Dr T Mphambukeli.

The department assisted the Free State branch of the Department of Rural Development with a number of training sessions for municipal planners in order to assist with the implementation of the Spatial Planning and Land Use Management Act, 16 of 2013.

## National and International Collaboration

The department organised two guest lectures in 2015. The first was with Dr Suzanne Speak of the University of Newcastle, who visited the department in September as part of a Newcastle University-UFS Researcher Links Mobility Initiative. She conducted workshops and delivered a guest lecture on planning and development in India. Dr Speak presented various research workshops to our master's and PhD students and delivered a guest lecture entitled "Planning and Development in India".

The second guest lecture was presented by Prof Vanessa Watson, a renowned researcher from the University of Cape Town. The lecture, presented in November 2015, was entitled "African Urban Fantasies" and regarded the dynamics of urban and regional planning on both the South Africa and global scale.

## Staff Matters

The department welcomed Messrs Stuart Denoon-Stevens and Kgosi Mocwagae, who joined the department in January 2015.

Dr Thulisile Mphambukeli graduated with her doctorate in December 2015.

## Research Outputs

### Research Article

**Sinxadi, L. & Campbell, M.** 2015. Creating sustainable environments through community participation: The case of Naledi Local Municipality, South Africa. *Journal of Public Administration* 50(2): 370-378.

### Book

**Steyn, J.J.** 2015. *Reforming normative planning: Essays on a Christian approach to planning. / Hervorming van normatiewe beplanning: Opstelle oor 'n Christelike benadering tot beplanning.* Orania: Prisca Uitgewers.

### Conference Contributions

**Bosman, G. & Steyn, J.J.** 2015. *Greening of cement stabilized brickyard industry for supporting sustainable building in the Northern Province.* Proceedings of the 9<sup>th</sup> Built Environment Conference of the Association of Schools of Construction of Southern Africa (ASOCSA), Durban, South Africa. 2-4 August. pp. 229-241.

**Mphambukeli, T.M. & Saheed, O.** 2015. *Towards sustainability: Practical options for irrigation water conservation at the Bloemfontein Campus of the University of the Free State.* Proceedings of the 8<sup>th</sup> Annual Quantity Surveying Research Conference 2015: Cementing the future, Bloemfontein, South Africa. 15-16 October. pp. 249-265.

**Campbell, M.M. & Mphambukeli, T.N.** 2015. *Enhancing the quality of postgraduate supervision: A students' perspective, University of the Free State.* Paper delivered at the 26<sup>th</sup> International Council for Open and Distance Education (ICDE) World Conference: Growing capacities for sustainable e-learning provision, Sun City, South Africa. 14-16 October.

**Mphambukeli, T.N. & Campbell, M.M.** 2015. *A remedial measure? Power relationships and social justice in planning: A case study of Emalaheni Local Municipality.* Paper delivered at the Second Conference of Planning Students and Young Graduates (CPSYG), Doornfontein Campus, University of Johannesburg, Johannesburg, South Africa. 5-7 October.

**Ramaila, E. & Denoon-Stevens, S.P.** 2015. *Leisure, open space and recreational planning in previously disadvantaged townships: A case study of Mahwelereng, Limpopo.* Paper delivered at the Second Conference of Planning Students and Young Graduates (CPSYG), Doornfontein Campus, University of Johannesburg, Johannesburg, South Africa. 5-7 October.

**Steyn, J.J.** 2015. *Regeneration of the Bloemfontein City Square.* Paper delivered at the ISUF 2015 - XXII International Conference: City as Organism: New visions for urban life, Faculty of Architecture, 'Sapienza', Rome, Italy. 22-26 September.



## Staff

**Professor:** Prof VJ Nel.

**Senior Lecturer:** Dr MM Campbell.

**Lecturers:** Dr TN Mphambukeli and Mr TS Stewart.

**Junior Lecturers:** Messrs S Denoon-Stevens and KG Mocwagae.

**Researcher/Research Assistant:** Ms E Ramaila.

**Research Associate:** Prof JJ Steyn.

**Secretary:** Ms RM Hugo.

**Senior Officer:** Ms AL Nel.

## Contact Details

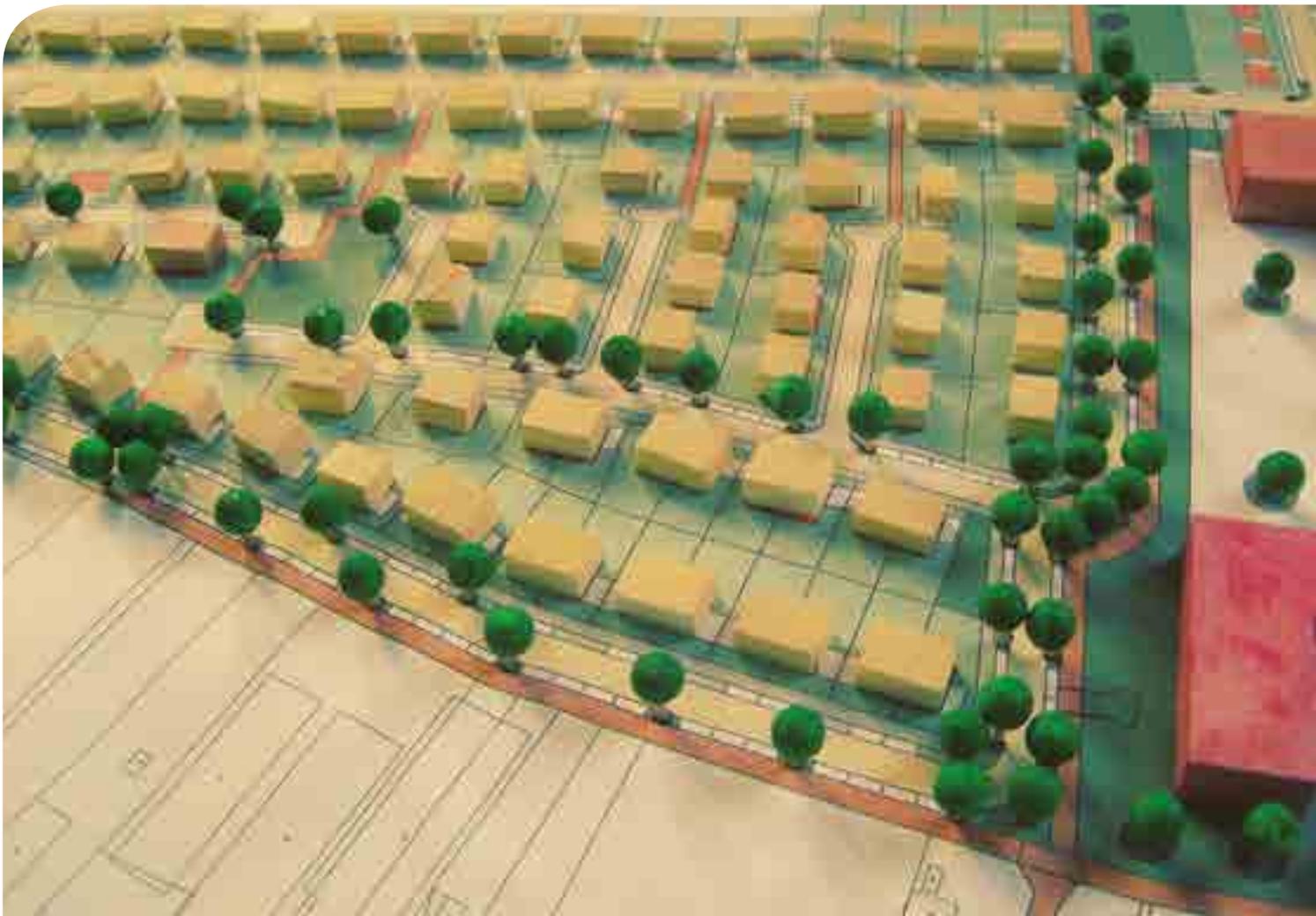
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# Natural Sciences

# Department of Chemistry

## Overview

The Department of Chemistry continued to focus on the strategic priorities of the UFS and the Faculty of Natural and Agricultural Sciences. The Department of Chemistry is spread over the three UFS campuses, with the South Campus concentrating on the extended BSc programme, as well as the bridging courses (UPP – University Preparation Programme), the Qwaqwa Campus catering for the local residential students and specialising in Polymer Science research, while the Main Campus teaches approximately 1 000 undergraduate students and conducts research in all four classic divisions in Chemistry, namely Analytical, Inorganic, Organic, and Physical Chemistry. The postgraduate students at the department included 12 honours, 18 MSc, and 29 PhD students, as well as 13 postdoctoral associates from as far as India, Germany, the Netherlands, Sudan, and Zimbabwe. The commitment and enthusiasm of Chemistry's personnel and students were clearly demonstrated by the research outputs of 2015, as manifested by the 68 research articles published in national and international accredited journals and 56 presentations made at local and international conferences, while five PhD and ten MSc students graduated from the department.



Prof Jeanet Conradie (UFS) receiving the Merck Medal from Prof Simon Lotz (President of the South African Chemical Institute) and Mrs Lynne Maritz (Merck).

The continued contribution and support of all personnel in the Department of Chemistry, the dean's office, the faculty, and senior UFS management are gratefully acknowledged.

## Structure of the Department of Chemistry

The Department of Chemistry on the Main Campus has four divisions, i.e. Inorganic Chemistry, Organic/Process Chemistry, Physical Chemistry, and Analytical Chemistry. The management committee of the department consists of Profs André Roodt (departmental chairperson), Jannie Swarts, Ben Bezuidenhout, and Walter Purcell, while Mr Rantooa Moji is the subject head on the Qwaqwa Campus.

## Teaching Activities

The undergraduate students on the Main Campus are trained in theory and practical aspects of all four classical Chemistry divisions (Analytical, Inorganic, Physical, and Organic) from the first to the third year, which include approximately 600 first-year students, 90 second-years, and 65 third-year students. Practicals for the first-years are organised, prepared, and controlled by Mss Magda Meyburgh and Janet Mmapo for approximately 800 students, which include students from the University Preparation and extended programmes on the South Campus. The honours course involved the teaching of 12 students in all four divisions of Chemistry.

The teaching of Chemistry modules on the South Campus is managed by Dr Charlene Marais and Ms Rina Meintjies and assisted by 14 facilitators. They also manage the Chemistry first-year teaching activities on the Qwaqwa Campus, as well as the Chemistry enrolment and courses at FET colleges such as the Goldfields FET College in Welkom and the Flavius Mareka FET College in Sasolburg. A total of 220 students were enrolled in the first-year Chemistry modules for the BSc Extended Programme on the South Campus, while 76 were enrolled in the UPP programme, which is designed to prepare students with low Admission Points (AP) scores for acceptance/enrolment for mainstream courses on the Main Campus.

Teaching on the Qwaqwa Campus also involves the theoretical and practical aspects of all four classical Chemistry divisions from the first to the third year, which include approximately 145 first-year students, 80 second-year students, and 50 third-year students. The honours course had an enrolment of six students, which involved the teaching of subjects applicable to Polymer Science.



## Research Activities

The **Inorganic Chemistry** division focuses on Coordination Chemistry and the integrated investigation of Reaction Mechanisms through the use of crystallography, spectroscopy, computational chemistry, and reaction kinetics. Three sub-research thrusts probe the applications to medicine (radiopharmaceutical and chemotherapeutic), industrial reactions/homogeneous catalysis/applied process chemistry, and the development of metal beneficiation technology.

This research continued in the group of Prof André Roodt (C1-rated), supported by Prof Deon Visser, Drs Johan Venter, Alice Brink (Thuthuka grant holder), Marietjie Schutte-Smith (Thuthuka grant holder), Ms Amanda-lee Manicum (Thuthuka grant holder), and Dr Truidi Venter (Thuthuka grant holder) as professional officer. The group also had three postdoctoral associates, six MSc students, and 11 PhD students; of whom one PhD and four students graduated during 2014. Group members attended numerous conferences and presented 23 oral and poster contributions during the year. Both Drs Brink and Schutte-Smith are UFS prestige scholars.

Prof André Roodt (one keynote address), Dr Carla Pretorius, and Mr Renier Koen presented 12 lectures at international conferences in Spain, Russia, Croatia, South Africa, Morocco, and Switzerland.

The **Organic and Process Chemistry** division focuses on the isolation and synthesis of natural products and compounds with therapeutic potential, while new methodologies for the synthetic organic compounds with the emphasis on catalyst development and evaluation for industrial processes are also being studied and developed.

The division is headed by Prof Ben Bezuidenhout (C3-rated and head of Process Chemistry), with Drs Susan Bonnet and Anke Wilhelm (Thuthuka grant holder and UFS prestige scholar) as lecturing staff, and Mr Rudi Swart as professional officer. The groups were involved in 17 (Process-chem 9) papers in the international chemistry literature, five MSc's (Process-chem 5), while six PhD students (Process-chem 3) were studying towards higher degrees. Two students (one MSc and one PhD) graduated during 2015. Dr Johannes van Tonder is employed by PETS Labs Pharmaceuticals but has been seconded to the UFS as a lecturer until the end of 2016.

Drs Susan Bonnet and Anke Wilhelm were involved in two prestigious Seventh Framework Programmes (FP7), namely hERG-screen – hERG related risk assessment of botanicals GA no. PIRSES-GA2011-295174 and MUTHI (Multidisciplinary University Traditional Health Initiative), an EU-funded project which aims to strengthen capacity for research on traditional herbal medicines in African universities. They attended workshops and conducted a number of research visits to Europe as part of the MUTHI project and the International Research Staff Exchange Scheme (IRSES) to establish collaboration between the project partners as part of the Framework 7 hERG-screen project. They have collaborators at the University of Basel, the University of Vienna, and the University of Innsbruck, where they are involved in various phytochemical projects. Postgraduate students in this section of Organic Chemistry include three MSc and six PhD students, as well as two postdoctoral fellows.

The **Physical Chemistry** is divided into four distinct and separate research groups which are independently headed by Profs Jannie Swarts (C1-rated) and Jeanet Conradie (C1-rated), Drs Ernie Langner, Eleanor Müller (Y2-rated), and Lizette Erasmus (Y2-rated), and are supported by Ms Ina du Plessis as professional officer.

The **Swarts Group** focuses on synthetic and physical chemistry aspects of multinuclear metallocenes, and concentrates on porphyrin and phthalocyanine compounds bearing metallocene substituents such as titanocene, zirconocene, ferrocene, ruthenocene, and osmocene derivatives, especially in association with late transition metals; electrochemical, kinetic, and thermal analyses of these complexes; medicinal aspects of these complexes; and industrial studies on



Prof Jeanet Conradie and Dr Happy Sithole, Director for the Centre for High-performance Computing in South Africa at the Centre for High-performance Computing (CHPC) National Meeting and Conference.

carboxylato complexes and heterogeneous catalysis of systems supported on two-dimensional matrices in collaboration with SASOL. The research in the **Conradie Group** focuses on the characterisation of transition metal complexes and intermediates by synthetic and computational chemistry. Transition metal porphyrin and related compounds, O,O'-Chelated titanium complexes, beta-diketonato-carbonyl complexes of rhodium(I) and rhodium(III), and dithizonato compounds of transition metal complexes are currently also being investigated. The **Erasmus Group**, on the other hand, focuses on heterogeneous catalysis of especially model catalysts on flat surfaces and materials characterisation with XPS techniques, while the **Langner Group** studies Metal Organic Frameworks (MOFs), especially for catalysis, gas adsorption and desorption studies, and thermal analysis thereof.

Profs Swarts and Conradie both hold two NRF research grants (Rated Researcher and Competitive Rated Researcher). Dr Erasmus holds a Rated Researcher NRF grant, while both Drs Langner and Müller are holders of NRF Thuthuka grants. The Swarts, Erasmus, and Langner groups were also funded by research grants from SASOL. Postgraduate students in this division include five MSc and nine PhD students, as well as four postdoctoral associates.

The division was involved in 36 publications in high-impact journals, attended ten conferences, and made 25 oral and poster contributions.

**Analytical Chemistry** has Prof Walter Purcell (C3-rated) as division head, with Prof Karel von Eschwege (C3-rated) and Dr Rebotsamang Shago. The division was supported by two PhD and six MSc students, as well as four postdoctoral associates. Two students (one MSc and one PhD) graduated in this period. The division was involved in ten publications in national and international journals, attended four conferences, and made five oral and poster contributions.

platinum-group elements (PGE), rare earth elements, as well as lithium beneficiation. Numerous samples were analysed for private individuals, as well as local and national companies.

The group also focuses on different inorganic chemistry projects, such as kinetic and structural studies of organometallic complexes of Ir(I) and Rh(I) oxidative addition reactions, Re(V) and Os(VI) cyano complexes, as well as some Co and Cr aqueous chemistry. All of these studies utilised XRD, IR UV/vis, Nuclear Magnetic Resonance (NMR), and computational methods.



Prof Walter Purcell next to the statue of Dalton during a research visit to the Manchester Metropolitan University.

The group focuses on a number of analytical and inorganic projects. The former concerns the dissolution, quantification, and method validation of a number of inorganic and ore samples such as zircon, tantalite, and columbite to establish methods to accurately quantify the different elements therein. These projects are conducted in collaboration with the Nuclear Energy Corporation of South Africa's (NECSA) Advanced Metals Initiative (AMI).

Different advanced analytical techniques are employed, such as microwave and acid dissolution procedures, while Inductively Coupled Plasma (both Optical Emission and Mass Spectroscopy, and OES and MS), Graphite Furnace Atomic Absorption Spectroscopy (GFAAS), and Infrared and UV/visible spectroscopy were used for the identification and quantification of the different elements – with ISO 17025 criteria as the benchmark. Other techniques such as X-ray Diffraction and X-ray Fluorescence (XRD, XRF), Differential Scanning Calorimetry (DSC), and Thermal Gravimetric Analysis (TGA) are also utilised. Elements which are currently investigated are niobium, tantalum, zirconium, hafnium, all the

In yet another thrust, the group is involved in the investigation of photochromic reactions in different transition metal complexes, with potential applications in high-density optical molecular switching mechanisms. Techniques such as Pulsed Laser, UV/visible, IR, NMR, Cyclic-Voltammetry, Quantum Computational Chemistry (ADF and Gaussian), and X-ray Crystallography are employed. The Analytical section was responsible for the element analyses for other groups in the departments of Chemistry, Geology, Physics, and Microbiology.

**Polymer Science** at the Qwaqwa Campus has Prof Riaan Luyt (C1-rated) as principal research leader. This group was mainly involved in investigating the morphology and properties of polymer blends, composites, and nanocomposites. The group consisted of two MSc and four PhD students, and was involved in 29 publications in international journals.

## Achievements

### Staff Achievements

- Prof Jeanet Conradie received the South African Chemical Institute (SACI) Merck Medal in August 2015 for achievement in a specific field of chemistry until 2014.
- Prof Conradie was the Runner-up in the South African Women in Science Awards.
- Prof Conradie presented two lectures: one invited keynote and one keynote lecture at international and national conferences respectively.
- Prof André Roodt presented one keynote address (INDABA8, Skukuza, Kruger National Park) and was the Chair of the Organising Committee of INDABA8, while Drs Alice Brink and Carla Pretorius served as members of this committee.
- Prof Roodt was appointed as international member on the Advisory Board of the Ruđer Bošković Institute (consisting of 14 divisions and centres) in Zagreb, Croatia.
- The department acquired two new NMR instruments to the value of R12 000 000, funded by the Research Development Department of the UFS and are managed by Dr Linette Twigge. The new 300-MHz Fourier NMR is dedicated to  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectroscopy and is mainly used for routine NMR by all postgraduate students. The 400-MHz Avance III NMR is equipped with two liquid-state probes (a 5-mm probe with a range of  $^{31}\text{P}$  -  $^{97}\text{Mo}$  and a 10-mm probe with a range of  $^{31}\text{P}$  -  $^{109}\text{Ag}$ ), along with a 4-mm multinuclear double resonance magic angle spinning probe for solid-state NMR with a range of  $^{15}\text{N}$  to  $^{31}\text{P}$ . The acquisition of the solid-state NMR enables the research groups to broaden their NMR studies to insoluble compounds like heterogeneous catalysts and MOFs. Both new NMR instruments are also equipped with auto samplers, which increase the productivity and output of the NMR lab. The addition of these new instruments to the existing 300 MHz DPX NMR and 600 MHz Avance II NMR make the department one of the best equipped NMR labs in the country. All the postgraduate students in the department have access to the NMR instruments and are trained to perform their own NMR experiments.

### Student Achievements

- Dr Ebrahiem Botha won first prize in the Three Minute Thesis competition (UFS) 2015.
- Ms Carla Pretorius won best student poster presentation at the International Symposium (more than 20 countries represented), INDABA8, in the Kruger National Park, South Africa.
- Ms Tanya Pieterse (PhD student) was the runner-up for best poster presentation at the Binational USA-SA Organic Chemistry Conference in 2015.
- Mr Stefaans Gerber won first prize for a poster at the Suid-Afrikaanse Akademie vir Wetenskap en Kuns (SAAWK) Studentesimposium 2015.
- Mr Maheshini Govender won third prize for a poster at the SAAWK Studentesimposium 2015.
- Dr Truidie Venter presented an invited presentation at the Science World Forum in Hungary.
- Ms Melanie Visser received the James Moir Medal.
- The Chemistry soccer team won the UFS Cup.



Postdoctoral associate Dr Trevor Chiweshe in discussion at a poster presentation.

## Activities

Prof Roodt served on behalf of the European Crystallographic Association (ECA) on the council (20 permanent organisation members) of the Initiative for Science in Europe, which includes more than 330 000 individual scientists as members. He was also a member of the international editorial board of the *Journal of Coordination Chemistry*, and was elected onto the National Committee of Applied Systems Analysis of the South African NRF. As president of the ECA, Prof Roodt chaired the executive meetings of the ECA in Basel, Switzerland, in February, and Rovinj, Croatia, in August, as well as the council meetings of the ECA in August. Prof Roodt concluded his three-year term as president of the ECA in August.



Prof Selwyn Mopalia (US)(middle), Walter Purcell (right), and Dr Johan Venter (left) at a conference in Bratislava, capital of the Czech Republic.



Postgraduate students Messrs Rikus Peens and Stewart Tsai are trained by Dr Mi Tian on high-pressure gas adsorption equipment at the University of Bath.



Postgraduate student Mr Rudi Swart operating GC-MS.



Postgraduate student Ms Jireh Smit busy with a reaction in the glove box.

Many colleagues of the department acted as external reviewers for different international chemistry journals and for the NRF and served on faculty and UFS committees, while others made their contributions as external examiners for a number of universities at undergraduate and postgraduate levels and represented the UFS on international research councils.

Dr Linette Twigg, manager of the Nuclear Magnetic Resonance facility, assisted more than 20 postgraduate students from the different research groups with delicate and advanced multi-nuclear NMR experiments.

Prof Conradie visited the University of Tromsø, Norway, to present research lectures and continue with research collaboration. She also acts as Physical Chemistry Editor for the *South African Journal of Chemistry*.

## Community Service and Marketing

Most lecturers were involved in continuous career guidance and laboratory demonstration sessions to individuals and school group learners, and also contributed to the University's open and expo days. Ms Ina du Plessis is involved in the planning and execution of all the department's marketing activities, such as the UFS Open Day and the Science Expo, in accordance with faculty and corporate activities, and sometimes by special request.

Drs Johan Venter and Ernie Langner, assisted by Dr Blener Buitendach, presented the Chemistry Magic Show on seven occasions at different Bloemfontein schools and other venues. This initiative illustrates different aspects of simple but exciting experiments in a tangible way to create awareness of chemistry and to inspire primary and secondary school learners' and teachers' interest in chemistry. It was also presented as part of the UFS first-year teaching initiative, UFS101, across all subject disciplines.

Mrs Ina du Plessis assisted in organising a Minquiz session at the department; Minquiz being one of the faculty's five community service flagships. All colleagues from Physical Chemistry, with special efforts from Drs Ernie Langner and Blener Buitendach, contributed to the success of this session.

Dr Erasmus was involved in a community project to build a house for an underprivileged staff member; she was responsible for research on producing a new type of cement for the house.

Prof Conradie was the chairperson of the Interest group for High-Performance Computing (HPC) at the UFS, and the representative of HPC on the Academic IT Workgroup. Since many of the first-year Chemistry students experience problems with Physical Chemistry, in particular with the more mathematical topics, Prof Conradie wrote several computer-based question-and-answer quiz programs to help develop their skills in the first-year Physical Chemistry curriculum. All these quiz items are incorporated in the ILEARN programme at the UFS, which also enables access for the students to test and examination papers and answers and results.



Dr Langner was secretary for the HPC group during 2015. He was also a judge at the Expo for Young Scientists, and assisted a learner from Eunice High School with a project for the National Expo, and also acted as a judge at the Expo.

A significant number of colleagues acted as external reviewers for different international chemistry journals and represented the UFS on international research councils. Prof Swarts serves in this capacity for the Irish Health Board.

Dr Johan Venter serves as the programme director of Physical Sciences (Chemistry and Physics) in the faculty, and on the Timetable Committee, which annually sets the test timetable for the faculty.

The Safety Committee of the department is chaired by Prof Ben Bezuidenhout, with the following group representatives: Drs Johan Venter (Inorganic), Eleanor Müller (Physical Chemistry), Marianne Conradie-Bekker (Analytical), and Mr Rudi Swart (Organic).

## National and International Collaboration

Dr Karel von Eschwege collaborated with Prof H Schwoerer at the National Laser Research Institute at Stellenbosch University and with Prof S Titinchi at the University of the Western Cape. He also initiated collaboration with the Crystallography section at the University of Pretoria, as well as in the area of Langmuir-Blodgett films in collaboration with Dr Shankara Radakrishnan. The Purcell Group has research collaboration with Dr Johann Nel from NECSA, and Prof Herman Potgieter and Dr Sanja Potgieter-Vermaak from the Manchester Metropolitan University in the United Kingdom.

The group of Prof Jannie Swarts collaborates with Profs Mike Cook and Andrew Cammidge (University of East Anglia, Norwich, England, on phthalocyanines); Manuel Aquino (Saint Francis Xavier University, Antigonish, Canada, on metal carboxylates); Bill Geiger (University of Vermont, Vermont, USA, on electrochemistry); Henry Lang (Chemnitz Technical University, Germany, on metal carboxylates and electrochemistry); Hans Niemantsverdriet (Schuit Institute of Catalysis



A dry-solvent percolator used to prepare dry solvents for organic reactions.

Technical University, Eindhoven, the Netherlands, on heterogeneous catalysis); and Dr Daniela Bezuidenhout (University of Pretoria, carbene electrochemistry). Prof Niemantsverdriet visited Prof Swarts in November 2014 to further existing collaboration in the field of heterogeneous catalysis. Prof Swarts visited Profs Cook, Niemantsverdriet, and Lang during August and September 2015 to further existing collaboration in the field of heterogeneous catalysis.

The Conradie Group has international collaboration with Prof Abhik Ghosh and Dr Katherine Hopman (Department of Chemistry, University of Tromsø, Norway, on computational chemistry of porphyrins and related macrocycles as models of high-valent heme protein intermediates); Profs Todd C Harrop (Department of Chemistry, University of Georgia, Athens, USA, on computational chemistry); Penny Brothers (Auckland, New Zealand, on computational chemistry of boron corroles and porphyrins); and Dr Marile Landman (University of Pretoria on Fischer carbene complexes). Dr Lizette Erasmus collaborates with Prof B Gates from the University of California at Davis on heterogeneous catalysis.

The Roodt Group's research on medical aspects of pharmaceutical model compounds, in collaboration with Dr Hendrik Engelbrecht from Precision Nuclear in Tennessee, USA, the University of Zürich, Switzerland (Prof Roger Alberto), NECSA, under the Nuclear Technologies in Medicine and the Biosciences (NTEMBi) programme, and PETLabs Pharmaceuticals / Klydon Gas (Dr Gerdus Kemp) again showed good progress. Prof Roodt's project with Prof Roger Alberto (Zürich), "Development of Novel Theranostic Pharmaceuticals", sourced more than R1 million from the NRF and the Swiss National Science Foundation (NSF).

Dr Alice Brink spent four months in Prof John Helliwell's group at the University of Manchester in the United Kingdom, and conducted research discussions with Novartis Pharmaceuticals in Basel, Switzerland. Dr Brink hosted three leading crystallographers, namely Prof John Helliwell, Dr

Madeleine Helliwell (University of Manchester), and Prof Elspeth Garman (University of Oxford) during November and December.

Prof Deon Visser continued the research collaboration with Dr Fabio Zobi from the University of Fribourg, Switzerland, Prof Demetrius Papadopoulos from Athens, Greece, as well as with Dr Gregory Smith from the University of Cape Town.

The Roodt Group's industrial-related project with the Nuclear Energy Corporation of South Africa (NECSA, Dr Johann Nel) under the AMI for selected metal beneficiation of the South African government's Department of Science and Technology (DST) continued and sourced over R600 000 for bursaries and project expenses for three PhD students. The project "Organometallic Complexes of the Platinum Group Metals", in collaboration with Prof Vadim Kukushkin from the St Petersburg State University in Russia, provided exchange funding for supervisors and four PhD students.

The Organic Chemistry phytochemistry group (Drs Susan Bonnet and Anke Wilhelm) collaborates under the Framework 7 hERG-screen project with the University of Innsbruck, the National and Kapodistrian University of Athens, University of Basel, the Biomedical Research Foundation of the Academy of Athens, and the University of Vienna. The group started two new projects; one in collaboration with the University of Vienna with the research group of Prof Judith Rollingier, and a second collaboration with Prof Matthias Hamburger from the University of Basel in Switzerland and Prof Stefan Hering from the University of Vienna.

The Bezuidenhout Group collaborates with Chemical Process Technologies, Pretoria, Wildlife Pharmaceuticals, Nelspruit, and with PETLabs Pharmaceuticals on the synthesis of compounds with medical applications.



Chemistry soccer team, the winner of the UFS Cup, with Dr Johan Venter as manager.

## Staff Matters

Prof Jan van der Westhuizen of the Organic Chemistry Division sadly passed away in 2015.

## Research Outputs

### Research Articles

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Ms Melanie Visser receiving the James Moir Medal from Prof André Roodt.

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**Pionteck, J., Valdez, E.M.M., Piana, F.O.M., Luyt, A.S. & Voit, B.** 2015. Reduced percolation concentration in polypropylene/expanded graphite composites: Effect of viscosity and polypyrrole. *Journal of Applied Polymer* 132(20): 1-12.

**Ponra, S., Gohain, M., Van Tonder, J.H. & Bezuidenhout, B.C.B.** 2015. Al(OTf)<sub>3</sub>-Catalyzed Preparation of 4-Hydroxy-3-propargylic Coumarins and Subsequent Regioselective Cyclization towards Furo- or Pyrano[3,2-c] coumarins. *Synlett* 26: 745-750.

**Purcell, W. & Visser, H.G.** 2015. Rhenium(V)-nitrido complexes with different nitrogen donor bidentate ligands. *Transition Metal Chemistry* 40: 899-906.

**Schutte-Smith, M. & Visser, H.G.** 2015. The versatility of pyridine-2,5-dicarboxylic acid in the synthesis of fac-M(CO)<sub>3</sub> complexes (M = Re, <sup>99m</sup>Tc): Reactivity toward substitution reactions and derivatization after coordination to a metal. *Polyhedron* 89: 122-128.

**Sefadi, J.S., Luyt, A.S., Pionteck, J. & Gohs, U.** 2015. Effect of surfactant and radiation treatment on the morphology and properties of PP/EG composites. *Journal of Material Science* 50: 6021-6031.

**Sefadi, S.J., Luyt, A.S. & Pionteck, J.** 2015. Effect of Surfactant on EG Dispersion in EVA and Thermal and Mechanical Properties of the System. *Journal of Applied Polymer Science* 132(4): 1-11.

**Smirnov, A.S., Kritchenkov, A.S., Bokach, N.A., Kuznetsov, M.L., Selivanov, S.I., Gurzhiy, V.V., Roodt, A. & Kukushkin, V.Y.** 2015. Regio- and Stereoselective 1,3-Dipolar Cycloaddition of Cyclic Azomethine Imines to Platinum(IV)-Bound Nitriles Giving  $\Delta^2$ -1,2,4-Triazoline Species. *Inorganic Chemistry* 54: 11018-11030.

**Som, S., Das, S., Dutta, S., Visser, H.G., Pandey, M.K., Kumar, P., Dubey, R.K. & Sharma, S.K.** 2015. Synthesis of strong red emitting  $Y_2O_3:Eu^{3+}$  phosphor by potential chemical routes: Comparative investigations on the structural evolutions, photometric properties and Judd-Ofelt analysis. *Royal Society Advances* 5: 70887-70887.

**Twala, T.N., Schutte-Smith, M., Roodt, A. & Visser, H.G.** 2015. Activation of the manganese(I) tricarbonyl core by selective variation of bidentate ligands (L,L'-Bid = N,N' and N,O donor atom sets) in fac-[Mn(CO)<sub>3</sub>(L,L'-Bid)(CH<sub>3</sub>OH)]<sup>n</sup> complexes. *Dalton Transactions* 44: 3278-3288.

**Van As, A., Joubert, C.C., Buitendach, B.E., Erasmus, E., Conradie, J., Cammidge, A.N., Chambrier, I., Cook, M.J. & Swarts, J.C.** 2015. Tetrabenzoporphyrin and -mono-, -cis-di- and Tetrabenzotriazaporphyrin Derivatives: Electrochemical and Spectroscopic Implications of meso CH Group Replacement with Nitrogen. *Inorganic Chemistry* 54: 5329-5341.

**Warsink, S., Venter, J.A. & Roodt, A.** 2015. NHC-amide donor ligands in rhodium complexes: Syntheses and characterization. *Journal of Organometallic Chemistry* 775: 195-201.

**Wilhelm, A., Kendrekar, P., Noreljaleel, A.E.M., Abay, E.T., Bonnet, S.L., Wiesner, L., De Kock, C., Swart, K.J. & Van der Westhuizen, J.H.** 2015. Syntheses and in Vitro Antiplasmodial Activity of Aminoalkylated Chalcones and Analogues. *Journal of Natural Products* 78: 1848-1858.

**Wilhelm, A., Van der Westhuizen, J.H., Phyngula, K.V., Van Rensburg, E., Zietsman, P.C. & Hering, S.** 2015. An investigation into consumed South African plant species as potential hERG channel blockers. *Planta Medica* 81: 113.

#### Conference Contributions

**Alexander, O.T., Duvenhage, M.M., Brink, A., Mueller, P., Swart, H.C. & Visser, H.G.** 2015. *Effects on the luminescence properties of two Gallium(III)-tris-(5,7-dimethyl-8-hydroxyquinolino) complexes.* Poster presented at Indaba 8 of the South African Crystallographic Society in conjunction with the Structural Chemistry Commission of the International Union of Crystallography (IUCr), Skukuza, Kruger National Park, South Africa. 16-21 August.

**Belay, N.A., Venter, J.A. & Drost, R.** 2015. *Synthesis and characterization of Nb(V) complexes with O,O' bidentate ligands.* Poster presented at Indaba 8 of the South African Crystallographic Society in conjunction with the Structural Chemistry Commission of the International Union of Crystallography (IUCr), Skukuza, Kruger National Park, South Africa. 16-21 August.

**Brink, A.** 2015. *Through the looking glass: Anomalies and packing.* Poster presented at the 29<sup>th</sup> European Crystallographic Meeting (ECM29), Rovinj, Croatia. 23-28 August.

**Cammidge, A.N., Chambrier, I., Cook, M.J., Langner, E.H.G., Rahman, M. & Swarts, J.C.** 2015. *Liquid crystallinity of some metalated 1,4,8,11,15,18,22,25-octaalkyl tetrabenzob [b,g,l,q][5,10,15]triazaporphyrin (TBAP) derivatives.* Paper delivered at the Applications in Thermal Analysis Conference by ThermSA, Stellenbosch, South Africa. 17-18 August.

**Conradie, J.** 2015. A frontier orbital energy approach to redox potentials. In *Journal of Physics: Conference Series* 633, peer-reviewed proceedings of the 4<sup>th</sup> International Conference on Mathematical Modeling in Physical Sciences (IC-MSQUARE), Mykonos Island, Greece. 5-8 June. pp. 01245.

**Conradie, J.** 2015. A frontier orbital energy approach to redox potentials. Paper delivered at the 4<sup>th</sup> International Conference on Mathematical Modeling in Physical Sciences (IC-MSQUARE), Mykonos Island, Greece. 5-8 June.

**Conradie, J.** 2015. *Electronic influence of different  $\beta$ -diketonato ligands on the electrochemical behaviour of tris( $\beta$ -diketonato)M(III) complexes, M = Cr, Mn and Fe.* Invited keynote lecture delivered at the 3<sup>rd</sup> International Symposium on Electrochemistry (ElectrochemSA - SACI), University of the Western Cape, Bellville, South Africa. 26-28 May.

- Conradie, J.** 2015. *Mono-, di- and tetranuclear bis( $\beta$ -diketonato)-dichlorotitanium(IV) complexes: Isomer distribution and hydrolysis.* Keynote lecture delivered at the Centre for High Performance Computing (CHPC) National Meeting and Conference (CSIR ICC), Pretoria, South Africa. 30 November – 4 December.
- Conradie, M.** 2015. *DFT mechanistic investigation of a large Molecular Catalytic System.* Lecture delivered at the Centre for High Performance Computing (CHPC) National Meeting and Conference (CSIR ICC), Pretoria, South Africa. 30 November – 4 December.
- Crause, A. & Langner, E.H.G.** 2015. *Sintese van Metaal Organiese Netwerk, Co-MOF-74.* Poster presented at the Natural Sciences Symposium for Postgraduate Students 2015, University of the Free State, Bloemfontein, South Africa. 29-30 October.
- Drost, R.M., Milani, B., De Bruin, B. & Elsevier, C.J.** 2015. *Catalyst Species Identification: Find the true catalyst.* Poster presented at the 17<sup>th</sup> South African Chemical Institute (SACI) Inorganic Chemistry Conference (INORG2015) and the Carman Physical Chemistry Symposium, Eden Grove Complex, Grahamstown, South Africa. 28 June – 2 July.
- Elmakki, M., Venter, J.A. & Drost, R.** 2015. *Synthesis and characterisation of rhodium cupferrate and substituted cupferrate complexes.* Poster presented at Indaba 8 of the South African Crystallographic Society in conjunction with the Structural Chemistry Commission of the International Union of Crystallography (IUCr), Skukuza, Kruger National Park, South Africa. 16-21 August.
- Esterhuysen, M., Visser, H.G., Brink, A., Zbačnik, M. & Roodt, A.** 2015. *Different compounds obtained from the same starting material: Serendipity, misfortune or different reaction conditions?* Poster presented at the 29<sup>th</sup> European Crystallographic Meeting (ECM29), Rovinj, Croatia. 23-28 August.
- Ferreira, H., Conradie, J. & Conradie, M.M.** 2015. *'n Sintese, katalitiese, elektrochemiese en berekeningschemie studie van Rh(CH<sub>3</sub>CNPhCHCOCH<sub>3</sub>)-(CO)(PPh<sub>3</sub>). / A synthetic, catalytic, electrochemical and computational study of Rh(CH<sub>3</sub>CNPhCHCOCH<sub>3</sub>)-CO)(PPh<sub>3</sub>).* Oral presentation delivered at the Natural Sciences Symposium for Postgraduate Students 2015, University of the Free State, Bloemfontein, South Africa. 29-30 October.
- Gerber, S.J. & Erasmus, E.** 2015. *Edelmetaal kataliste op metal oksied ondersteunings material deur 'n gesamentlike presipitasie metode vir lae temperatuur selektiewe hidrogenering.* Poster presented at the Natural Sciences Symposium for Postgraduate Students 2015, University of the Free State, Bloemfontein, South Africa. 29-30 October.
- Gerber, S.J. & Erasmus, E.** 2015. *Noble metal catalysts on metal oxide support by Co-precipitation for low temperature selective hydrogenation.* Poster presented at the 26<sup>th</sup> Catalysis Society of South Africa (CATSA) Conference 2015, Arabella Hotel & Spa, Kleinmond, Cape Town, South Africa. 15-18 November.
- Govender, M., Swarts, J.C. & Fourie, E.** 2015. *"Sintese, karakterisering en elektrochemie van osmoseenbevattende alkohole".* Poster presented at the Natural Sciences Symposium for Postgraduate Students 2015, University of the Free State, Bloemfontein, South Africa. 29-30 October.
- Jansen van Rensburg, A., Landman, M., Van Rooyen, P.H. & Conradie, J.** 2015. *Pnictogen-Substituted Fischer Ethoxycarbene Complexes: Synthesis, structure, electrochemistry and catalysis.* Poster presented at the 26<sup>th</sup> Catalysis Society of South Africa (CATSA) Conference 2015, Arabella Hotel & Spa, Kleinmond, Cape Town, South Africa. 15-18 November.
- Landman, M., Buitendach, B.E., Liu, R., Pretorius, R., Fraser, R., Freitag, R., Conradie, M.M., Van Rooyen, P.H. & Conradie, J.** 2015. *Electrochemical behaviour of Cr and W Fischer carbenes: a comparative study.* Poster presented at the 3<sup>rd</sup> International Symposium on Electrochemistry (ElectrochemSA – SACI), University of the Western Cape, Bellville, South Africa. 26-28 May.
- Landman, M., Conradie, J. & Van Rooyen, P.H.** 2015. *Computational chemistry insights in the REDOX behaviour of Cr and W Fischer carbene complexes.* In *Journal of Physics: Conference Series* 633, peer-reviewed proceedings of the 4<sup>th</sup> International Conference on Mathematical Modeling in Physical Sciences (IC-MSQUARE), Mykonos Island, Greece. 5-8 June. pp. 12068-12073.
- Landman, M., Conradie, J. & Van Rooyen, P.H.** 2015. *Computational chemistry insights on the REDOX Behaviour of Cr and W Fisher carbenes.* Poster presented at the 4<sup>th</sup> International Conference on Mathematical Modeling in Physical Sciences (IC-MSQUARE), Mykonos Island, Greece. 5-8 June.
- Langner, E.H.G., Tsai, C-W. & Peens, F.H.** 2015. *Post-synthetic modification of selected Metal Organic Frameworks.* Paper delivered at the South Africa – UK Workshop: Materials-Based Hydrogen Storage: Design, Synthesis and Characterisation of Porous Materials, Pretoria, South Africa. 1-4 September.
- Lewtak, J.P. & Swarts, J.C.** 2015. *Synthesis and electrochemical properties of phthalocyanines bearing Fc(CH<sub>2</sub>)<sub>n</sub>S- and dodecyl substituents in non-peripheral positions.* Lecture presented at the ECS Meeting 2015: the 227<sup>th</sup> Electrochemical Society Meeting, Chicago, USA. 24-28 May.
- Malan, F.P., Singleton, E., Landman, M., Van Rooyen, P.H. & Conradie, J.** 2015. *"Die sintese, karakterisering, elektrochemiese eienskappe en katalitiese toepassing van nuwe [CpNiBr(NHC)] komplekse". / The synthesis, characterisation, electrochemical properties and catalytic application of novel [CpNiBr(NHC)] complexes.* Poster presented at the Natural Sciences Symposium for Postgraduate Students 2015, University of the Free State, Bloemfontein, South Africa. 29-30 October.
- Malefo, G., Purcell, W., Nete, M. & Nel, J.T.** 2015. *The quantification of hafnium in hafnium-containing compounds.* Poster presented at the AMI and SAIMM Nuclear Materials Development Network Conference 2015, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 28-30 October.
- Mokgawa, J.L., Tutu, H., Nel, J.T. & Nete, M.** 2015. *Method development for determination of trace element impurities in zirconium sponge by ICP-OES and ICP-MS.* Poster presented at the AMI and SAIMM Nuclear Materials Development Network Conference 2015, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 28-30 October.
- Nete, M., Purcell, W. & Nel, J.T.** 2015. *Element distribution between particle size fractions of a tantalite sample.* Poster presented at the AMI and SAIMM Nuclear Materials Development Network Conference 2015, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 28-30 October.
- Peens, F.H. & Langner, E.H.G.** 2015. *"Sintese van Amino-MIL-53(Al) met Adsorpsie van Ferroseen en Ferroseenkarboksiesuur".* Oral presentation delivered at the Natural Sciences Symposium for Postgraduate Students 2015, University of the Free State, Bloemfontein, South Africa. 29-30 October.



**Pretorius, C., Brink, A. & Roodt, A.** 2015. *Novel 1-D rhodium polymeric chain systems via rhodium-rhodium interactions.* Oral presentation delivered at the 29<sup>th</sup> European Crystallographic Meeting (ECM29), Rovinj, Croatia. 23–28 August.

**Pretorius, C., Brink, A. & Roodt, A.** 2015. *Assembly of one-dimensional metal chains via metallophilic interactions using Rh(I) metal centres.* Poster presented at Indaba 8 of the South African Crystallographic Society in conjunction with the Structural Chemistry Commission of the International Union of Crystallography (IUCr), Skukuza, Kruger National Park, South Africa. 16–21 August.

**Purcell, W.** 2015. *Oxidative addition between [Ir(cod)(sacac)] and CH<sub>3</sub>: A mechanistic study.* Poster presented at the 21<sup>st</sup> European Conference on Organometallic Chemistry (EuCOMC XXI), Bratislava, Slovakia. 5–9 July.

**Koen, R., Visser, H.G. & Roodt, A.** 2015. *A redetermination of the structure of Tetraethylammonium mer-oxidorichlorido(thenoyltrifluoroacetato-K<sup>2</sup>O,O')niobate (V) - (NEt<sub>4</sub>)[NbOCl<sub>3</sub>(ttfa)].* Oral presentation delivered at the AMI and SAIMM Nuclear Materials Development Network Conference 2015, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 28–30 October.

**Koen, R., Visser, H.G. & Roodt, A.** 2015. *Comparing tantalum and niobium: The β-diketone approach.* Poster presented at Indaba 8 of the South African Crystallographic Society in conjunction with the Structural Chemistry Commission of the International Union of Crystallography (IUCr), Skukuza, Kruger National Park, South Africa. 16–21 August.

**Roodt, A.** 2015. *A few perspectives of Cedric Holzzapfel from an 'Inorganic' Chemist.* Invited lecture delivered at the C.W. Holzzapfel Symposium, University of Johannesburg, Johannesburg, South Africa. 2 October.

**Roodt, A.** 2015. *Applications of Crystallography in Chemistry.* Invited lecture delivered at the 2<sup>nd</sup> European Crystallographic School (ECS2): Crystallography: Fundamentals, Online tools and applications, Mieres, Asturias, Spain. 30 August – 5 September.

**Roodt, A.** 2015. *Are detailed reaction mechanisms really necessary in (applied) Organometallic and Coordination Chemistry?* Invited special lecture delivered at the Special Seminar from the Russian Academy of Sciences; State University of Saint Petersburg, St. Petersburg, Russia. 22 September.

**Roodt, A.** 2015. *Outcomes of the South African Summit Meeting in Bloemfontein.* Invited lecture delivered at the Crystallography for the next Generation Conference: IYCr Legacy resolution, Rabat, Morocco. 22–24 April.

**Roodt, A.** 2015. *Perspectives on the 2<sup>nd</sup> European Crystallographic School.* Invited opening lecture delivered at the 2<sup>nd</sup> European Crystallographic School (ECS2): Crystallography: Fundamentals, Online tools and applications, Mieres, Asturias, Spain. 30 August – 5 September.

**Roodt, A. & Alberto, R.** *Multi-functional Cyclopentadienyl and Carbonyl Complexes for Theranostic Applications.* Invited lecture delivered at the Mid-term Conference and Workshop of the Swiss South African Joint Research Programme (SSAJRP), Basel, Switzerland. 22–23 October.

**Roodt, A., Brink, A., Schutte-Smith, M. & Visser, H.G.** 2015. *Structure and function of coordination compounds for radiopharmaceutical application.* Oral presentation delivered at the 29<sup>th</sup> European Crystallographic Meeting (ECM29), Rovinj, Croatia. 23–28 August.

**Roodt, A., Brink, A., Schutte-Smith, M. & Visser, H.G.** 2015. *Intimate mechanism of substitution reactions at organometallic octahedral / square planar metal sites via state-of-the art kinetic studies.* Invited

lecture delivered at the International Organometallic and Coordination Chemistry Conference: Achievements and Challenges (VI Razuvaev Lectures), Volga river, Nizhny Novgorod, Russia. 18–23 September.

**Schutte-Smith, M., Visser, H.G. & Roodt, A.** 2015. *A mechanistic study of rhenium (I) complexes: Aqua vs methanol substitution.* Poster presented at Indaba 8 of the South African Crystallographic Society in conjunction with the Structural Chemistry Commission of the International Union of Crystallography (IUCr), Skukuza, Kruger National Park, South Africa. 16–21 August.

**Swarts, J.C.** 2015. *Comparative electrochemical properties of phthalocyanines bearing Fc(CH<sub>2</sub>)<sub>n</sub>- and/or alkyl substituents in non-peripheral and/or peripheral positions.* Lecture presented at the ECS Meeting 2015: the 227<sup>th</sup> Electrochemical Society Meeting, Chicago, USA. 24–28 May.

**Swarts, J.C.** 2015. *Different functionalisation strategies to tune the physical properties of phthalocyanines.* Keynote lecture delivered at the 17<sup>th</sup> South African Chemical Institute (SACI) Inorganic Chemistry Conference (INORG2015) and the Carman Physical Chemistry Symposium, Eden Grove Complex, Grahamstown, South Africa. 28 June – 2 July.

**Swarts, J.C. & Siegert, U.** 2015. *Polysiloxanes as carriers for rhodium-ferrocenyl complexes with potential catalytic applications.* Lecture delivered at the 25<sup>th</sup> International Conference on Coordination and Bioinorganic Chemistry, Smolenice, Slovakia. 31 May – 5 June 2015.

**Swarts, J.C., Magqi, N. & Erasmus, E.** 2015. *Silver and Platinum Catalysts for oxidation hydrogenation and aromatisation: From two-dimensional models on silicon wafers to three-dimensional zeolite-supported systems.* Invited lecture delivered at the Advanced Materials World Congress (AMWC) organized by the International Association of Advanced Materials IAAM), Linköping University and the VBRI Press, Viking Line Cruise Mariella, Stockholm, Sweden. 23–26 August.

**Van Rensburg, E., Zietsman, P.C., Wilhelm, A., Van der Westhuizen, J.H. & Bonnet, S.L.** 2015. *hERG channel inhibitors in South African medicinal plants with the focus on Boophane disticha (Amaryllidaceae) bulbs.* Paper delivered at the Joint Society Conference of the Society for Economic Botany and Indigenous Plant Use Forum (IPUF - SEB 2015), Clanwilliam, South Africa. 28 June – 2 July.

**Venter, G.J.S., Steyl, G. & Roodt, A.** 2015. *Influencing Rh(I) dicarbonyl and phosphine complexes with substituted enamino ketones.* Poster presented at the 29<sup>th</sup> European Crystallographic Meeting (ECM29), Rovinj, Croatia. 23–28 August.

**Venter, J.A.** 2015. *The road less travelled? How solvents are involved during methyl migration in rhodium(III) cupferrate complexes.* Poster presented at the 21<sup>st</sup> European Conference on Organometallic Chemistry (EuCOMC XXI), Bratislava, Slovakia. 5–9 July.

**Visser, H.G., Brink, A., Alexander, O., Swart, H.C., Duvenhage, M.-M. & Ntwaeaborwa, M.** 2015. *Structure and Spectroscopic Properties of M(Qn)<sub>3</sub> complexes (M = Aluminium, Gallium, Indium, Europium; Qn = 8-hydroxyquinoline and derivatives thereof).* Paper delivered at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4–8 May.

**Visser, H.G., Roodt, A., Schutte-Smith, M., Brink, A., Twala, T.N., Kemp, G. & Zobi, F.** 2015. *Reactivity and structure relations in Mn(I), Re(I) and Tc(I)-tricarbonyl complexes – impact on drug design.* Poster presented at the 21<sup>st</sup> International Symposium on Radiopharmaceutical Sciences (ISRS 2015), Columbia, Missouri, USA. 26–31 May.

**Von Eschwege, K.G.** 2015. *Synthetic fuel from CO<sub>2</sub> – The Ultimate Answer?* Invited lecture delivered at the Carbon Capture: Clean Environment Workshop, University of Western Cape, South Africa. 2-4 March.

**Von Eschwege, K.G., Conradie, J. & Ferreira, H.** 2015. *Theoretical Design in dye-sensitized solar cells.* Lecture delivered at the 3<sup>rd</sup> International Congress on Energy Efficiency and Energy Related Materials (ENEFM 2015), Oludeniz, Mugla, Turkey. 19-23 October.

**Von Eschwege, K.G., Conradie, J. & Ferreira, H.** 2015. *Redox and spectral tuning of dyes in solar cells – A DFT approach.* Oral presentation delivered

at the 42<sup>nd</sup> National Convention of the South African Chemical Institute (SACI2015), Durban, South Africa. 29 November – 4 December.

**Wilhelm, A., Van der Westhuizen, J.H., Bonnet, S.L., Phungula, K.V., Van Rensburg, E., Zietsman, P.C. & Hering, S.** 2015. *An investigation into consumed South African plant species as potential hERG channel blockers.* Poster presented at the 63<sup>rd</sup> International Congress and Annual Meeting of the Society for Medical Plant and Natural Product Research (GA 2015), Budapest, Hungary. 23-27 August.

## Staff

**Distinguished Professor:** Prof A Roodt.

**Professors:** Profs HG Visser, JC Swarts, J Conradie, BCB Bezuidenhout, KG von Eschwege, and W Purcell.

**Senior Lecturers:** Drs A Brink, JA Venter (Programme Director: Physical Sciences), M Schutte-Smith, EH Langner, E Erasmus, E Müller, and S Bonnet.

**Lecturers:** Drs RF Shago, L Twigge (NMR Manager), A Wilhelm, J van Tonder, (part-time), C Marias (South Campus), MA Malimabe (QQ), NF Molefe (QQ), L Hlalele (QQ), Mss R Meintjies (South Campus), A Manicum, Messrs K Khotso K (QQ), and TA Tsotetsi (QQ).

**Junior Lecturer:** Mr RG Moji (Subject Head: QQ).

**Researcher/Research Assistant:** Mr FMA Muller.

**Research Associate:** Prof AS Luyt.

**Secretary:** Ms AS Van Rooyen

**Senior Officers: Professional Services:** Mss T Swarts (Finances), C Laubcher (Finances), Messrs C Smith, and MP Coetzee.

**Officers: Professional Services:** Ms I du Plessis (Marketing), Dr T Venter, Mr R Swart, Dr MM Conradie, Mss M Meyburg, A Alleman, Dr JP Mofokeng (QQ), Mr MFT Mosoabisane (QQ), Mss CE Clarke-Koni (QQ), and P Leche (QQ).

**Technical Aid Assistants:** Messrs ID Fish, JP Masedi, KJ Mokhesi, GJ Nkotsana, and Ms JB Mmope.

**Facilitators:** Messrs T Kama, K Sekhoathane, and R Swart.

## Contact Details

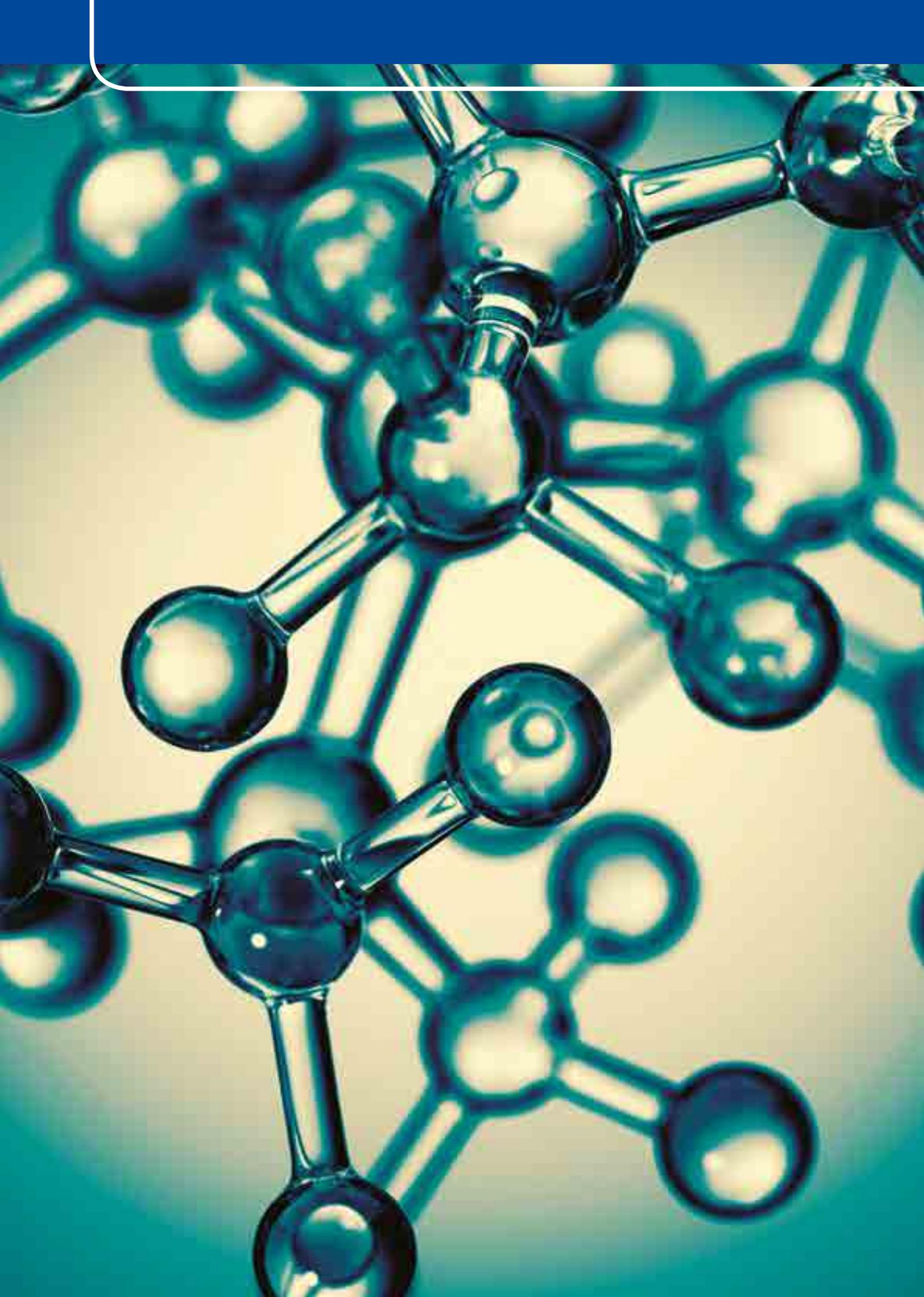
### Prof W Purcell

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# Department of Computer Science and Informatics



Staff and students visited Westline Aviation and learned about navigation and the software for managing air traffic.



Two students with their “weapons” during a paintball competition between students and staff.

## Overview

The Department of Computer Science and Informatics delivers highly trained information technologists with technical skills in programming, system design and analysis, as well as database and network management.

The department offers two specialised degrees, namely a degree in Computer Science and a degree in Information Systems. Students who want to apply their knowledge of technology in scientific environments can enrol for the BSc IT degree. The powerful combination of Computer Science with Mathematics and/or Mathematical Statistics provides the student with a solid knowledge base and excellent background for a career in the IT industry, as well as academic and research institutions such as universities, the CSIR, ARC, etc. In combination with Physics and/or Chemistry, students are equipped for a career as information technologists in the industry; for example in the manufacturing sector.

Students can also enrol for our unique Baccalaureus in Computer Information Systems (BCIS) programme. This degree allows students to combine modules from the department with modules from the Faculty of Economic and Management Sciences. This enables the students to apply the general theory of Information Technology as it pertains to the business world or in a corporate environment to support the cause and purpose of the organisation where they will be employed.

The department also forms part of the new Engineering Sciences project at the UFS by presenting the programming modules for students following this programme.

## Student Achievements

Our students performed excellently at the Symposium of the South African Academy for Arts and Science for Afrikaans students. In Computer Science and Information Systems, Mr Ian van der Linde was awarded first prize, Mr Daniël Hoffman second prize, and Mr Luan van der Walt was awarded a special prize for the use of Afrikaans. Mr J-P du Plessis, a lecturer in the department, was one of the judges.



Students at work in one of our purposely arranged and well-equipped laboratories.

## Research

The research focus of the department falls on the following five areas:

### Data Warehousing and Business Intelligence

For 2015, the Data Warehousing and Business Intelligence research focused on the construction of a computing platform to analyse unstructured data and to conceptually design an artefact to improve the existing agricultural economic model for South Africa. Two MSc students are working on these research projects. The computing platform is a 12-node cluster that will be expanded in 2016 and configured with Hadoop® to allow for low-cost storage and analysis of big data. A PhD student is investigating an alternative cloud-based model that will allow higher education institutions in South Africa to share student administration data in a business intelligence environment.

### Educational Technology

Prof Liezel Nel is running the UFS iPad project in the department as part of a collaboration effort with the UFS Centre for Teaching and Learning (CTL). The aim of this project is to investigate how tablet devices such as iPads can be utilised in Computer Science lectures to enhance student engagement and address various challenges that exist in the current UFS teaching and learning context. During 2015, the iPad lab – consisting of 25 iPad mini devices – was utilised to facilitate various individual and collaborative classroom activities in five undergraduate Computer Science modules. A basic workflow was also established for the configuration, deployment, and management of iPad devices at the UFS. These guidelines will be used by other departments in the Faculty of Natural and Agricultural Sciences, which will join the project in 2016.



Staff members finding time to relax on a game drive during a writing retreat.

### Eye Tracking

Eye tracking involves the study of human gaze behaviour on various stimuli, for example advertisements and websites, as well as the use of eye gaze to interact with a computer. One of our PhD students is studying the gaze behaviour of primary school learners when they are confronted with a mathematical problem. Another PhD student is investigating the possibility of low-cost eye tracking to remedy the diagnosed

reading deficiencies of technologically underprivileged, early-teenage rural students in Lesotho. The eye-tracking research group organised a successful eye-tracking workshop at which the abovementioned research projects were presented, along with other eye-tracking activities in the department.

Mr Daniël Hoffman completed an interdisciplinary study, using eye-tracking glasses to assess the effect of cartographer expertise and map design on the speed and accuracy of map interpretation. The final results indicated that differences in map design can have a significant effect on map interpretation, but, contrary to the expectation, cartographer expertise had no significant effect on the speed and accuracy with which participants executed tasks on a map.

### Human-Computer Interaction

Human-computer interaction (HCI) is the study of how people interact with computers and to what extent computers are developed for



Daniël Hoffman with a participant wearing the eye-tracker glasses.

successful interaction with human beings. Usability specialists attempt to determine in various ways, of which usability tests in a usability laboratory is well known, how usable a computer product is, as well as the level of its user experience (in terms of user enjoyment, frustration, excitement,

etc.). Upon visiting the usability lab, second-year HCI students are exposed to usability and what a usability study entails. Honours students in the HCI module conduct a full-fledged usability study, on a small scale, on a live website with real users as their semester assignment in order to prepare them as usability specialists in the industry. Three master's dissertations in the HCI discipline (especially using a brain-computer interface) were successfully completed in 2015, covering topics ranging from computer games, the user experience of children playing mathematical games, and testing Life Orientation teachers' preconceptions on sensitive aspects such as heteronormative versus homosexual pedagogy.

### Natural User Interfaces

Natural User Interface research is focused on investigating alternative, intuitive means of interacting with computers as alternatives to the traditional keyboard and mouse. As a result of the symptoms associated with Parkinson's disease (PD), many sufferers are unable to use computers with existing traditional input devices such as the mouse and keyboard, for example. However, many PD sufferers express the need for computer use to execute their everyday tasks. Mr Andries Burger, completing his PhD studies, investigated whether a more recent natural user interface (NUI) device, the Microsoft Kinect, can be successfully used by PD sufferers to enter text on a computer via an onscreen keyboard. He found that although there is still room for improvement and further research, the potential of applying Microsoft Kinect as a computer interaction device for PD sufferers is promising.

Mr Rouxan Fouché was awarded an MSc degree (cum laude) for his work which examined the use of a brain-computer interface (BCI) and a gaming glove on a two-dimensional shooting game. During the course of the study, he compared the use of a traditional mouse and keyboard with the use of facial expressions or hand gestures to trigger actions. The study was aimed at determining the usability of new and innovative interactive methods for gaming purposes. It was found that the mouse and keyboard remain superior to the newer technologies, but that there was an element of learning taking place with the newer technologies.

## Community Service

Dr Anelize van Biljon is the official South African representative of the annual Primary Mathematics World Competition in Hong Kong. She contributed to the question papers and was, together with Dr Elsie Schoombie, responsible for the travelling and accommodation arrangements of the Free State team of four Grade 7 learners. The team won the cultural prize in Hong Kong for the second successive year.

Dr van Biljon is also involved with the setting and translation of question papers for the International Mathematics Competition and the selection tests of the International Mathematics Assessments for schools. She received a trophy from the South African Mathematics Olympiad (SAMO) for her contributions to SAMO over the past ten years. She was also reappointed as examiner for another term of three years.

Besides her involvement with Mathematics Olympiads, Dr Van Biljon is also responsible for the talent search project of the South African Computer Olympiad. Three of the learners she trained achieved full marks in the online competition.

Prof Pieter Blignaut developed an eye-tracking system to enable Dr Mike Pretorius, a quadriplegic suffering from Multiple Sclerosis, to use a computer as a nondisabled person is able to do.

## National and International Collaboration

Dr Anelize van Biljon is the official South African representative of the annual Primary Mathematics World Competition in Hong Kong. She contributed to the question papers and was, together with Dr Elsie Schoombie, responsible for the travelling and accommodation arrangements of the Free State team of four Grade 7 learners. The team won the cultural prize in Hong Kong for the second successive year.

## Staff Matters

Messrs Jean-Pierre du Plessis, Jaco Marais and Ms Rouxan Fouché graduated with their master's degrees. Dr Tanya Beelders was awarded a Y2 rating from the NRF. Messrs Jean-Pierre du Plessis, Jaco Marais, Daniël Wium, Mss Thlolohelo Nkalai and Rouxan Fouché, were promoted from junior lecturer to lecturer and Ms Suezette Opperman, our departmental manager, was promoted to officer.

## Research Outputs

### Research Articles

**Mudzana, T. & Kotzé, J.E.** 2015. Some determinants of business intelligence adoption using the technology-organisation-environment framework: A developing country perspective. *Journal for New Generation Sciences* 13(1): 107-119.

**Nel, G., Nel, E. & Cronjé, J.C.** 2015. Attributes contributing to students' use of quality software development practices. *African Journal of Information & Communication* 15: 38-50.

**Rambe, P. & Nel, E.** 2015. Technological utopia, dystopia and ambivalence: Teaching with social media at a South African University. *British Journal of Educational Technology* 46(3): 629-648.

**Van der Linde, I.D. & Kotzé, J.E.** 2015. Uitdagings vir die hantering van groot datastelle. *Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 34(1): 1335-1335.

**Verkijika, S. & De Wet, L.** 2015. Using a Brain-Computer interface (BCI) in Reducing Math Anxiety: Evidence from South Africa. *Computers & Education* 81: 113-122.



Dr Anelize van Biljon receiving her trophy in recognition for ten years of service from Mr Thomas Haghspill, chairman of committees of SAMO.



Dr Mike Pretorius using an eye-tracking system to interact with his computer.

### Conference Contributions

**Dollman, G.J., De Wet, L. & Beelders, T.R.** 2015. Commercial Brain Computer Interface: Potential as a Natural User Interface. *Proceedings of the 2015 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists (SAICSIT '15)*, Stellenbosch, South Africa. 28-30 September. Article 13.

**Dürr, J.A., Van Zyl, J.H., Strydom, D.B., Beelders, T.R. & Wium, D.J.** 2015. *Branding and packaging of South African white maize meal, an eye-tracking case study*. Paper delivered at the 20<sup>th</sup> International Farm Management Congress: Healthy Agriculture for a Healthy World, Quebec City, Canada. 12-17 July. pp. 89-98.

**Nel, G. & Nel, E.** 2015. Improving program quality: The role of process measurement data. *Proceedings of the 44<sup>th</sup> Annual Southern African Computer Lecturers Association Conference: Renewing ICT teaching and learning – Building on the past to create new energies (SACLA 2015)* edited by E. Coleman, Johannesburg, South Africa. 1-3 July. pp. 1-6.

**Nkalai, T.S., De Wet, L. & Schall, R.** 2015. Comparing the sensor glove

and questionnaire as measures of computer anxiety. *Proceedings of the 2<sup>nd</sup> International Conference on Physiological Computing Systems (PhyCS2015)*, Angers, France. 11-13 February. pp. 93-103.

**Venter, M., De Wet, L., Van der Walt, A. & Swart, A.** 2015. *An investigation of the use of mobile mathematics applications: An African perspective*. Paper presented at the 45<sup>th</sup> Annual Frontiers in Education (FIE) Conference: Launching a new vision in engineering education, El Paso, Texas, USA. 21-24 October. pp. 865-873.

**Wium, D.J. & Van Soelen, B.** 2015. AUTOCAL: A software application for the calibration of stellar magnitudes. *Proceedings of the SAIP2014: The 59<sup>th</sup> Annual conference of the South African Institute of Physics*, Johannesburg, South Africa. 7-11 July. pp. 404-409.

## Staff

**Professor:** Prof PJ Blignaut.

**Adjunct Professor:** Prof L Nel.

**Senior Lecturers:** Drs TR Beelders, L de Wet, JE Kotzé, and A van Biljon.

**Lecturers:** Ms EH Dednam, Messrs RB Brown, AJ Burger, and W Nel.

**Junior Lecturers:** Mss MJF Botha, TS Nkalai, Messrs JL du Plessis, RF Fouché,

WSJ Marais, and DJ Wium.

**Officer:** Ms S Opperman.

**Assistant Officers:** Mss C Afrika, P Magau, and S de Klerk.

**Technical Assistants:** Messrs B Bresler, CA Cilliers, and H Smith.

## Contact Details

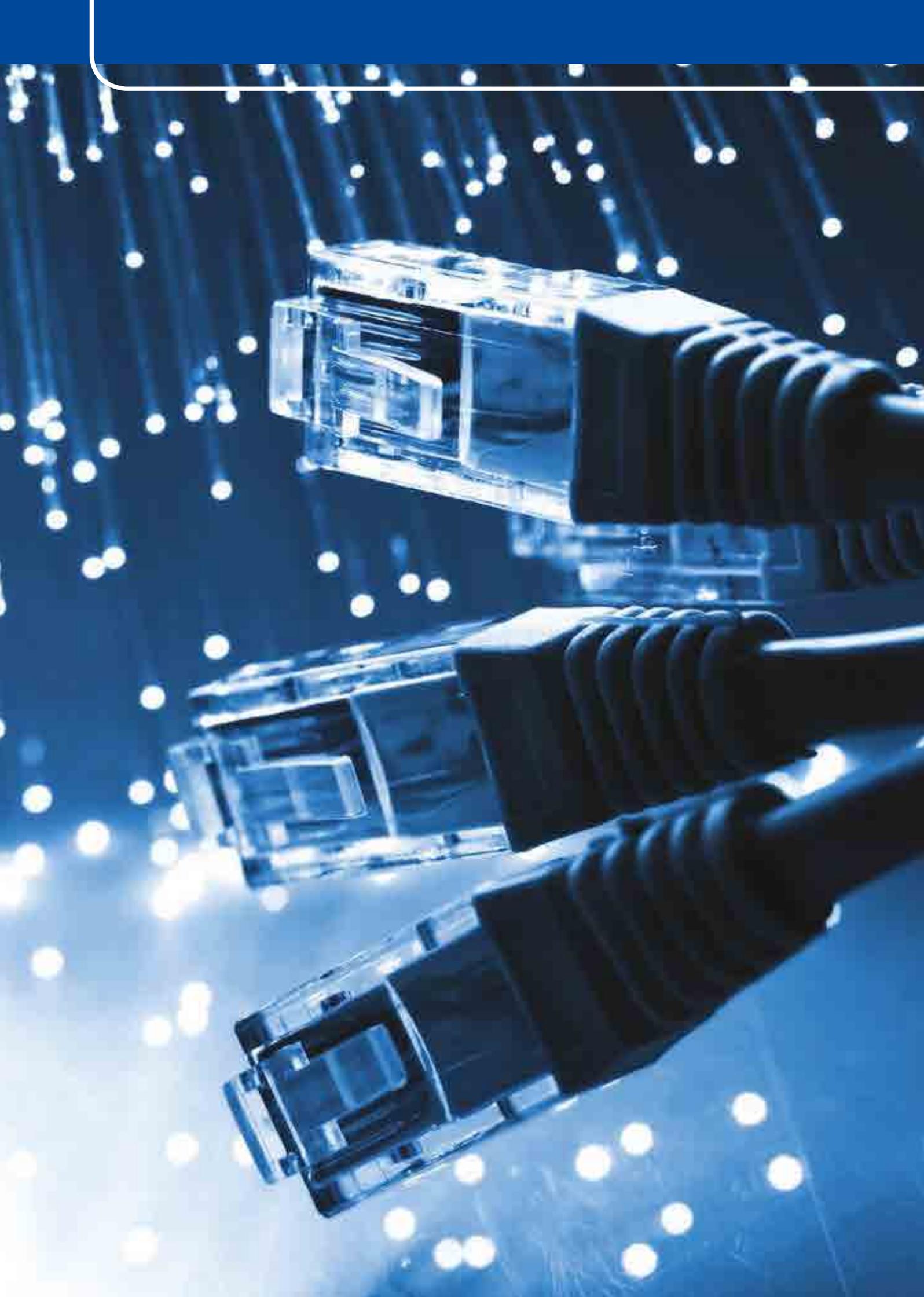
### Prof PJ Blignaut

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# Department of Consumer Science

## Overview

The Department of Consumer Science seeks to equip our undergraduate students with the knowledge to identify and understand the needs of individuals and families regarding food, clothing, and housing, and the skills to help them fulfil these needs with the available resources. The department also strives to motivate and lead postgraduate students to undertake research projects to strengthen the scientific basis from which the consumer can benefit in the fields of clothing, textiles, and food. Regular revision of modules and module content is necessary in order to keep the qualification relevant.

The department offers a three-year B Consumer Science degree, a four-year BSc Home Economics (Foods) degree, a BScHons Home Economics, an MSc Home Economics, and a PhD degree.



As part of National Home Economics Day 2015, the Community Service Student Group handed out some food packages to underprivileged people of the community. Alina Ralehokondia was happy to receive such a package.

In 2015, 46 students successfully completed the B Consumer Science degree programme, and two students successfully completed the BSc Home Economics degree. The BSc Honours in Home Economics was successfully completed by eight students. Three students successfully completed the PhD degree.

## Staff Achievements

- Drs Ismari van der Merwe and Natasha Cronjé both obtained their PhD degrees.
- Prof Hester Steyn was appointed as the chairperson for the Consumer and Sustainable Development Committee of the International Federation of Home Economics.
- Prof Steyn was invited as a keynote speaker at the Second International Conference of the Faculty of Specific Education of the Alexandria University, Egypt.

## Student Achievements

- Ms Janika de Beer won the Free State Women's Agricultural Union award for the best Consumer Science student in 2015.
- Ms Marina Coetzer won the 2015 Beth Erlank Prize for the best student in Clothing.

## Activities

The department hosted and managed the Consumer Studies Olympiad for Grade 11 and Grade 12 learners in 2015 under the leadership of Ms Fransie van Tonder. The Olympiad examination was written by 4 316 learners from all the provinces of South Africa.

The department celebrated World Home Economics Day by collecting non-perishable food from the staff and students and presenting it to less-privileged members in the community.

Prof Steyn attended the main World Home Economics Day celebrations in Valetta, Malta.



The fourth-years busy giving back to the community as part of their Community Development programme (Nellie Moletsane, Minke Vorster, and Sophie Mekhoe).

## Research

Research conducted in the Department of Consumer Science in 2015 consisted mainly of projects in the following areas:

- Food product development with healthy eating patterns and sustainable food sources as the main aim.
- Empowerment of the disabled community through skills development.
- Consumer awareness of sustainable practices.

## Community Service

The Department of Consumer Science continued with the Mamello community development programme in the “old milk shed” on the experimental farm of the UFS.

## National and International Collaboration

Prof Steyn was involved in a programme review of the Department of Family and Consumer Sciences of the University of Botswana.



The year 2015 was a very successful year for the Department of Consumer Science. Two lecturers, Drs Natasha Cronjé (left) and Ismari van der Merwe (third from left) obtained their degrees, as well as Dr Kgalalelo Seiphetheng, a student from Botswana. The study leader for all three was Prof HJH Steyn.



The two winners of the 2015 Consumer Studies Olympiad with Ms Ina Paarman. The merit winner was Ms T Abrahams of High School Calitzdorp (left) and the overall winner was Ms C Rencken from Wartburg Kitchdorf School (right).

## Conferences

Ms Petro Swart attended the 11<sup>th</sup> Pangborn Sensory Science Symposium in Gothenburg, Sweden, from 23–27 August 2015. The congress was attended by ±800 people from around the world. She presented a poster entitled “The development of a sensory acceptable nutritious vegetable chip for children”. There was much interest in the subject, especially because the study focused on children. Very little work is done on this segment of the community.

Much research is conducted in developed countries and we realised that we in South Africa or Africa are much more involved with issues concerning the health of our people, while other studies are directed more at issues concerning cultural aspects and to better, good food. We

use sensory development in a more practical way, focused on a specific product. The talk about challenges and opportunities in emerging markets and the sensory cues in the context of culture and media in our daily lives was extremely interesting.

The Afro Sense conference, where new techniques and trends for sensory characterisation and consumer profiling were presented, was held in Stellenbosch, 23–25 November 2015. Ms Petro Swart attended this conference and presented a poster entitled “Veggies versus chips: What will children choose?” The conference programme included six keynote speakers from Europe, Uruguay, and South Africa. It was a privilege to be able to talk to the keynote speakers from Pangborn who attended this conference as well. This was the first international sensory conference in Africa and it addressed the needs, challenges, and sensory opportunities of different African regions.

Ms Albie du Toit attended the 21<sup>st</sup> SAAFoST (South African Association for Food Science & Technology) international congress and exhibition that were held in Durban, 7–9 September 2015. SAAFoST seeks to advance food science and technology in the supply of enjoyable, safe, wholesome, and affordable food. During the three-day congress, themes such as functional foods, waste management, food chemistry, and biofortification were explored in the plenary as well as the breakaway sessions. Ms Du Toit’s poster was displayed in the Functional Ingredients and Foods section, as one of only five posters. It was entitled “Determination of physical and rheological properties of mucilage from cactus pear cladodes for human food application”.

Prof Steyn attended the leadership meeting of the International Federation for Home Economics on the Valetta Campus of the University of Malta from 16–19 March 2015.

Prof Steyn also attended the Action for Family and Consumer Wellbeing: Home Economics Literacy – Bringing Skills to Life Conference of the University of Malta on 20 and 21 March 2015.



Class of 2015: B Consumer Science students with the lecturers at a year-end function at the Botanical Gardens.



Prof Steyn chaired the International Federation of Home Economics – Region Africa Annual General Meeting in Alexandria, Egypt, in her capacity as vice-president of the International Federation of Home Economics (IFHE) for region Africa on 26 October 2015.

## Research Outputs

### Research Article

**Vermaas, J.F., Hugo, C.J., Steyn, H.J.H. & Schall, R.** 2015. The efficacy of anolyte as an environmentally friendly disinfectant on *Escherichia Coli* and *Staphylococcus Aureus* contaminated cotton, polyester/cotton and polyester. *Journal of Family Ecology and Consumer Sciences Science* 43: 26-32.

## Staff

**Associate Professor:** Prof HJH Steyn.

**Lecturers:** Drs JF Vermaas, I van der Merwe, and N Cronjé.

**Junior Lecturers:** Mss PZ Swart, N Tinta, and JS van Zyl.

**Part-time Contract Lecturers:** Ms F van Tonder.

### Conference Contributions

**Du Toit, A.** 2015. *Determination of physical and rheological properties of mucilage from cactus pear cladodes for human food application.* Poster presented at the 21<sup>st</sup> Biennial International Congress and Exhibition of the South African Association for Food Science and Technology (SAAFoST), Southern Sun Elangeni & Maharani Beachfront Hotels, Durban, South Africa. 6-9 September.

**Swart, P.Z.** 2015. *The development of a sensory acceptable nutritious vegetable chip for children.* Poster presented at the 11<sup>th</sup> Pangborn Sensory Science Symposium, Svenska Mässan, Gothenburg, Sweden. 23-27 August.

**Swart, P.Z.** 2015. *Veggies versus chips: What will children choose?* Poster presented at the 1<sup>st</sup> AfroSense Conference: New techniques and trends for sensory characterisation and consumer profiling, STIAS Conference Centre, Stellenbosch, South Africa. 23-25 November.

**Senior Officer: Professional Services:** Ms D Jacobs.

**Officer: Professional Services:** Ms C Denner.

**Assistant Officer:** Ms W van der Walt.

## Contact Details

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# Department of Genetics

## Overview

The year 2015 marked a major milestone for the Department of Genetics with the opening of the new Genetics building. The opening ceremony took place on 3 September 2015, with many collaborators and representatives of some of our prominent stakeholders present. Guest speakers were General E Ngokha, head of the South African Police Service Forensic Science Laboratory (SAPS-FSL), and Mr Coenie Erasmus, Head of Research of the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA). The official opening was conducted by the Vice-Chancellor and Rector of the UFS, Prof Jonathan Jansen. This special occasion was also attended by the Vice-Rector: Research of the UFS, Prof Corli Withunn, and the dean of the Faculty of Natural Sciences and Agriculture, Prof Neil Heideman.

will help contribute to teaching and research programmes in this new division within the Department of Genetics. To further strengthen the ties between the SAPS-FSL and the Department of Genetics, Dr Mwenesongole was taken on a behind-the-scenes tour of the FSL in Pretoria, as well as of the impressive state-of-the-art facility in Cape Town. Collaborative ties were made on research projects and training, with students from the FSL enrolling for postgraduate studies in Forensic Science, in addition to those already currently enrolled in the Forensic Genetics programme.

## Staff Achievements

Dr Karen Ehlers was appointed by the Minister of Police, Mr NPT Nhleko, as one of ten board members of the National Forensic Oversight and



Opening of the Genetics building. Profs J Jansen (middle), JP Grobler (right), and N Heidemann (left).

International collaboration continued with Prof Trudy Turner from the University of Wisconsin-Milwaukee in the USA visiting the department in July, and with Prof Sahar Saad El-din Ahmed from the National Research Center in Giza, Egypt, visiting the department later in the year.

The Forensic Science section received a much needed donation of a GC-MS from the South African Doping Control Laboratory (SADoCoL), which

Ethics Board. This board was created as part of the new DNA Act which became operational in January 2015. They are tasked to monitor the implementation of the DNA Act, make proposals to the Minister of Police regarding improvement of the practices of the National Forensic DNA Database, provide oversight, and handle complaints regarding alleged violations relating to the abuse of DNA samples and profiles. Dr Ehlers was also appointed as the leader of the Systems Reports and Gaps Analysis



subcommittee, of which the function is to oversee the sample collection and performance of the SAPS-FSL to ensure that the minimum quality standards are met for the National Forensic DNA Database.

Prof Grobler was appointed as Adjunct Professor in the Department of Fish and Wildlife Conservation at Virginia Tech University in the USA, following many years of productive collaboration with that institution. Dr Gerda Marx, together with Prof Marius Coetzee (Faculty of Medical Sciences), received a National Health Laboratory Service (NHLS) research grant for the Genetic and Clinical Characterisation of Hereditary Haemorrhagic Telangiectasia (HHT). Two members of staff, Mss Letecia Wessels and Sue-Rica Schneider, received Thuthuka funding for research in Forensic Entomology and Human Genetics respectively.

## Student Achievements

Ms S Ndyogolo obtained her MSc degree in 2015; she is the first MSc student to complete her studies under supervision of Ms Bindeman. Two honours students qualified for special awards based on their overall good performance: Mr FP Venter received the Hofmeyr-Van Schaik Medal for his performance in Genetics, while Ms JA de Jong received the AstraZeneca Award, a prize sponsored by the DNA project for her performance in Forensic Genetics.

## Activities

In September, Prof Grobler, Ms Bindeman, and postgraduate student Ms Sinobongo Ndyogolo attended the annual symposium of the South African Wildlife Management Association held in Kimberley. Presentations covered the occurrence of an unusual phenotype in impala from the Limpopo province, and genetic differences between catfish from the east- and west-flowing river systems of South Africa. In December, Prof Grobler was invited by the National Department of Environmental Affairs (DEA) to discuss the impact of intensive and selective breeding at a stakeholders' meeting held for the game industry in Pretoria.

Dr Karen Ehlers, Ms Letecia Wessels, and Dr Ellen Mwenesongole were invited by the SAPS to present at the Third Forensic Services Conference held in Pretoria, which resulted in the establishment of research networks and/or collaborative research through postgraduate students. Dr Gerda Marx served on the organising committee of the National Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA) conference, which was held on the Main Campus from 17–19 April 2015. She also gave an invited lecture on the topic of "The genetics of diabetes". Drs Gerda Marx and Karen Ehlers attended the Ion Torrent World Tour on Next Generation Sequencing (NGS) at Leriba Lodge, Centurion, on 5 and 6 October 2015. Mss Zurika Odendaal, Sue-Rica Schneider, and Dr Gerda Marx also attended the Human Genetics Conference at Klein Kaap Hotel, Centurion, from 16–19 August 2015.

## Research

A large number of research projects continued in 2015 in the fields of Population Genetics, Conservation Genetics, Forensic Genetics, Forensic Science, Wildlife Forensics, Recombinant DNA Technology, Human Genetics, Behavioural Genetics, and Systematics.

## Community Service

Dr Marx organised and attended three community outreaches: 1) In Koffiefontein on 13 November 2015 to visit a family with HHT, inviting them to participate in a study of and to create HHT awareness; 2) in Bloemfontein on 1 October 2015 at the Kenworth Centre for Diabetes, testing glucose levels of interested community members for early diagnosis and treatment to create awareness; and 3) in Bloemfontein on 30 October 2015 at Twin City Mall, Heidedal, for diabetes awareness and testing glucose and HbA1c levels of interested community members for early diagnosis and treatment.

Prof Grobler was elected to serve on the Conservation Committee of the South African Hunters and Game Conservation Association, a body with approximately 42 000 members.

## National and International Collaboration

Prof Trudy Turner from the University of Wisconsin-Milwaukee in the USA visited the department in July 2015. The visit formed part of a long-standing collaboration between Profs Turner and Grobler on aspects of conservation and evolutionary genetics of vervet monkeys. During the second semester of 2015, Prof Grobler hosted Prof Sahar Saad El-din Ahmed from the National Research Centre in Giza, Egypt. This resulted in a new collaborative programme that also involves the department's affiliated members of staff at the National Zoological Gardens (NZG). The joint research is aimed at describing the contribution of endemism and immigration to the population genetic structure of Egyptian goat populations, a species that has been kept in Egypt since ancient times.

The very strong linkage with our collaborators and affiliated members of staff at the NZG in Pretoria, Prof Antoinette Kotze and Dr Desire Dalton, continues. The NZG runs a strong programme in conservation genetics as well as wildlife forensic research, and several outputs resulted from this link in 2015, as indicated later in this report.

Lt Col Anton Lucassen from the SAPS Forensic Division has been associated with the Department of Genetics for a number of years and is an affiliated lecturer in the department. In 2015, he provided training to the department's honours students on the statistical approaches used by the SAPS forensic laboratories.

## Staff Matters

Congratulations to Dr Ellen Mwenesongole, who graduated from Anglia Ruskin University in Cambridge, UK, on 15 October 2015, with specialisation in Forensic Science and Chemistry. Dr Mwenesongole's research was on "Simultaneous detection of drugs of abuse in waste water using gas-chromatography-mass spectrometry".

The department appointed a new member to the academic staff, Dr Gerda Marx, early in 2015. Her current research focuses on the genetics of diabetes. Her research will contribute to expanding the field of human genetics in the department. Two former members of staff, Prof Johan Spies and Dr Paula Spies, were appointed as Research Fellows, ensuring continuity in the field of Plant Genetics in the Department of Genetics.

## Research Outputs

### Research Articles

**Amato, K.R., Yeoman, C.J., Cerda, G., Schmitt, C.A., Cramer, J.D., Berg Miller, M.E., Gomez, A., Turner, T.R., Wilson, B.A., Stumpf, R.M., Nelson, K.E., White, B.A., Knight, R. & Leigh, S.R.** 2015. Variable responses of human and non-human primate gut microbiomes to a Western diet. *Microbiome* 3: 53.

**Boakye, M.K., Pietersen, D.W., Kotze, A., Dalton, D.L. & Jansen, R.** 2015. Knowledge and uses of African pangolins as a source of traditional medicine in Ghana. *Plos One* 10: 11-14.

**Dalton, D.L., Wimberger, B.L., Nupen, L., Tordiffe, A.S.W., Taylor, P.J., Madisha, T. & Kotze, A.** 2015. New insights into Samango monkey speciation in South Africa. *Plos One* 10(3): 1-26.

**Daso, A.P., Okonkwo, J.O., Jansen, R., Brandao, J.D.D.O. & Kotze, A.** 2015. Mercury concentrations in eggshells of the Southern Ground-Hornbill (*Bucorvus leadbeateri*) and Wattled Crane (*Bugeranus carunculatus*) in South Africa. *Ecotoxicology and Environmental Safety* 114: 61-66.

**Daso, A.P., Okonkwo, J.O., Jansen, R., Forbes, P.B.C., Kotze, A. & Rohwer, E.R.** 2015. Polybrominated diphenyl ethers (PBDEs) in eggshells of the Southern Ground-Hornbill (*Bucorvus leadbeateri*) and Wattled Crane (*Bugeranus carunculatus*) in South Africa. *Chemosphere* 118: 284-292.

**Fourie, N.H., Turner, T.R., Brown, J.L., Pampush, J.D., Lorenz, J.P. &**

**Bernstein, R.M.** 2015. Variation in vervet (*Chlorocebus aethiops*) hair cortisol concentrations reflect ecological disturbance by humans. *Primates* 56: 365-373.

**Grobler, J.P., Ndyogolo, S., Barasa, J., Abila, R., Bindeman, H. & Schlemmer, A.F.J.** 2015. Genetic identification of invasive walking catfish *Clarias batrachus* intermingled with African catfish *C. gariepinus* in South Africa. *South African Journal of Wildlife Research* 45(1): 55-62.

**Jones, J.W., Johnson, N., Grobler, J.P., Schilling, D., Neves, R.J. & Hallerman, E.M.** 2015. Endangered Rough Pigtoe Pearlymussel: Assessment of phylogenetic status and genetic differentiation of two disjunct populations. *Journal of Fish and Wildlife Management* 6(2): 338-349.

**Labuschagne, C., Kotzé, A., Grobler, J.P. & Dalton, D.L.** 2015. Endonuclease V digestion for SNP discovery and marker development in white rhino (*Ceratotherium simum*). *Conservation Genetics Resources* 7: 53-56.

**Labuschagne, C., Nupen, L., Kotz, A., Grobler, J.P. & Dalton, D.L.** 2015. Assessment of microsatellite and SNP markers for parentage assignment in ex situ African Penguin (*Spheniscus demersus*) populations. *Ecology and Evolution* 5(19): 4389-4399.

**Lehoczky, I., Dalton, D.L., Lanszki, J., Sallai, Z., Madisha, T., Nupen, L.J. & Kotze, A.** 2015. Assessment of population structure in Hungarian otter populations. *Journal of Mammalogy*: 1-9.

**Madisha, M.T., Ponsonby, D., Schwaibold, U., Kotze, A., Jansen, R., Brettschneider, H. & Dalton, D.L.** 2015. Differentiation of two South African otter species (*Anonyx capensis* and *Lutra maculicollis*) from sprint based on partial CytB primer sets. *Global Ecology and Conservation* 4: 8-13.

**McManus, J.S., Dalton, D.L., Kotze, A., Smuts, B., Dickman, A., Marshal, J.P. & Keith, M.** 2015. Gene flow and population structure of a solitary top carnivore in a human-dominated landscape. *Ecology and Evolution* 5(2): 335-344.

**Mwale, M., Dalton, D.L., Roelofse, M., Radebe, T., Labuschagne, K., Kloppers, A., Musekwa, T., Parusnath, S. & Kotze, A.** 2015. Progress in the barcoding of illegally traded South African wildlife species at the National Zoological Gardens of South Africa. *Genome* 58: 259-260.

**Pienaar, L., Naser, F.W.C., Grobler, J.P., Scholtz, M.M., Swart, H., Ehlers, K., Marx, M. & MacNeil, M.D.** 2015. Pedigree analysis of the Afrikaner cattle breed. *Animal Genetic Resources* 57: 51-56.

**Rodríguez, R.L., Cramer, J.D., Schmitt, C.A., Gaetano, T.J., Grobler, J.P., Freimer, N.B. & Turner, T.R.** 2015. Adult age confounds estimates of static allometric slopes in a vertebrate. *Ethology, Ecology & Evolution* 27(4): 412-421.

**Turner, T.R.** 2015. Preface. *Yearbook of Physical Anthropology* 156(S59): 1.

**Warren, W.C., Jasinska, A.J., Garcia-Perez, R., Svardal, H., Tomlinson, C., Rocchi, M., Archidiacono, N., Capozzi, O., Minx, P., Montague, M.J., Kim, K., Hillier, L.W., Graser, M., Graves, T., Hughes, J., Tran, N., Huang, Y., Ramensky, V., Juretic, N., Wasserscheid, J., Marques-Bonet, T., Turner, T.R., Wiseman, R.W., Tuscher, J.J., Karl, J.A., Schmitz, J.E., O'Connor, D.H., Schmidt, C., Kaplan, J.R., Jorgensen, M.J., Nordberg, M., Tomas, G.W.C., Hahn, M.W., Raney, B.J., Aken, B., Schmitz, J., Churakov, G., Noll, A., Stanyon, R., Webb, D., Thibaud-Nissen, F., Dewar, K., Weinstock, G., Wilson, R.W. & Freimer, N.B.** 2015. The genome of the vervet (*Chlorocebus aethiops sabaues*). *Genome Research* 25(12): 1921-1933.

### Chapter in Book

**Turner, T.R., Dufour, D. & Stevens, N.** 2015. The final field site. In: *Disasters in field research: Preparing for and coping with unexpected events*, edited by G.H. Ice, D.L. Dufour and N.J. Stevens. Maryland: Rowman & Littlefield Publishers. pp. 26.



*Chlorocebus aethiops*.

## Conference Contributions

**Ehlers, K.** 2015. *Identifying and overcoming challenges encountered in wildlife forensic laboratories in South Africa.* Paper delivered at the 3<sup>rd</sup> Forensic Services Conference, Pretoria, South Africa. 16-19 February.

**Marx, G.** 2015. *Genetics of Diabetes.* Paper delivered at the National Conference of the Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA), Bloemfontein, South Africa. 18-19 April.

**Montague, M.J., Hillier, L., Jasinska, A.J., Turner, T.R., Kaplan, J., Jorgensen, M.J., Freimer, N., Weinstock, G., Wilson, R.K. & Warren, W.C.** 2015.

*Structural variant discovery among related vervet monkeys.* Paper delivered at the 84<sup>th</sup> Annual Meeting of the American Association of Physical Anthropology (AAPA), St. Louis, Missouri, USA. 25-29 March.

**Mwenesongole, E.** 2015. *Estimating community drug usage patterns by the analysis of waste water.* Paper delivered at the 3<sup>rd</sup> Forensic Services Conference, Pretoria, South Africa. 16-19 February.

**Wessels, L.** 2015. *Molecular Forensic Entomology research programme at the UFS.* Paper delivered at the 3<sup>rd</sup> Forensic Services Conference, Pretoria, South Africa. 16-19 February.

## Staff

**Professor:** Prof JP Grobler.

**Lecturers:** Drs K Ehlers, G Marx, E Mwenesongole, Messrs F Maleka, T Viljoen, Mss L Wessels, H Bindeman, Z Odendaal, and S Schneider.

**Researcher/Research Assistant:** Ms SM Reinecke.

**Affiliated Professor:** Prof T Turner (University of Milwaukee-Wisconsin).

**Affiliated Associate Professor:** Prof A Kotze (NZG).

**Affiliated Lecturers:** Dr DL Dalton (NZG) and Lt Col A Lucassen (SAPS –

Forensic Division).

**Research Fellows:** Prof J Spies and Dr P Spies.

**Secretary:** Ms B Henn.

**Officer: Laboratory Technician:** Ms T Cornwell.

**Senior Assistant Officer: Laboratory Technician:** Mr A Sithole.

**Assistant Officer:** Ms V Nuttall.

## Contact Details

### Prof JP Grobler

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# Department of Geography

## Overview

The Geography department had a busy 2015 with several student and research activities taking place. Various academics and students attended conferences where they presented various research outputs. Dr Ruth Massey and Ms Anneri Pretorius received a grant from the Society of South African Geographers (SSAG) which allowed the department to engage with local primary schools. Various staff members were selected to sit on editorial boards, be part of scholar programmes, and head up associations. Staff members were engaged in internationalisation initiatives and networking.

## Staff Achievements

- Dr Ruth Massey was made an Editorial Board Member of the international journal *Urban Forum*.
- Dr Ruth Massey was selected as a member of the Vice-Chancellor's Prestige Scholars Programme (PSP).
- Dr JJ le Roux was elected as president of the Southern African Association of Geomorphologists.

## Research

Departmental staff have been busy with various research activities, including those linked to the Afro-Montane Research Institute on the Qwaqwa Campus.

## Community Service

The Green Box project: Dr Ruth Massey and Ms Anneri Pretorius received a grant from the Society of South African Geographers (SSAG) to run a project that saw ten under-resourced Bloemfontein schools receive Geography teaching and learning support material (targeting the intermediate phase). The project also provided workshops on Geography teaching. Some money was left over and 20 atlases were bought for 20 other under-resourced schools in the area.



Staff and postgraduate students of the Geography Department (Main Campus).

## National and International Collaboration

Dr Massey visited the United Kingdom in 2015 to meet with the Overseas Development Initiative (ODI) in London and the Geography Department at the University of Birmingham. A strong partnership has been formed between Dr Massey and the University of Birmingham, which led to further visits and a joint grant application to the NRF and ESRC.

## Postgraduate Students

The department currently hosts several honours and master's students in both Human and Physical Geography.

## Staff Matters

- Prof Gustav Visser left the department for a post at Stellenbosch University.
- Ms Mulalo Rabumbulu left the department for a post at the University of Johannesburg.
- Mss Ernestina Nkoe (Human Geography) and Elizabeth Rudolph (Physical Geography) joined the department at the end of the year.

## Research Outputs

### Research Articles

**Adelabu, S.A., Mutanga, O. & Adam, E.** 2015. Testing the reliability and stability of the internal accuracy assessment of random forest for classifying tree defoliation levels using different validation methods. *Geocarto International* 30(7): 810-821.

**Browning, C. & Roberts, D.L.** 2015. Lithostratigraphy of the Witzand formation (Sandveld Group), South Africa. *South African Journal of Geology* 118(3): 317-322.

**Chingombe, W., Pedzisai, E., Manatsa, D., Mukwada, G. & Taru, T.** 2015. A participatory approach in GIS data collection for flood risk management, Muzarabani district, Zimbabwe. *Arabian Journal of Geosciences* 8(2): 1029-1040.

**Dube, T., Mutanga, O., Seutloali, K., Adelabu, S.A. & Shoko, C.** 2015. Water quality monitoring in sub-Saharan African lakes: A review of remote sensing applications. *African Journal of Aquatic Science* 40(1): 1-7.

**Hall, C., Amelung, B. & Visser, G.E.** 2015. Denying bogus scepticism in climate change and tourism research. *Tourism Management* 47: 352-356.

**Hall, C., Amelung, B. & Visser, G.E.** 2015. No time for smokescreen scepticism: A rejoinder to Shani and Arad. *Tourism Management* 47: 341-347.

**Kamuti, T.** 2015. A critique of the Green Economy: Approaching in the Wildlife Ranching Sector in South Africa. *Africa Insight* 45(1): 146-168.

**Massey, R.T.** 2015. Integral Theory: A tool for mapping and understanding conflicting governmentalities in the upgrading of Cape Town's informal settlements. *Urban Forum* 26: 303-319.

**Matthews, T., Van Dijk, E., Roberts, D.L. & Smith, R.** 2015. An early Pliocene (5.1 Ma) fossil frog community from Langebaanweg, south-western Cape, South Africa. *African Journal of Herpetology* 64(1): 39-53.

**Mukwada, G., Taru, T. & Chingombe, W.** 2015. Role of Social-Ecological Systems in forest and woodland conservation in Zimbabwean resettlement areas. *Journal of Asian and African Studies* 50(3): 276-288.

**Roberts, D.L. & Mthembi, P.** 2015. Lithostratigraphy of the Graauw Duinen formation (Cenozoic West Coast group), South Africa. *South African Journal of Geology* 118(3): 331-334.



The Green Box – Developed as part of a grant from the Society of South African Geographers (SSAG).

**Shoko, C., Dube, T., Sibanda, M. & Adelabu, S.A.** 2015. Applying the Surface Energy Balance System (SEBS) remote sensing model to estimate spatial variations in evapotranspiration in Southern Zimbabwe. *Transactions of the Royal Society of South Africa* 70(1): 47-55.

**Sibanda, M., Dube, T., Seutloali, K. & Adelabu, S.A.** 2015. Operational applications of remote sensing in groundwater mapping across sub-Saharan Africa. *Transactions of the Royal Society of South Africa* 70(2): 173-179.

**Visser, G.E. & Hoogendoorn, G.** 2015. A decade of second home tourism research in South Africa: Research prospects for the developing world? *South African Geographical Journal* 97(2): 111-122.

### Research Reports

**Le Roux, J.J., Barker, C.H., Weepener, H., Van den Berg, E. & Pretorius, S.** 2015. Sediment yield modelling in the Mzimvubu River catchment. Report commissioned by the Water Research Commission, Pretoria, South Africa. pp. 1-79.

**Weepener, H., Le Roux, J.J., Van den Berg, E., Tswai, D. & Nell, J.** 2015. *Developing methods for converting digitised rivers into a hydrological drainage network.* Report commissioned by the Water Research Commission, Pretoria, South Africa. pp. 1-114.

### Chapter in Book

**Holmes, P.J.** 2015. The western Free State panfield: A landscape of myriad pans and lunettes. In *Landscapes and landforms of South Africa*, edited by S. Grab & J. Knight. Switzerland, Cham: Springer. pp. 139-145.

### Conference Contributions

**Anderson, R. & Le Roux, J.J.** 2015. *The influence of event driven processes on sediment creation from gully erosion in the uMzimvubu River Catchment*. Paper delivered at the Southern African Association of Geomorphologists (SAAG) Biannual Conference, Sani Mountain, Lesotho. 19-20 September.

**Baade, J., Glotzbach, C., Rowntree, K., Paape, A., Miller, J. & Le Roux, J.J.** 2015. *Contemporary and long-term erosion and sediment yield in South Africa*. Paper delivered at the Inaugural African Quaternary (AFQUA) Conference and Workshop, University of Cape Town, Cape Town, South Africa. 30 January – 8 February.

**Hedding, D., Hansen, C., Nel, W., Loubser, M., Le Roux, J.J. & Meiklejohn, K.** 2015. *Landscape processes in Antarctic ecosystems*. Paper delivered at the South African Association of Geomorphologists (SAAG) Biannual Conference, Sani Mountain, Lesotho. 19-20 September.

**Le Roux, J.J.** 2015. *Sediment yield contribution from gully erosion in the Mzimvubu River Catchment*. Paper delivered at the Southern African Association of Geomorphologists (SAAG) Biannual Conference, Sani Mountain, Lesotho. 19-20 September.

**Meiklejohn, K., Nel, W., Hansen, C., Lee, J., Matcher, G., Dwight, R., Scott, D., Kotze, C., Rudolph, L., Ayres, G., Rosenfels, J., Hedding, D., Loubser, M., Van der Merwe, B., Le Roux, J.J. & Davis, J.** 2015. *Rock mass loss on a nunatak in Western Dronning Maud Land, Antarctica: Implications for periglacial landform development and habitat facilitation*. Paper delivered at the Southern African Association of Geomorphologists (SAAG) Biannual Conference, Sani Mountain, Lesotho. 19-20 September.

**Pretorius, S., Weepener, H., Le Roux, J.J. & Sumner, P.** 2015. *Change detection and multi-temporal analysis of gully erosion in the Tsitsa River Catchment, South Africa, using eCognition software*. Paper delivered at the 35<sup>th</sup> European Association of Remote Sensing Laboratories (EARSEL) Symposium, Stockholm, Sweden. 15-19 June.



Teachers receiving training training on the Green Boxes at one of the workshops.



## Staff

**Professor:** Prof GE Visser.

**Associate Professor:** Prof W van Zyl.

**Senior Lecturers:** Drs CH Barker, JJ le Roux, and G Mukwada.

**Lecturers:** Drs RT Massey, A Adjei, Mss E Kruger, T Mehlomakulu, E Nkoe, E Rudolph, M Naidoo, and Mr S Adelabu.

**Junior Lecturers:** Messrs A van der Walt, P Mahasa, Mss M Rabumbulu, and A Pretorius.

**Senior Officers: Professional Services:** Mss S Brits and N van Dyk.

**Assistant Officer:** Ms N Mokhethine.

## Contact Details

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# Department of Geology

## Overview

A total of 72 degrees were awarded by the department over the course of the year; with 41 students receiving BSc degrees, 25 honours degrees, one MSc degree, and five Mineral Resource Throughput Management (MRTM) degrees. The department was responsible for the presentation of six undergraduate and three honours programmes, as well as the master's degree in MRTM, and supervised the continued research of 46 students in the MRTM programme, nine MSc candidates, and five PhD candidates.

Prof Willem van der Westhuizen retired at the end of 2015 after being associated with the department for more than 40 years. Prof Marian Tredoux was retained on contract for the year. Prof Gerard Germs was appointed as affiliated associate professor. Ms Justine Magson took over the duties of programme director from Dr Hermann Praekelt at the start of the year. Two postdoctoral researchers, Drs Matthew Huber and Elizaveta Kovaleva (under the supervision of Prof Marian Tredoux and Dr Freddie Roelofse), joined the department during the year. Mr John Clark was appointed on contract for the duration of the year and assisted the department with the presentation of a number of first- and second-year modules.

## Achievements

Ms Bianca Kennedy, MSc student of Prof Marian Tredoux, was awarded the Corstorphine Medal and the John Handley Award of the Geological Society of South Africa for her dissertation entitled "Investigation of the possibility of platinum-group element clusters in magmatic systems using synthetic sulphide melts". The former recognises an MSc thesis of a particularly high

standard that is worthy of international recognition, and the latter the best dissertation submitted to a South African university over the course of the preceding year. Ms Kennedy shared these two awards with Mr Michael Hartnady of the University of Cape Town.

Prof Christoph Gauert was appointed as a visiting professor at the University of Panzihua (Yunnan, China) in March 2015. Prof Marian Tredoux was appointed as external examiner for the University of Limpopo's School of Physical and Mineral Science (focus area: Geology) for the next three years. The visiting investigator appointment of Dr Freddie Roelofse at the Department of Terrestrial Magnetism, Carnegie Institution for Science, was extended until the end of 2016.

## Activities

It was a busy year as usual with undergraduate and honours students embarking on numerous field trips across the country and with staff members travelling both locally and abroad. Staff members and students presented their work at several conferences, including the Igneous and Metamorphic Studies Group meeting (University of Pretoria, January 2015), Precious Metals 2015 (Cornwall, UK, May 2015), the Society for Geology Applied to Mineral Deposits conference (Nancy, France, August 2015), Goldschmidt 2015 (Prague, Czech Republic, August 2015), and the Layered Intrusions Research Group meeting (Potsdam, Germany, August 2015). Prof Christoph Gauert and Dr Freddie Roelofse attended a workshop in August organised by the International Continental Scientific Drilling Programme at the Deutsches GeoForschungs Zentrum, Potsdam, Germany, to discuss matters related to a potential drilling project in the Bushveld Complex.

Mr Colin Rice of Colin Rice Exploration and Training presented a one-day "Introduction to Drilling" course to the department's honours students in April. Several Geotalks and student colloquia were also presented over the course of the year. Mr Stuart Bateman (InnovX systems) presented a talk entitled "Latest developments in portable X-ray equipment" in March, followed by a practical session on the use of a handheld X-ray fluorescence (XRF) spectrometer for the department's third-year geochemistry students.

Prof Christoph Gauert was involved in a joint excursion between the Department of Geology and the Universities of Graz and Leoben to the Bushveld Complex, the Vredefort Dome, and Kimberley. Part of this joint excursion was also attended by the department's third-year group. Prof Gauert also attended the Platreef workshop and the associated excursions to Mokopane and surroundings in May, and was responsible for organising and leading the annual economic geology honours field trip to the Transvaal Basin that took place in June, where students were exposed to various aspects of the metallogeny and economic geology of the Witwatersrand



Honours students on the annual economic geology field trip organised and led by Prof Christoph Gauert.

Supergroup, the Uitkomst Complex, the Bushveld Complex, and alluvial diamond deposits (see photo). Prof Gauert also organised two one-day excursions in October for the department's third-year students to Shafts 2 and 3 of Beatrix Gold Mine. The third-year field trip to the Vredefort structure in September, led by Dr Roelofse, Mss Thendo Mapholi, and Rinae Makhadi, was once again a great success.

The annual second-year field school to the Barkly East district, under the guidance of Mr Adriaan Odendaal, took place in October. Mr Odendaal also led a field excursion to the Vanderkloof district for the department's honours students in August, where the students performed sedimentological fieldwork that included mapping and the compilation of sedimentological profiles. Mr Odendaal attended the Origins and Evolution of the Cape Mountains and Karoo Basin Imbizo held at the Nelson Mandela Metropolitan University during November and presented his work on structures interpreted as lungfish burrows in the lower Beaufort Group of the Karoo Supergroup.

First-year students enjoyed two field excursions to Austin's Post and Omerin as part of their first and second semester Geology modules respectively. Mr Raimund Rentel accompanied the honours mineralogy students to the Northern Cape province in March, where the students studied several pegmatite occurrences and alluvial diamond workings.

Visitors to the department over the course of the year included Profs Aberra Mogessi, Frank Melcher, and C Hauenberger (University of Graz, University of Leoben), as well as Dr Jock Robey (De Beers, retired).

## Community Service

The department again hosted the Free State leg of the Minquiz National Science Competition, held on 14 May 2015. A total of 26 schools (mostly from the Free State), each represented by three learners, took part in the competition. The learners were also afforded the opportunity of visiting the departments of Chemistry, Physics, and Geology in order to see what these departments have on offer for prospective students.

## National and International Collaboration

Staff in the department actively collaborated with the following researchers at national and international institutions over the course of the year:

- Dr David Cornell, University of Gothenburg.
- Profs F Zaccarini and G Garuti, University of Leoben.
- Dr Iain McDonald, Cardiff University.
- Prof Dr Chris Ballhaus, Steinmann Institute, Bonn University.
- Dr Lutz Hecht, Museum für Naturkunde, Berlin.
- Drs Lukas Ackerman and J Trubac, Institute of Geology v.v.i., Academy of Sciences of the Czech Republic.
- Prof C Hauenberger, University of Graz.
- Dr G Costin, Rhodes University.
- Dr A Zeh, University of Frankfurt.
- Dr Habil Aleksandra Gaweda, Uniwersytet Slaski W. Katowicach, Poland.



Honours mineralogy students visiting alluvial diamond workings in the Northern Cape province.

- Drs Rick Carlson and Timothy Mock, Department of Terrestrial Magnetism, Carnegie Institution for Science.
- Prof Lewis Ashwal, School of Geosciences, University of the Witwatersrand.
- Prof Dr Rolf Romer and Dr Bob Trumbull, Deutsches GeoForschungs Zentrum.



Honours Mineralogy students studying stromatolitic dolomites on their field trip to the Northern Cape province under the guidance of Mr Raimund Rentel.

## Research Outputs

### Research Articles

**Classen, J.O.** 2015. Application of systemic flow-based principles

in mining. *The Journal of the South African Institute for Mining and Metallurgy* 115: 747-754.

**Clark, J.H.A., Tredoux, M. & Van Huyssteen, C.W.** 2015. Heavy metals in the soils of Bloemfontein, South Africa: Concentration levels and possible sources. *Environmental Monitoring and Assessment* 187: 439.

**Colliston, W.P., Cornell, D.H., Schoch, A.E. & Praekelt, H.E.** 2015. Geochronological constraints on the Hartbees River Thrust and Augrabies Nappe: New insights into the assembly of the Mesoproterozoic Namaqua-Natal Province of South Africa. *Precambrian Research* 265: 150-165.

**Gauert, C., Schannor, M., Hecht, L., Radtke, M. & Reinholz, U.** 2015. A comparison of in situ analytical methods for trace element measurement in gold samples from various South African gold depositors. *Geostandards and Geoanalytical Research* 40(2): 267-289.

**Hansen, R.N.** 2015. Contaminant leaching from gold mining tailings dams in the Witwatersrand Basin, South Africa: A new geochemical modelling approach. *Applied Geochemistry* 61: 217-223.

**Kovaleva, E., Klotzli, U., Habler, G. & Wheeler, J.** 2015. Planar microstructures in zircon from paleo-seismic zones. *American Mineralogist* 100: 1834-1847.

**Mielke, C., Boesche, N.K., Rogass, C., Kaufmann, H. & Gauert, C.** 2015. New geometric hull continuum removal algorithm for automatic absorption band detection from spectroscopic data. *Remote Sensing Letters* 6: 97-105.

**Roelofse, F. & Mulder, K.** 2015. Die invloed van verpoëring op die kwikinhoud van verskeie gesertifiseerde verwysingsmaterials. *Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 34(1): Art 1290.

**Roelofse, F., Ashwal, L.D. & Romer, R.L.** 2015. Multiple, isotopically heterogeneous plagioclase populations in the Bushveld Complex suggest mush intrusion. *Chemie der Erde* 75: 357-364.

#### Chapter in Book

## Staff

**Professor:** Prof WA van der Westhuizen.

**Associate Professors:** Profs WP Colliston, CDK Gauert, and M Tredoux.

**Senior Lecturers:** Drs JO Claassen, HE Praekelt, and F Roelofse.

**Lecturer:** Mr AI Odendaal.

**Junior Lecturers:** Mss J Magson, R Makhadi, T Mapholi, and Mr R Rentel.

**Affiliated Academic/Research Staff:** Profs GJ Beukes, DE Miller, R Scheepers, GJB Germs, R Schouwstra, L Jacobson, AE Schoch, Drs JC Looek, L Nel, PJ

**Netshitungulwana, R., Yibas, B., Gauert, C., Vermeulen, D., Novhe, O. & Motlakeng, T.** 2015. Investigation of the metal contamination in the Upper Olifants Primary Catchment by using stream sediment geochemistry, Witbank Coalfield, South Africa. In: *Sediment Matters*, edited by P. Heiningen & J. Cullmann. New York: Springer Publishing Company. pp. 169-186.

#### Conference Contributions

**Castillo, J., Gomez-Arias, A., Posthumus, J., Welman-Purchase, M. & Van Heerden, E.** 2015. *Geochemical study of the interaction of acid and alkaline mine drainage with BaCO<sub>3</sub>*. Proceedings of the 10<sup>th</sup> International Conference on Acid Rock Drainage (ICARD) & the International Mine Water Association's (IMWA) Annual Meeting (ICARD-IMWA 2015), Grand Hyatt Hotel, Santiago, Chile. 21-24 April. pp. 1-12.

**Giebel, R.J., Gauert, C. & Costin, G.** 2015. *Rare earth minerals in the lower part of the Palabora Carbonatite Complex, South Africa*. Proceedings of the 13<sup>th</sup> Biennial Meeting of the Society for Geology Applied to Mineral Deposits (SGA), Centre National de la Recherche Scientifique, Nancy, France. 24-27 November. pp. 1009-1012.

**Gomez-Arias, A., Castillo, J., Welman-Purchase, M., Posthumus, J. & Van Heerden, E.** 2015. *Evidences of effective treatment of alkaline mine drainage with BaCO<sub>3</sub>*. Proceedings of the 10<sup>th</sup> International Conference on Acid Rock Drainage (ICARD) & the International Mine Water Association's (IMWA) Annual Meeting (ICARD-IMWA 2015), Grand Hyatt Hotel, Santiago, Chile. 21-24 April. pp. 1-12.

Pretorius, RN Hansen, H Prinsloo, Messrs AC Dunne, PJ Grobler, PG Laurens, and MJAR Vrijens.

**Secretary:** Ms PS Swart.

**Administrative Officers:** Mss R Immelman and C van der Vyver.

**Technical Support Staff:** Messrs J Choane, A Felix, D Radikgomo, and Ms M Purchase.

## Contact Details

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# Department of Mathematical Statistics and Actuarial Science

## Overview

Our department grows from strength to strength. We improved our research outputs for 2015 as well as our throughput rates. We obtained accreditation level III from the Actuarial Society of South Africa (ASSA), the highest possible level, which puts us on par with other universities and strengthens our actuarial intake of students.

## Staff Achievements

- Prof Finkelstein was awarded the Sichel Medal by the South African Statistical Association for the best publication.
- Prof Van Zyl obtained a C-rating from the NRF.
- Dr Verster obtained a Y-rating from the NRF.



Annual Research Forum of the department in the Equitas Auditorium (Old CRS Auditorium).

## Student Achievements

Ms Deirdré Basson received the Dean's Medal for best BSc student in the faculty, as well as the Senate Medal.

## Special Achievements

A team of four students was led by Mr Jan Blomerus in the Chartered Institute of Management Accountants' (CIMA) Global Business Challenge. There were 180 teams from South Africa and more from overseas, with the Kovies team coming second.

## Activities

The department started the year with a strategic session end of February at Amanzi Private Game reserve, which was very positive and will be repeated annually. This followed the annual research conference in the department where most of the staff, including several visitors, presented their research (see photo). The department attended the South African Statistical Association (SASA) conference in November, where one of our staff members managed to bump the rental car into a parking lot pillar. Our presentations were a lot less bumpy and received great feedback. The actuarial component of staff attended the annual actuarial convention in Johannesburg, also in November 2015.

## Research

The department specialises in various fields of study:

- Actuarial Science – Longevity, Long-term Care, and Alternative Risk Transfer.
- Mathematical Statistics – Reliability Theory, Bayes Analysis, Extreme Value Theory, Paired Comparisons, Biostatistics, and Multiple Imputation.

The 7.99 research units in 2014 were improved upon with the preliminary count of 8.6 units in 2015.

## Community Service

Our department is not particularly involved in community service. However, our student body, together with several students, visit the cancer centre in Bloemfontein every year where children with cancer are treated.

## National and International Collaboration

Prof Finkelstein conducted research visits to the Max Planck Institute of Demographic Research (Germany) and the Elektropribor Institute (Russia), where he worked on stochastic modelling in demography and reliability respectively. Numerous publications resulted from these visits.

Prof Jan Beirlant (KU Leuven, Belgium) visited our university for three months, where he lectured Extreme Value Theory to the students and assisted in relevant research projects with staff. He also gave a short course/workshop in Extreme Value Theory in the department.

## Postgraduate students

Dr Divan Burger obtained his PhD in the department and joined the department as a postdoc under Prof Robert Schall.

## Staff Matters

Our staff component is very stable; however, we have a few retirements looming in the near future. The year 2015 saw no new permanent staff being employed in the department nor anyone leaving/retiring. The current staff did, however, perform exceptionally well:

- Prof Max Finkelstein obtained an A-rating from the NRF.
- Dr Andréhette Verster obtained a Y-rating from the NRF.



Some of the speakers, guests, and attendees of the Annual Departmental Research Forum.

Dr Von Maltitz visited the Survey Research Centre in the Institute for Social Research at the University of Michigan in September and October 2015, refining and presenting research on a robust model for multiple imputation of missing data, and starting work on goodness-of-fit tests for normal multiple imputation models. In December 2015, Prof Donald Rubin (renowned statistician from Harvard) and his partner, Ms Elizabeth Zell (biostatistician formerly part of the Center for Disease Control (CDC)), visited the Department of Mathematical Statistics and Actuarial Science. Both academics engaged with staff and students in the department and presented valuable public lectures on topics in causal inference, including the “potential outcomes” approach to causal inference.

- Dr Martin van Zyl was promoted to Adjunct Professor, and also obtained a C-rating from the NRF.
- Mr Jan Blomerus obtained his master’s degree.
- Ms Zani Ludick became an associate actuary at the Actuarial Society of South Africa (ASSA).
- Mr Frans Koning attained a postgraduate diploma in Financial Planning Law.

Furthermore, all staff members who do not have a PhD yet are currently busy with one and we aim to be a department with only PhD staff members within a few years.

# Research Outputs

## Research Articles

**Chikobvu, D.** 2015. Extreme risk, value-at-risk and expected shortfall in the gold market. *International Business & Economics Research Journal* 14(1): 107-122.

**Chikobvu, D.** 2015. Modelling of extreme minimum rainfall using generalised extreme value distribution for Zimbabwe. *South African Journal of Science* 111(9): 140-147.

**De Waal, D.J., Coetzer, R. & Van der Merwe, S.** 2015. Classification of multiple dirichlet observations under a multinomial model. *Chemometrics and Intelligent Laboratory Systems* 150: 51-57.

**Finkelstein, M.S.** 2015. 'Time-free' preventive maintenance of systems with structures described by signatures. *Applied Stochastic Models Business Industry* 31: 836-845.

**Finkelstein, M.S.** 2015. A dynamic stress-strength model with stochastically decreasing strength. *Metrika* 78: 807-827.

**Finkelstein, M.S.** 2015. A proactive group maintenance policy for continuously monitored deteriorating systems: Application to offshore wind turbines. *Journal of Risk and Reliability* 229(5): 373-384.

**Finkelstein, M.S.** 2015. An opportunistic condition-based maintenance policy for offshore wind turbine blades subjected to degradation and environmental shocks. *Reliability Engineering and System Safety* 142: 463-471.

**Finkelstein, M.S.** 2015. An optimal age-based group maintenance policy for multi-unit degrading systems. *Reliability Engineering and System Safety* 134: 230-238.

**Finkelstein, M.S.** 2015. Environmental stress screening modelling, analysis and optimization. *Reliability Engineering and System Safety* 139: 149-155.

**Finkelstein, M.S.** 2015. On new optimal preventive maintenance strategies for navigation-information systems with penalties. *Gyroscope and Navigation* 6(1): 73-77.

**Finkelstein, M.S.** 2015. On random age and remaining lifetime for populations of items. *Applied Stochastic Models Business Industry* 31: 681-689.

**Finkelstein, M.S.** 2015. On the optimal degree of imperfect repair. *Reliability Engineering and System Safety* 138: 54-58.

**Ring, A.** 2015. A randomised controlled trial of six weeks of home enteral nutrition versus standard care after oesophagectomy or total gastrectomy for cancer: Report on a pilot and feasibility study. *Trials* 16(531): 1-12.

**Ring, A.** 2015. Complete versus lesion-only primary PCI. The randomized cardiovascular MR CvLPRIT Sub-study. *Journal of the American College of Cardiology* 66(24): 2713-2724.

**Schall, R. & Burger, D.A.** 2015. A Bayesian nonlinear mixed-effects regression model for the characterization of early bactericidal activity of tuberculosis drugs. *Journal of Biopharmaceutical Statistics*: 1-25.

**Schall, R. & Burger, D.A.** 2015. Bactericidal activity of Pyrazinamide and Clofazimine alone and in combinations with Pretomanid and Bedaquiline. *American Journal of Respiratory and Critical Care Medicine* 191(8): 943-953.

**Schall, R. & Burger, D.A.** 2015. Efficiency and safety of the combination of moxifloxacin, pretomanid (PA-824), and pyrazinamide during the first 8 weeks of antituberculosis treatment: A phase 2b, open-label, partly randomised trial in patients with drug-susceptible or drug-resistant pulmonary tuberculosis. *Lancet* 385: 1738-1747.

**Van der Merwe, A.J.** 2015. Analysis of unbalanced occupational exposure data using a bayesian random effects model. *South African Statistical Journal* 49: 169-185.

**Van der Merwe, A.J.** 2015. Bayes factors for grouped data. *Journal for New Generation Sciences* 13(3): 149-162.

**Van der Merwe, A.J.** 2015. Bayesian control chart for nonconformities. *Quality Reliability Engineering International* 31(8): 1359-1366.

**Van Zyl, J.M.** 2015. Applying least absolute deviation regression to regression-type estimation of the index of a stable distribution using the characteristic function. *Communications in Statistics-Simulation and Computation* 44: 2442-2462.

**Van Zyl, J.M.** 2015. Estimation of the shape parameter of a generalized pareto distribution based on a transformation to pareto distributed variables. *Journal of Statistical Theory and Practice* 9: 171-183.

## Chapter in Book

**Schall, R. & Ring, A.** 2015. Cardiovascular toxicity, especially QT/QTc prolongation. In *Statistical methods for evaluating safety in medical product development*, edited by L. Gould. United Kingdom: John Wiley and Sons Ltd. pp. 193-228.

## Reports

**Van Zyl, R. & Van der Merwe, A.J.** 2015. *A Bayesian control chart for a common standardised normal mean*. Report 443. University of the Free State, Bloemfontein, South Africa.

**Van Zyl, R. & Van der Merwe, A.J.** 2015. *A Bayesian control chart for a one-sided upper tolerance limit for the normal population*. Report 444. University of the Free State, Bloemfontein, South Africa.

**Van Zyl, R. & Van der Merwe, A.J.** 2015. *A Bayesian control chart for a one-sided upper tolerance limit for the two-parameter exponential distribution*. Report 445. University of the Free State, Bloemfontein, South Africa.

**Van Zyl, R. & Van der Merwe, A.J.** 2015. *A Bayesian procedure for the piecewise exponential model*. Report 448. University of the Free State, Bloemfontein, South Africa.

**Van Zyl, R. & Van der Merwe, A.J.** 2015. *Bayesian control charts for the two-parameter exponential distribution*. Report 446. University of the Free State, Bloemfontein, South Africa.

**Van Zyl, R. & Van der Merwe, A.J.** 2015. *Bayesian control charts for the two-parameter exponential distribution if the location parameter can take on any value between minus infinity and plus infinity*. Report 447. University of the Free State, Bloemfontein, South Africa.

**Van Zyl, R. & Van der Merwe, A.J.** 2015. *Bayesian results for the process capability indices,  $C_{pl}$ ,  $C_{pu}$  and  $C_{pk}$  and Control chart for the  $C_{pk}$  index*. Report 449. University of the Free State, Bloemfontein, South Africa.

**Von Maltitz, M.J.** 2015. *Multiple imputation using regularised iterative multiple correspondence analysis*. Report 440. University of the Free State, Bloemfontein, South Africa.

**Von Maltitz, M.J. & Van der Merwe, A.J.** 2015. *A robust model for use in sequential regression multiple imputation*. Report 441. University of the Free State, Bloemfontein, South Africa.

**Von Maltitz, M.J. & Van der Merwe, A.J.** 2015. *Bayesian estimation of a robust alternative to the probit model for classification and prediction*. Report 442. University of the Free State, Bloemfontein, South Africa.

## Conference Contribution

**Chikobvu, D.** 2015. *Evaluating risk in gold prices with generalized hyperbolic and stable distributions*. Proceedings of the 57<sup>th</sup> Annual Conference of the South African Statistical Association (SASA), Engineering III Building, Hatfield Campus, University of Pretoria, South Africa. 29 November – 2 December.

## Staff

**Distinguished Professor:** Prof MS Finkelstein.

**Professors:** Profs JM van Zyl and R Schall.

**Senior Lecturers:** Drs D Chikobvu, L van der Merwe, A Verster, A Neethling, (Units), and Mr FF Koning.

**Lecturers:** Drs MJ von Maltitz, M Sjolander, Messrs JM Blomerus, AM Naudé, J Venter, S van der Merwe, Mss W Oosthuizen, L da Silva, (Units), ME Girmay, and Z Ludick.

**Junior Lecturers:** Messrs A Ngeuleu Kotchap (Units) and AS Ruswa (Units).

**Researchers/Research Assistants:** Profs PCN Groenewald, AJ van der Merwe, DJ de Waal, and Dr VG Micali.

**Affiliate Associate Professors:** Profs J Dhaene, A Ring, and J Beirlant.

**Secretary:** Ms ME Mathee.

**Messenger:** Mr W Baranye.

## Contact Details

**Mr FF Koning**

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# Department of Mathematics and Applied Mathematics

## Overview

The Department of Mathematics and Applied Mathematics offers a variety of modules – some with emphasis on the more abstract side of mathematics, and others more on the applicable side of mathematics. Students who finish their studies in our department typically obtain the degrees BSc, BCom, and sometimes even BA. We also offer service modules to many students who study other scientific directions, such as biology, agriculture, engineering, and the building sciences.

Research activities have picked up considerably over the past few years, especially in the areas of graph theory, algebra, numerical analysis, and modelling.

The department is also concerned with what is happening on school level. Some of the staff members are closely involved with the training of learners who are interested in Mathematics Olympiads.



Mr B-E de Klerk presenting his talk during the International Conference on Radicals, Rings, Nearrings, and other Algebraic Structures in Vorau, Austria.

## Activities and Achievements

Prof JH Meyer continued his research by visiting a colleague in Tainan, Taiwan, where work on an open problem continued, which will hopefully be finalised in 2016. During this visit, he also presented an invited talk in the

seminar series of the Department of Mathematics of the National Cheng Kung University. He presented an invited talk on maximal rings of functions at the 24<sup>th</sup> International Conference on Nearrings, Nearfields, and Related Topics from 5–12 July, held at the Manipal Institute of Technology, Manipal University, Manipal, India. Prof Meyer acted as chairperson for a session and was also asked to write a chapter on matrix nearrings in a book that will appear in a series of lecture notes.

Prof Meyer and his PhD student, Mr B-E de Klerk, also attended the International Conference on Radicals, Rings, Nearrings, and other Algebraic Structures in Vorau, Austria, from 26 July to 1 August, where they presented talks on their research results.

Prof Meyer continued his involvement (as in the past 20 plus years) with the training and setting of papers for the Mathematics Olympiads. He also reviewed several papers for *Zentralblatt Math* (published by Springer), as well as for *Math Reviews*.

Prof TM Acho attended the International Conference in Biomath in Pretoria, South Africa, from 12–17 July. He presented a paper on a modelling problem. He also reviewed two articles for the American Mathematical Society's Mathematical Reviews Database.

Prof T Vetric continued his research in the area of graph theory, gave an invited talk at an International Conference in Slovakia in June, and published three papers in research journals. He also reviewed several papers, and served on various committees of the National Research Foundation. He acted as the supervisor of our postdoctoral fellow, Dr SJ Childs.

## Student Achievements

Ms ECM Maritz, a PhD student in Graph Theory, won the first prize for her presentation at the 15<sup>th</sup> Annual Student Symposium in Natural Sciences, as well as the Eureka Prize for her excellent contribution towards Computer Science and the Mathematical Sciences.

## Community Service

Prof JH Meyer and Messrs C Venter, JB Smit, and B-E de Klerk continued to be involved with Olympiad training amongst school learners from all over the country.

## National and International Collaboration

Members of the department had international collaboration with researchers from Slovakia, Zimbabwe, Malawi, the Philippines, Taiwan, and the USA, and national collaboration with researchers from Johannesburg and Stellenbosch.

## Postgraduate Students

The following PhD students are enrolled in our department: Messrs JB Smit, D Mengesha, IC Oguoma, B-E de Klerk, M Fasondini, Mss ECM Maritz, and L Bolton.

## Staff Matters

The department appointed three new lecturers: Drs Edward Ngounda and Albert Kriel, at the Main Campus, and Mr Sibusiso Nkosi at the Qwaqwa Campus.

## Research Outputs

### Research Articles

**Childs, S.J.** 2015. An improved temporal formulation of pupal transpiration in *Glossina*. *Mathematical Biosciences* 262: 214-229.

**Marki, L., Meyer, J.H., Szigeti, J. & Van Wyk, L.** 2015. Matrix representations of finitely generated Grassmann algebras and some consequences. *Israel Journal of Mathematics* 208: 373-384.



Ms Elizabeth Maritz, who received the first prize for her presentation at the 15<sup>th</sup> annual Student Symposium in Natural Sciences.

**Vetrik, T.** 2015. Diameter of neighbourhood graphs. *Bulletin of the Malaysian Mathematical Sciences Society*: 1-6.

**Vetrik, T.** 2015. Selected topics in the extremal graph theory. *Acta Mathematica Nitriensia* 1: 44-49.

**Vetrik, T. & Ahmad, A.** 2015. Computing the metric dimension of the categorical product of some graphs. *International Journal of Computer Mathematics*. Published online: Oct/Nov.

#### Conference Contributions

**De Klerk, B-E.** 2015. *A structural classification of the automorphisms of certain abelian groups*. Paper delivered at the International Conference on Radicals, Rings, Nearings and other Algebraic Structures (ICOR 2015), Vorau, Austria. 26 July – 2 August.

**Maritz, E.C.M.** 2015. *'n Fynbedagte kleurespel in grafiekteorie*. Paper delivered at the 15<sup>th</sup> Annual Student Symposium in Natural Sciences organized by Die SA Akademie vir Wetenskap en Kuns, Bloemfontein. 30 October.

**Marki, L., Meyer, J.H., Szigeti, J. & Van Wyk, L.** 2015. *Matrix representations of finitely generated Grassmann algebras*. Paper delivered at the

International Conference on Radicals, Rings, Nearings and other Algebraic Structures (ICOR 2015), Vorau, Austria. 26 July – 2 August.

**Meyer, J.H. & Maxson, C.J.** 2015. *Unique maximal rings of functions*. Invited talk delivered at the 24<sup>th</sup> International Conference on Nearings, Nearfields and Related Topics, Manipal Institute of Technology, Manipal University, Karnataka, India. 5-12 July.

**Oguoma, I.C., Acho, T.M. & Ukaga, C.N.** 2015. *Mathematical Modelling of Oncocerciasis Transmission Potentials of Female Blackflies in Hyper-Endemic Communities after a Decade Annual Ivermectin Treatment*. Paper delivered at the Annual International Conference on Mathematical Methods and Models in Biosciences (Biomath 2015-S), Pretoria, South Africa. 12-17 July.

**Smit, J.B.** 2015. *The metric dimension for the categorical product of graphs*. Paper delivered at the 34<sup>th</sup> Southern Africa Mathematical Sciences Association (SAMSA) Annual Conference, Windhoek, Namibia. 23-27 November.

**Vetrik, T.** 2015. *Selected topics in the extremal graph theory*. Invited talk delivered at the 13<sup>th</sup> Mathematical Conference in Nitra, Slovakia. 18-19 June.

## Staff

**Professor:** Prof J Meyer.

**Associate Professors:** Profs T Acho, T Vetrik, and J Schröder (Qwaqwa).

**Senior Lecturers:** Dr S Dorfling and Ms J van Niekerk.

**Lecturers:** Drs E Ngounda, A Kriel, Mss A Kleynhans, A Swart, M Botha, Messrs C Venter, B-E de Klerk, M Fasondini, P Mbambo (Qwaqwa), and S

Nkosi (Qwaqwa).

**Junior Lecturer:** Ms Christa Faber (Qwaqwa).

**Temporary Lecturers:** Dr H Bargenda, Mss E Maritz, H Oosthuizen, K Junqueira, Messrs J Smit, R Jansen, and N Sebastian (Qwaqwa).

**Postdoc Fellow:** Dr S Childs.

## Contact Details

**Prof Johan Meyer**

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# Department of Microbial, Biochemical and Food Biotechnology

## Overview

The highlight of 2015 was undoubtedly the completion of the refurbishment of the Biotechnology building and the opening of the new wing comprising a large research laboratory with a seminar room and offices on 29 October.

Academics from the department received recognition and interacted with various organisations and institutions, both locally and abroad. The department was also well represented nationally and internationally by staff and students attending various conferences and meetings. The Kovsie Microbrewers team of the department excelled at the annual SA Breweries Intersarsity Beer Brewing Challenge, where they not only dominated in the bottle labelling category with a first, second, and fourth prize, but our cider also received a second place in the category for ciders.



The Kovsie Microbrewers team of the department excelled at the annual SA Breweries Intersarsity Beer Brewing Challenge, where they dominated in the bottle labelling category with a first, second, and fourth prize. Their cider also received a second place in the category for ciders.

## Activities and Achievements

Prof James du Preez is a joint Editor-in-Chief for *Biotechnology for Biofuels* and was invited to serve a third term on the grant evaluation panel of the European Research Council. Prof Celia Hugo was appointed as sub-editor of the *International Journal of Systematic and Evolutionary Microbiology*

from 1 October 2015. Dr Charlotte Boucher was elected as a member of the new cohort of the Rector's Prestige Scholar Programme (PSP). Dr Trudi O'Neill co-organised the third annual meeting of the African Research Network for Neglected Tropical Diseases that was held in Blantyre, Malawi, in November. She also obtained a C1-rating from the NRF. Prof Rob Bragg was the main speaker at a symposium arranged by Phibro International as part of the Potential for Poultry Production in Developing Countries conference, which was held in Turkey in October 2015. He was also the main speaker at a series of symposiums arranged by Ventri Biotechnologies in India, where some 800 poultry producers attended presentations on the control of Infectious Coryza hosted at various locations throughout India. During the second half of 2015, Dr K Myburgh was invited by the South African National Secretariat of the International Dairy Federation to represent the country at the World Dairy Summit in Vilnius in Lithuania from 21–24 September 2015. Dr Maryna de Wit was a keynote speaker and organiser of two consecutive international workshops on cactus pears: the Bi-lateral Mexico-South Africa Workshop (23–24 January 2015, Bloemfontein) and the International Cactus Pear Workshop (27–28 January 2015, Bloemfontein). Dr Frans O'Neill was appointed to the NRF Biotechnology/Nanotechnology/ICT/Hydrogen and Fuel Cells Advisory Panel for the South Korea/Japan/South Africa Research Cooperation Programme.

## National and International Collaboration

Dr Chantel Swart has active collaboration with the Mayo Clinic in Rochester, USA, as well as with the Dalhousie University in Halifax, Canada. Drs Bragg and Boucher undertook a study visit to China to foster cooperation with various researchers in China. In addition, four DAAD-RISE interns were hosted in the department in 2015. Ms Nadja Huempfer (Free University of Berlin) was hosted by Dr Trudi O'Neill; Ms Michelle Sorgenfrei (University of Tuebingen) was hosted by Dr Frans O'Neill; and Mr Jan Freihart and Ms Saskia Funk (Universität Heidelberg) were hosted by Prof Esta van Heerden.

## Postgraduate Students

Sixteen students completed their BScHons degrees, while four PhD and six MSc degrees were conferred in 2015.

## Research

In the **Food Science Division**, the research group of Prof Celia Hugo investigates *Chryseobacterium* as food spoilage microorganisms and compares the growth rates and proteolytic and lipolytic activities of the well-known food spoilage organism, *Pseudomonas*. Prof Arno Hugo and his postgraduate students continued with investigations into the improvement of the quality of fresh and processed meat products in South Africa. Current projects include investigations into the inclusion of Echium oil as a means to improve the omega-3 fatty acid content of pork. Extensive research is also conducted on the effect of salt and sodium reduction on the chemical and microbial stability and sensory properties of processed meat products, as well as the effect of brine injection on the quality of fresh pork. In the sensory and product development laboratory, Dr Carina Bothma investigated the sensory profiling and nutritional values of novel food plants, such as *Agave americana*, lucerne, and cactus pear (*Opuntia ficus-indica* and *Opuntia robusta*) cladodes. The research of Dr Maryna de Wit still focuses on the functional uses of cactus pears in food applications. These include the cladodes and mucilage, as well as seed oils. The research of Prof Garry Osthoff on milk from non-dairy animals concentrates on the casein micelles. His research found that the alpha caseins are absent in the milk of the African elephant, and the micelles are only stabilised by beta- and kappa-caseins. This is unique and further studies should help to explain the structure-function aspects of casein micelles in general. Dr Koos Myburgh and his students developed a chromatographic method to detect heat damage in milk. They also developed an analytical method for the detection of recombinant bovine somatotropin (rBST) in milk.

In the **Biochemistry Division**, the Screening Applications and Novelty in Specialised Environments (SAENSE) Platform, led by Prof Esta van Heerden, continued their work in the deep subsurface. The research specifically addresses microbial carbon transformations in subsurface environments. Several water quality monitoring programmes were also established by the research group. The Molecular Virology research group of Dr Trudi O'Neill continued research activities into the development of alternative rotavirus vaccines, and the research in Clinical Biochemistry, led by Dr Frans O'Neill, focuses on human cellular detoxification and sterol metabolism. The aim of the Biocatalysis Group of Prof Martie Smit and Dr Dirk Opperman is to develop excellent biocatalysts for the introduction of oxygen into molecules. The group focuses on the oxyfunctionalisation of various natural and petrochemical hydrocarbons, including monoterpenes, alkanes, and alkenes by cytochrome P450 monooxygenases, as well as the synthesis of esters and lactones from the corresponding ketones.

In the **Microbiology Division**, the Food Biotechnology research group led by Prof Bennie Viljoen continued their work on indigenous fermented foods and beverages but also established a totally new direction on mushrooms. The projects on fermented foods and beverages aim to improve the livelihoods and incomes of rural communities and small-scale processors through improved technologies for the processing and development of fermented maize and dairy products that have the potential to be utilised as weaning and/or supplementary foods for children.

The **Pathogenic Yeast Research Group** currently comprises Profs Koos Albertyn, Carlien Pohl, Drs Olihile Sebolai, and Chantel Swart. They focus on metabolism and molecular mechanisms of bioactive lipids of pathogenic yeasts. In addition, research is conducted using novel imaging techniques,

such as Nano Scanning Auger Microscopy (NanoSAM) and Secondary Ion Mass Spectrometry – Time-of-Flight (SIMS-TOF), that can be applied in the search for novel cell inclusions and drugs. This is done in collaboration with Profs Hendrik Swart and Pieter van Wyk of the UFS Department of Physics and the UFS Laboratory for Microscopy. The applicability of NanoSAM to nanomedicine, specifically anticancer drugs, is researched in collaboration with the Mayo Clinic based in Rochester, USA.



Beer tasting hosted by the Kovie Microbrewers team.

The **Fermentation Biotechnology Research Group** comprises Prof Stephanus Kilian, Ms Laurinda Steyn, and Mr Du Toit Schabert. Software was developed for integrated systems biology and bioinformatics employing next-generation sequencing, with application to genetic and kinetic regulation of metabolism in the yeast *Kluyveromyces marxianus*. Optimisation of the conversion of sucrose into oligosaccharides was continued and the main factors impacting production were identified. The tetrasaccharide produced was identified as an isomer of nystose, which is commercially used in the formulation of prebiotics.

The **Veterinary Biotechnology Research Group** of Prof Rob Bragg and Dr Charlotte Boucher was very fortunate to obtain three interdisciplinary research grants from the UFS. The first of these was for the continuation of the work with Prof Muriel Meiring of the Medical Faculty. The scope of this work was expanded and additional genes were successfully expressed, which has greatly assisted in the development of diagnostic tests, for which a patent has been submitted. A new cooperation with Prof F Burt was also established during 2015, also based on the awarding of an interdisciplinary grant. The work involved the expression of selected genes from the Crimean Congo haemorrhagic fever virus. The third interdisciplinary project was with the Department of Zoology and Entomology, where the secretions of the secretory glands of *Amietophrynus* toad species were analysed for antimicrobial activity.



Beer tasting during the annual SA Breweries Intersarsity Beer Brewing Challenge

## Staff Matters

Prof James du Preez, who had been the departmental chairperson from 2002, stepped down at the end of 2014 to retire at the end of 2015. Prof Martie Smit was appointed as the new academic departmental head as of January 2016. Mr Du Toit Schabort, who had been in a contract position, was appointed as junior lecturer in Biochemistry. Ms Arista van der Westhuizen took over as financial officer from Ms Leonie Myburgh, who retired in June 2015. Ms Aurelia van Wyk was appointed as the new curator of the yeast culture collection and analyst of the South African Fryer Oil Initiative in the place of Ms Andri van Wyk, who retired at the end of 2015. In the Food Science division, Ms Tinah Mkololo also retired at the end of 2015 and Dr George Charimba was first promoted to Senior Officer: Professional Services before his position was changed to lecturer. During 2015, Prof Hugh Patterton and Dr Elize Patterton also left our department. Prof Carlien Pohl-Albertyn was promoted to full professor and Dr Olihile Sebolai to senior lecturer.

## Research Outputs

### Research Articles

- Ajuka, M., Charimba, G., Hugo, C.J. & Buys, E.M.** 2015. Characterization of bacterial pathogens in rural and urban irrigation water. *Journal of Water and Health* 13: 103-117.
- Akanni, G.B., Du Preez, J.C., Steyn, L. & Kilian, S.G.** 2015. Protein enrichment of an *Opuntia ficus-indica* cladode hydrolysate by cultivation of *Candida utilis* and *Kluyveromyces marxianus*. *Journal of the Science of Food and Agriculture* 95: 1094-1102.
- Barbour, E.K., Bragg, R.R., Karrouf, G., Lyer, A., Harakeh, S. & Kumosani, T.** 2015. Control of eight predominant *Eimeria* spp. involved in economic coccidiosis of broiler chicken by a chemically characterized essential oil. *Journal of Applied Microbiology* 118: 583-591.
- Bekker, A., Steyn, L., Charimba, G., Jooste, P. & Hugo, C.** 2015. Comparison of the growth kinetics and proteolytic activities of *Chryseobacterium* species and *Pseudomonas fluorescens*. *Canadian Journal of Microbiology* 61: 977-982.
- Borgonie, G., Linage-Alvarez, B., Ojo, A., Mundle, S., Freese, B., Van Rooyen, C., Kuloyo, O., Albertyn, J., Pohl, C., Cason, E., Vermeulen, J., Pienaar, C., Litthauer, D., Van Niekerk, H., Van Eeden, J., Sherwood Lollar, B., Onstott, T. & Van Heerden, E.** 2015. Eukaryotic opportunists dominate the deep subsurface biosphere in South Africa. *Nature Communications* 6: 8952.
- Borgonie, G., Linage-Alvarez, B., Ojo, A., Shivambu, S., Kuloyo, O., Cason, E.D., Maphanga, S., Vermeulen, J., Litthauer, D., Ralston, C.D., Onstott, T.C., Sherwood-Lollar, B. & Van Heerden, E.** 2015. Deep subsurface mine stalactites trap endemic fissure fluid Archaea, Bacteria, and Nematoda possibly originating from ancient seas. *Frontiers in Microbiology* 6: Article 833.
- Boucher, C.E., Theron, C.W., Hitzeroth, A.C. & Bragg, R.R.** 2015. Regulation of chicken immunity-related genes and host response profiles against *Avibacterium paragallinarum* pathogen challenge. *Veterinary Immunology and Immunopathology* 167: 70-74.
- De Wit, M., Bothma, C., Hugo, A., Sithole, T., Absalom, C. & Van den Berg, C.** 2015. Physico-chemical and sensory evaluation of cactus pear (*Opuntia ficus-indica* L. Mill and *Opuntia robusta* Wendl) cladode flour in different baked products. *Journal of the Professional Association for Cactus Development* 17: 89-106.
- De Wit, M., Shongwe, N.C. & Hugo, A.** 2015. The effect of genotype, location and season on the lipid content and lipid composition of cactus pear (*O. ficus-indica*) seed. *Acta Horticulturae* 1067: 173-179.
- Du Toit, A., De Wit, M., Osthoff, G. & Hugo, A.** 2015. Antioxidant content and capacity of fruit from different colour cactus pear (*O. ficus-indica* and *O. robusta*) cultivars. *Acta Horticulturae* 1067: 187-192.
- Hugo, A. & Roodt, E.** 2015. Fat quality of South African pigs with different carcass classification characteristics. *South African Journal of Animal Science* 45: 302-312.
- Hugo, C.J. & Hugo, A.** 2015. Current trends in natural preservatives for fresh sausage products. *Trends in Food Science and Technology* 45: 12-23.
- Kara, S., Schrittwieser, J.H., Gargiulo, S., Ni, Y., Yanase, H., Opperman, D.J., Van Berkel, W.J.H. & Hollmann, F.** 2015. Complete enzymatic oxidation of methanol to carbon dioxide: Towards more eco-efficient regeneration systems for reduced nicotinamide cofactors. *Advanced Synthesis and Catalysis* 357: 1687-1691.
- Labonté, J.M., Field, E.K., Lau, M., Chivian, D., Van Heerden, E., Wommack, K.E., Kieft, T.L., Onstott, T.C. & Stepanauskas, R.** 2015. Single cell genomics

indicates horizontal gene transfer and viral infections in a deep subsurface Firmicutes population. *Frontiers in Microbiology* 6: Article 349.

**Lozano, A., Ayora, C., Macias, F., Nieto, J.M., Gomez-Arias, A., Castillo, J. & Van Heerden, E.** 2015. Sulphate removal from acid mine drainage: Evaluation of granular BaCO<sub>3</sub> with column experiments. *Revista de la Sociedad Española de Mineralogía* 20: 83-84.

**Madende, M., Osthoff, G., Patterton, H.G., Patterton, H.E., Martin, P. & Opperman, D.J.** 2015. Characterization of casein and alpha lactalbumin of African elephant (*Loxodonta africana*) milk. *Journal of Dairy Science* 12: 8308-8318.

**Madu, U.L., Ogundeji, A.O., Mochochoko, B.M., Pohl, C.H., Albertyn, J., Swart, C.W., Allwood, J.W., Southam, A.D., Dunn, W.B., May, R.C. & Sebolai, O.M.** 2015. Cryptococcal 3-hydroxy fatty acids protect cells against amoebal phagocytosis. *Frontiers in Microbiology* 6: Article 1351.

**Maleke, M., Williams, P., Castillo, J., Botes, E., Ojo, A., DeFlaun, M. & Van Heerden, E.** 2015. Optimization of a bioremediation system of soluble uranium based on the biostimulation of an indigenous bacterial community. *Environmental Science and Pollution Research* 22: 8442-8450.

**Mielmann, A., Bothma, C., Hugo, A. & Hugo, C.J.** 2015. Descriptive sensory analysis and consumer acceptability of lucerne (*Medicago sativa* L.). *British Food Journal* 117: 2975-2992.

**Motaung, T.E., Albertyn, J., Pohl, C.H. & Köhler, G.** 2015. *Candida albicans* mutant construction and characterization of selected virulence determinants. *Journal of Microbiological Methods* 115: 153-165.

**Nantapo, C.W.T., Muchenje, V., Nkukwana, T.T., Hugo, A., Descalzo, A., Grigioni, G. & Hoffman, L.C.** 2015. Socio-economic dynamics and innovative technologies affecting health-related lipid content in diets: Implications on global food and nutrition security. *Food Research International* 76: 896-905.

**Odendaal, C., Seaman, M., Kemp, G., Patterton, H.E. & Patterton, H.** 2015. An LC-MS/MS based survey of contaminants of emerging concern in drinking water in South Africa. *South African Journal of Science* 111: Article 2014-0401.

**Pennec, A., Hollmann, F., Smit, M.S. & Opperman, D.J.** 2015. One-pot conversion of cycloalkanes to lactones. *ChemCatChem* 7: 236-239.

**Pennec, A., Jacobs, C.L., Opperman, D.J. & Smit, M.S.** 2015. Revisiting cytochrome P450 mediated oxyfunctionalization of linear and cyclic alkanes. *Advanced Synthesis and Catalysis* 357: 118-130.

**Pienaar, G.H., Einkamerer, O.B., Van der Merwe, H.J., Hugo, A. & Fair, M.D.** 2015. The effect of an active live yeast product on the digestibility of finishing diets for lambs. *Small Ruminant Research* 123: 1-8.

**Ricklefs, E., Girhard, M., Koschorreck, K., Smit, M.S. & Urlacher, V.B.** 2015. Two-step one-pot synthesis of pinoresinol from eugenol in an enzymatic cascade. *ChemCatChem* 7: 1857-1864.

**Slobodkina, G.B., Kovaleva, O.L., Miroshnichenko, M.L., Slobodkin, A.I., Kolganova, T.V., Novikov, A.A., Van Heerden, E. & Bonch-Osmolovskaya, E.A.** 2015. *Thermogutta terrifontis* gen. nov., sp. nov. and *Thermogutta hypogea* sp. nov., thermophilic anaerobic representatives of the phylum Planctomycetes. *International Journal of Systematic and Evolutionary Microbiology* 65: 760-765.

**Strydom, A. & Witthuhn, C.R.** 2015. *Listeria monocytogenes*: A target for bacteriophage biocontrol. *Comprehensive Reviews in Food Science and Food Safety* 14: 694-702.

**Strydom, P.E., Frylinck, L., Van Heerden, S.M., Hope-Jones, M., Hugo, A., Webb, E.C., Moholisa, E., Liebenberg, B.E. & Sehoole, O.C.** 2015. Sources of variation in quality of South African beef: Case studies in relation to the

red meat classification system. *South African Journal of Animal Science* 45: 289-301.

**Van der Merwe, R., Labuschagne, M.T., Herselman, L. & Hugo, A.** 2015. Effect of heat stress on seed yield components and oil composition in high- and mid-oleic sunflower hybrids. *South African Journal of Plant and Soil* 32: 121-128.

**Vermaas, J.F., Hugo, C.J., Steyn, H.J.H. & Schall, R.** 2015. The efficacy of anolyte as an environmentally friendly disinfectant on *Escherichia coli* and *Staphylococcus aureus* contaminated cotton, polyester/cotton and polyester. *Journal of Family Ecology and Consumer Sciences* 43: 26-32.

#### Chapter in Book

**Sebolai, O.M. & Ogundeji, A.O.** 2015. New antifungal discovery from existing chemical compound collections. In *Antifungals: From genomics to resistance and the development of novel agents*, edited by A.T. Coste and P. Vandeputte. United Kingdom: Horizon Scientific Press. pp. 1213-1214.



The SAENSE Platform Group developed a new treatment for Exxaro's mine drainages. Representatives from Exxaro and the UFS visited the pilot plant. From left to right: Arno Mauriks (UFS sub-contractor), Theuns van Wyk (Exxaro engineer), Julio Castillo (UFS postdoc student), Gawie Pretorius (Exxaro), Emela Mochubele (Exxaro), Rohan Posthumus (UFS junior researcher), Prof Esta van Heerden (UFS lead researcher), and Diksha Somai (Exxaro).

#### Patents

**Bragg, R.R., Boucher, C.E., Theron, C.W. & Hitzeroth, A.C.** 2015. Production of polypeptides relevant to human and animal health using *Yarrowia lipolytica*. P49573ZAPO. South Africa.

**Castillo, J., Gomez, A., Van der Hoven, W.G., Posthumus, J. & Van Heerden, E.** 2015. Mine drainage remediation using barium carbonate dispersed alkaline substrate. P49198ZAPO. South Africa.

#### Conference Contributions

**Bothma, C., Semuli, M., Osthoff, G. & Hugo, A.** 2015. Determination of the effect of blanching and different preparation methods on the sensory properties of *Agave americana* flowers. Poster presented at the 11<sup>th</sup>

Pangborn Sensory Science Symposium, Svenska Mässan, Gothenburg, Sweden. 23–27 August.

**Boucher, C.E. & Bragg, R.R.** 2015. *Regulation of chicken immunity-related genes and host response profiles against Avibacterium paragallinarum pathogen insult.* Paper delivered at the 19<sup>th</sup> World Veterinary Poultry Association (WVPA) Congress, Cape Town, South Africa. 7–11 June.

**Bragg, R.R.** 2015. *An overview of infectious coryza.* Paper delivered at the Symposium on the Potential for Poultry Production in Developing Countries, Antalya, Turkey. 15–18 October.

**Bragg, R.R.** 2015. *Continual disinfection for the control of poultry diseases.* Paper delivered at the 2<sup>nd</sup> Animal Vaccines and Immunologic Adjuvant Technology Salon, Bizhou, China. 3–4 December.

**Bragg, R.R.** 2015. *Infectious Coryza: An opportunity for Mentofin?* Paper delivered at the 3<sup>rd</sup> International Scientific Mentofin Symposium, Kantary Hotel, Ayutthaya, Thailand. 8–9 March.

**Bragg, R.R.** 2015. *Lessons from South Africa for the control of infectious coryza.* Paper delivered at the Symposium on the Potential for Poultry Production in Developing Countries, Antalya, Turkey. 15–18 October.

**Bragg, R.R., Boucher, C.E., Hitzeroth, A.C., Coetsee, E., Coetzee, M. &**

**Bragg, R.R., Van der Westhuizen, W.A., Lee, J-Y., Coetsee, E., Coetzee, M., Theron, C.W., Hitzeroth, A.C. & Boucher, C.E.** 2015. *Treatment options in a post antibiotic era in poultry production.* Paper delivered at the 19<sup>th</sup> World Veterinary Poultry Association (WVPA) Congress, Cape Town, South Africa. 7–11 June.

**Bragg, R.R., Van der Westhuizen, W.A., Lee, J-Y., Coetsee, E., Coetzee, M., Theron, C.W., Hitzeroth, A.C. & Boucher, C.E.** 2015. *Treatment options in a post antibiotic era in poultry production.* Paper delivered at the 109<sup>th</sup> Avi Africa Congress of the South African Poultry Association (SAPA), Johannesburg, South Africa. 23–25 June.

**Bragg, R.R., Van der Westhuizen, W.A., Lee, J-Y., Coetsee, E., Coetzee, M., Theron, C.W., Hitzeroth, A.C. & Boucher, C.E.** 15 – 18 December 2015. *Treatment options in a post antibiotic era.* Paper delivered at the 2<sup>nd</sup> International Conference on Infectious Diseases and Nanomedicine (ICIDN-2015), Kathmandu, Nepal. 15–18 December.

**Buitendach, G.C., De Witt, F.H., Hugo, A., Van der Merwe, H.J. & Fair, M.D.** 2015. *Long term effect of dietary lipid saturation on eggshell quality and bone characteristics of laying hens.* Poster presented at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21–23 September.

**Cason, E.D., Onstott, T.C., Harris, R. & Van Heerden, E.** 2015. *Deep mine subsurface research – Diversity, geochemistry and (meta)genomics.* Paper delivered at the International Continental Scientific Drilling Program Workshop on Drilling into Seismogenic Zones of M2.0–5–5 Earthquakes in South African Gold Mines, Potchefstroom, South Africa. 31 October – 3 November.

**Castillo, J., Gomez-Arias, A., Posthumus, J., Welman- Purchase, M. & Van Heerden, E.** 2015. *Geochemical study of the interaction of acid and alkaline mine drainage with BaCO<sub>3</sub>.* In: *Proceedings of the 10<sup>th</sup> International Conference on Acid Rock Drainage & IMWA Conference (INCARD-IMWA 2015)*, Santiago, Chile. 21–24 April. Art. 290.

**Chen, J., Castillo, J., Cason, E.D., Esterhuizen, L. & Van Heerden, E.** 2015. *Scoping study on current emerging contaminants, geochemistry and microbial diversity influencing quality of water sources in the Free State Province.* Paper delivered at the 2<sup>nd</sup> African Water Symposium in conjunction with the 6<sup>th</sup> Orange River Basin Symposium, University of the Free State, Bloemfontein, South Africa. 7–8 October.

**Cluff, M., Rasebotsa, D., Roodt, E., Hugo, C.J. & Hugo, A.** 2015. *A survey: Labelled versus analyzed salt and sodium content of South African processed meat products.* Poster presented at the 21<sup>st</sup> Biennial Congress and Exhibition of the South African Association for Food Science and Technology, Durban, South Africa. 6–10 September.

**Cluff, M., Steyn, H., Kobane, I., Zacharia, P., Bothma, C., Hugo, C. & Hugo, A.** 2015. *Sodium reduction: A solution in itself?* Paper delivered at the 21<sup>st</sup> Biennial Congress and Exhibition of the South African Association for Food Science and Technology, Durban, South Africa. 6–10 September.

**Coetsee, E., Bragg, R.R. & Boucher, C.E.** 2015. *Multiplex PCR for serotyping Avibacterium paragallinarum isolates.* Poster presented at the 19<sup>th</sup> World Veterinary Poultry Association (WVPA) Congress, Cape Town, South Africa. 7–11 June.

**Coetzee, M., Hitzeroth, A.C., Boucher, C.E. & Bragg, R.R.** 2015. *Detection of QAC resistance genes in Staphylococcus aureus in the presence of quaternary ammonium compounds.* Poster presented at the Symposium on Antibiotic Resistance and Antibiotic Alternatives: Looking towards the future, London, UK. 2–4 November.

**Coetzee, M., Jansen, A.C., Boucher, C.E. & Bragg, R.R.** 2015. *Minimum inhibitory concentration determination of quaternary ammonium compounds in bacteria harbouring QAC resistance genes.* Poster



Reitumetse Molao is currently doing a master's degree on the production of Biogas in the department. Biogas production is a growing technology that uses the principle of anaerobic digestion to produce energy.

**Hellmuth, J.E.** 2015. *Ever changing situation with Infectious Coryza.* Paper delivered at the 19<sup>th</sup> World Veterinary Poultry Association (WVPA) Congress, Cape Town, South Africa. 7–11 June.

**Bragg, R.R., Theron, C.W. & Boucher, C.E.** 2015. *Yeast based expression system.* Paper delivered at the 2<sup>nd</sup> Animal Vaccines and Immunologic Adjuvant Technology Salon, Bizhou, China. 3–4 December.

**Bragg, R.R., Van der Westhuizen, W., Coetzee, M., Lee, J-Y., Jansen, A.C., Theron, C.W. & Boucher, C.E.** 2015. *Phage therapy in a post antibiotic era: The savior of the human race or a pie in the sky?* Paper delivered at the 2<sup>nd</sup> International Conference on Infectious Diseases and Nanomedicine (ICIDN-2015), Kathmandu, Nepal. 15–18 December.

**Bragg, R.R., Van der Westhuizen, W.A., Lee, J-Y., Coetsee, E., Coetzee, M., Theron, C.W., Hitzeroth, A.C. & Boucher, C.E.** 2015. *Treatment options in a post antibiotic era in poultry production.* Paper delivered at the 3<sup>rd</sup> International Scientific Mentofin Symposium, Kantary Hotel, Ayutthaya, Thailand. 8–9 March.



presented at the 19<sup>th</sup> World Veterinary Poultry Association (WVPA) Congress, Cape Town, South Africa. 7-11 June.

**De Wit, M.** 2015. *A perspective on South African cactus pear R&D*. Paper delivered at the International Workshop on the development of a Cactus Pear Agro-industry for the Sub-Sahara African Region, Bloemfontein, South Africa. 26-30 January.

**De Wit, M.** 2015. *The role and future of Burbank cactus pear cultivars for human consumption*. Paper delivered at the Bi-lateral Mexico-South Africa Workshop, Bloemfontein, South Africa. 23-24 January.

**Dithebe, K., Pohl, C.H., Swart, H.C., Coetsee, E., Van Wyk, P.W.J., Lodolo, E.J. & Swart, C.W.** 2015. *Gas bubble discovery in fermenting yeasts*. Poster presented at the 32<sup>nd</sup> International Specialized Symposium on Yeast (ISSY32): Yeast biodiversity and biotechnology in the 21<sup>st</sup> century, Perugia, Italy. 7-11 November.

**Du Toit, L., Bothma, C., De Wit, M. & Hugo, A.** 2015. *Opuntia mucilage as gellant in marshmallows*. Poster presented at the 21<sup>st</sup> Biennial Congress and Exhibition of the South African Association for Food Science and Technology, Durban, South Africa. 6-10 September.

**Du Toit, L., Bothma, C., De Wit, M. & Hugo, A.** 2015. *There is mucilage in my marshmallows...say what?!* Poster presented at the 1<sup>st</sup> AfroSense Conference: New techniques and trends for sensory characterisation and consumer profiling, STIAS Conference Centre, Stellenbosch, South Africa. 23-25 November.

**Du Toit, L., De Wit, M., Fouche, H.J. & Hugo, A.** 2015. *Determination of the physical and rheological properties of mucilage from the cactus pear (Opuntia ficus-indica) cladodes for human food applications*. Poster presented at the 21<sup>st</sup> Biennial Congress and Exhibition of the South African Association for Food Science and Technology, Durban, South Africa. 6-10 September.

**Folorunso, O.S., Makatsa, M.S., Albertyn, J. & O'Neill, H.G.** 2015. *Genomic integration and expression of the major virion rotavirus proteins (VP6) in yeast derived from single and dual expression vectors*. Poster presented at the Virology Africa 2015 Conference, Cape Town, South Africa. 30 November – 3 December.

**Fourie, R., Albertyn, J., Ells, R., Swart, C., Sebolai, O. & Pohl, C.H.** 2015. *Candida albicans prostaglandin E<sub>2</sub> production, fact or fiction?* Poster presented at the 12<sup>th</sup> Yeast Lipid Conference, Ghent, Belgium. 20-22 May.

**Fourie, R., Albertyn, J., Ells, R., Swart, C., Sebolai, O. & Pohl, C.H.** 2015. *Influence of Pseudomonas aeruginosa on eicosanoid production by Candida albicans*. Poster presented at the 12<sup>th</sup> Yeast Lipid Conference, Ghent, Belgium. 20-22 May.

**Gomez-Arias, A., Castillo, J., Posthumus, J., Welman-Purchase, M. & Van Heerden, E.** 2015. *Geochemical study of the interaction of acid and alkaline mine drainage with BaCO<sub>3</sub>*. In: *Proceedings of the 10<sup>th</sup> International Conference on Acid Rock Drainage & IMWA Conference (INCARD-IMWA 2015)*, Santiago, Chile. 21-24 April. Art. 303.

**Hitzeroth, A.C., Coetzee, M., Boucher, C.E. & Bragg, R.R.** 2015. *Detection of QAC resistance genes in avian pathogenic Escherichia coli (APEC)*. Poster presented at the Symposium on Antibiotic Resistance and Antibiotic Alternatives: Looking towards the future, London, UK. 2-4 November.

**Kanono, L., Bothma, C. & Hugo, A.** 2015. *Boer goat meat as an alternative source of red meat in South Africa*. Poster presented at the 1<sup>st</sup> AfroSense Conference: New techniques and trends for sensory characterisation and consumer profiling, STIAS Conference Centre, Stellenbosch, South Africa. 23-25 November.

**Kgotle, E.Y., Dithebe, K., Pohl, C.H., Swart, H.C., Coetsee, E., Van Wyk, P.W.J. & Swart, C.W.** 2015. *Gas bubble formation in fermenting and non-fermenting yeasts*. Poster presented at the 32<sup>nd</sup> International Specialized

Symposium on Yeast (ISSY32): Yeast biodiversity and biotechnology in the 21<sup>st</sup> century, Perugia, Italy. 7-11 November.

**Kieft, T.L., Onstott, T., Lau, C.Y.M., Magnabosco, C., Slater, G.F., Stepanauskas, R. & Van Heerden, E.** 2015. *Microbial carbon cycling in the deep biosphere of the Kaapvaal craton, South Africa*. Paper delivered at the Annual Meeting of the Geological Society of America (GSA2015), Baltimore, USA. 1-4 November.

**Kutu, M., Hugo, A., Zondagh, B., Calitz, F. & Jooste, P.** 2015. *The effect of brine composition and injection level on the chemical composition of frozen chicken meat*. Poster presented at the 21<sup>st</sup> Biennial Congress and Exhibition of the South African Association for Food Science and Technology, Durban, South Africa. 6-10 September.

**Kutu, M., Hugo, A., Zondagh, B., Calitz, F. & Jooste, P.** 2015. *The effect of*



James du Preez seminar room: A new seminar room added during the upgrading of the Biotechnology building was named after Prof James du Preez for his significant contribution to the department. Prof Du Preez was appointed as lecturer from 1 January 1975 in the then Department of Microbiology and served as departmental chairperson from 1 October 2002 to 31 December 2014. Prof Du Preez retired in December 2015 after 40 years of service.

*brine injection on the oxidative stability of chicken meat*. Poster presented at the 21<sup>st</sup> Biennial Congress and Exhibition of the South African Association for Food Science and Technology, Durban, South Africa. 6-10 September.

**Kutu, M., Jooste, P., Zondagh, B., Hugo, A. & Calitz, F.** 2015. *Microbiological quality of chicken breasts injected with re-circulated brine*. Poster presented at the 21<sup>st</sup> Biennial Congress and Exhibition of the South African Association for Food Science and Technology, Durban, South Africa. 6-10 September.

**Kutu, M., Zondagh, B., Hugo, A., Van Heerden, I., Calitz, F. & Jooste, P.** 2015. *The sensory and physical properties of frozen chicken breasts injected at five different injection levels with various brine formulations*. Paper delivered at the 21<sup>st</sup> Biennial Congress and Exhibition of the South African Association for Food Science and Technology, Durban, South Africa. 6-10 September.

**Lau, M.C.Y., Magnabosco, C., Simkus, D., Slater, G.F., Kieft, T.L., Sherwood Lollar, B., Van Heerden, E. & Onstott, T.C.** 2015. *Microbial CH<sub>4</sub> production and oxidation at a 1.34-km deep subterranean site in South Africa*. Paper delivered at the Deep Life Community Meeting and Deep Life Scientific

Steering Committee Meeting, Lisbon, Portugal. 7-9 May.

**Lee, J.-Y., Theron, C.W., Boucher, C.E. & Bragg, R.R.** 2015. *Investigation into phage endolysin as antibacterial treatment for Gram-negative bacteria; focusing on avian pathogenic Escherichia coli*. Poster presented at the 14<sup>th</sup> International Congress of Bacteriology and Applied Microbiology and the 14<sup>th</sup> International Congress of Mycology and the 16<sup>th</sup> International Congress of Virology, Montréal, Canada. 27 July – 1 August.

**Lee, J.-Y., Theron, C.W., Boucher, C.E. & Bragg, R.R.** 2015. *Bacteriophage lambda endolysin expression and bacterial assay*. Poster presented at the 19<sup>th</sup> World Veterinary Poultry Association (WVPA) Congress, Cape Town, South Africa. 7-11 June.

**Lee, J.-Y., Theron, C.W., Boucher, C.E. & Bragg, R.R.** 2015. *The expression of endolysin from bacteriophage Lambda for the treatment of Avian colibacillosis*. Poster presented at the Virology Africa 2015 Conference, Cape Town, South Africa. 30 November – 3 December.

**Madende, M., Osthoff, G., Patterton, H., Patterton, H.E. & Opperman, D.** 2015. *Structure-function aspects of the casein micelles*. Paper delivered at the 48<sup>th</sup> Annual General Meeting and Symposium of the South African Society of Dairy Technology (SASDT): Innovation and cost optimization, Cape St. Francis, South Africa. 14-16 April.

**Madu, L., Ogundeji, A., Swart, C., Van Wyk, P., Pohl, C.H., Albertyn, J. & Sebolai, O.** 2015. *Cryptococcal 3-hydroxy fatty acid protects cell against amoebal phagocytosis*. Poster presented at the 12<sup>th</sup> Yeast Lipid Conference, Ghent, Belgium. 20-22 May.

**Makatsa, M.S., Folorunso, O.S., Albertyn, J., Van Dijk, A.A. & O'Neill, H.G.** 2015. *Towards the development of non-live rotavirus vaccines: Expression of rotavirus VP6 in various yeasts*. Poster presented at the 12<sup>th</sup> International Double-Stranded RNA Virus Symposium, Goa, India. 6-10 October.

**Mielmann, A., Bothma, C., Hugo, A., Steyn, F. & Hugo, C.J.** 2015. *The acceptability of lucerne (Medicago sativa L.) for human consumption*. Paper delivered at the 21<sup>st</sup> Biennial Congress and Exhibition of the South African Association for Food Science and Technology, Durban, South Africa. 6-10 September.

**Mielmann, A., Bothma, C., Hugo, C.J. & Hugo, A.** 2015. *Descriptive sensory analysis and consumer acceptability of lucerne (Medicago sativa L.)*. Paper delivered at the 1<sup>st</sup> AfroSense Conference: New techniques and trends for sensory characterisation and consumer profiling, STIAS Conference Centre, Stellenbosch, South Africa. 23-25 November.

**Mochochoko, B.M., Ogundeji, A.O., Pohl, C.H. & Sebolai, O.M.** 2015. *The effect of cryptococcal 3-hydroxy fatty acids on Pseudomonas aeruginosa*. Poster presented at the Joint 55<sup>th</sup> Interscience Conference on Antimicrobial Agents and Chemotherapy and the 28<sup>th</sup> International Congress of Chemotherapy Meeting (ICAAC/ICC 2015), San Diego, USA. 17-22 September.

**Moloantoa, K.M., Castillo, J. & Van Heerden, E.** 2015. *Biogeochemistry of sulfate reducing communities enriched from mine drainages*. Paper delivered at the 4<sup>th</sup> South African Young Water Professionals (YWP-ZA) Biennial Conference and the 1<sup>st</sup> African IWA Young Water Professionals Conference, Pretoria, South Africa. 16-18 November.

**Motanyane, L., João, E.D., De Deus, N. & O'Neill, H.G.** 2015. *Molecular characterisation of Mozambican group A rotavirus field strains*. Poster presented at the Virology Africa 2015 Conference, Cape Town, South Africa. 30 November – 3 December.

**Myburgh, J.** 2015. *The effect of heat exposure on b-lactoglobulin in raw milk*. Poster presented at the 48<sup>th</sup> Annual General Meeting and Symposium of the South African Society of Dairy Technology (SASDT): Innovation and cost optimization, Cape St. Francis, South Africa. 14-16 April.

**O'Neill, H.G., Motanyane, L., João, E.D. & De Deus, N.** 2015. *Phylogenetic analysis of VP4 and VP7 coding sequences of Mozambican rotavirus strains*. Poster presented at the 6<sup>th</sup> European Rotavirus Biology Meeting, Dijon, France. 17-20 May.

**Odundeji, A.O., Pohl, C.H., Albertyn, J., Swart, C. & Sebolai, O.M.** 2015. *The effects of aspirin and ibuprofen on Cryptococcus neoformans and Cryptococcus gattii*. Poster presented at the Joint 55<sup>th</sup> Interscience Conference on Antimicrobial Agents and Chemotherapy and the 28<sup>th</sup> International Congress of Chemotherapy Meeting (ICAAC/ICC 2015), San Diego, USA. 17-22 September.

**Onstott, T., Lau, C.Y.M., Magnabosco, C., Slater, G.F., Sherwood Lollar, B., Kieft, T., Stepanauskas, R., Van Heerden, E. & Borgonie, G.** 2015. *The deep continental biosphere: Abundance, diversity and activity*. Paper delivered at the Annual Meeting of the Geological Society of America (GSA2015), Baltimore, USA. 1-4 November.

**Osthoff, G., Madende, M., Patterton, H., Patterton, H.E. & Opperman, D.** 2015. *Structure-function aspects of the caseins of African elephant milk*. Poster presented at the 7<sup>th</sup> International Dairy Federation's (IDF) International Symposium on Sheep, Goat and Other Non-Cow Milk, Limassol, Cyprus. 23-25 March.

**Pohl, C.H.** 2015. *Production and role of eicosanoids in Candida spp.: More questions than answers*. Paper delivered at the 12<sup>th</sup> Yeast Lipid Conference, Ghent, Belgium. 20-22 May.

**Pohl, C.H., Motaung, T., Albertyn, J., Ells, R., Swart, C. & Sebolai, O.** 2015. *Phenotypic switching in Candida albicans influences prostaglandin E<sub>2</sub> production*. Poster presented at the 12<sup>th</sup> Yeast Lipid Conference, Ghent, Belgium. 20-22 May.

**Rani, Z.T., Hugo, C.J., Charimba, G. & Muchenje, V.** 2015. *Microbial contamination at different stages of the meat distribution chain in Eastern Cape Province, South Africa*. Poster presented at the 61<sup>st</sup> International Congress of Meat Science and Technology (ICoMST), Clermont-Ferrand, France. 23-28 August.

**Saaiman, S.E., Pohl, C.H., Van Wyk, P.W.J. & Swart, C.W.** 2015. *Exposing gas bubbles in the fungus Rhizopus oryzae*. Poster presented at the 32<sup>nd</sup> International Specialized Symposium on Yeast (ISSY32): Yeast biodiversity and biotechnology in the 21<sup>st</sup> century, Perugia, Italy. 7-11 November.

**Smith, A. & Myburgh, J.** 2015. *rbST in milk*. Paper delivered at the 48<sup>th</sup> Annual General Meeting and Symposium of the South African Society of Dairy Technology (SASDT): Innovation and cost optimization, Cape St. Francis, South Africa. 14-16 April.

**Swart, P., Bothma, C., Van Der Merwe, I. & Hugo, A.** 2015. *Development of a sensory acceptable nutritious vegetable chip for children*. Poster presented at the 11<sup>th</sup> Pangborn Sensory Science Symposium, Svenska Mässan, Gothenburg, Sweden. 23-27 August.

**Swart, P., Bothma, C., Van Der Merwe, I. & Hugo, A.** 2015. *Veggies versus chips? What will children choose?* Poster presented at the 1<sup>st</sup> AfroSense Conference: New techniques and trends for sensory characterisation and consumer profiling, STIAS Conference Centre, Stellenbosch, South Africa. 23-25 November.

**Van der Westhuizen, W.A., Boucher, C.E., Theron, C.W. & Bragg, R.R.** 2015. *Development of an iss-based avian pathogenic Escherichia coli vaccine by use of cell wall surface display in Yarrowia lipolytica*. Poster presented at the 19<sup>th</sup> World Veterinary Poultry Association (WVPA) Congress, Cape Town, South Africa. 7-11 June.

**Van der Westhuizen, W.A., Boucher, C.E., Theron, C.W. & Bragg, R.R.** 2015. *Identifying potential avian pathogenic Escherichia coli (APEC) for the development of a bacteriophage therapy treatment for colibacillosis*. Paper delivered at the 14<sup>th</sup> International Congress of Bacteriology and



Applied Microbiology and the 14<sup>th</sup> International Congress of Mycology and the 16<sup>th</sup> International Congress of Virology, Montréal, Canada. 27 July – 1 August.

**Van der Westhuizen, W.A., Boucher, C.E., Theron, C.W. & Bragg, R.R.** 2015. *Development of an ISS-based Avian Pathogenic Escherichia coli vaccine in Escherichia coli and Yarrowia lipolytica*. Poster presented at the Virology Africa 2015 Conference, Cape Town, South Africa. 30 November – 3 December.

**Van Heerden, E. & DeFlaun, M.** 2015. *“Innovative” and “new” technologies to consider in mine water treatment*. Paper delivered at the Water Management in Mining Conference, Johannesburg, South Africa. 10-11 February.

**Van Wyngaard, L., Strydom, P., Hope-Jones, M., Snyman, H. & Hugo, A.**

## Staff

**Professors:** Profs M Smit, K Albertyn, R Bragg, S Kilian, E van Heerden, B Viljoen, G Osthoff, and C Pohl-Albertyn.

**Associate Professors:** Profs A Hugo and C Hugo.

**Senior Lecturers:** Drs F O’Neill, T O’Neill, D Opperman, M de Wit, K Myburgh, O Sebolai, and Mr N Bezuidenhout (part-time).

**Lecturer:** Dr C Bothma.

**Junior Lecturers:** Ms C Boucher and Mr D Schabort.

**Senior Researcher:** Dr G Kemp.

**Researchers:** Dr C Swart and Ms L Steyn.

**Affiliate Professor:** Prof M DeFlaun.

**Affiliate Associate Professor:** Prof B Lodolo.

2015. *Evaluation of tenderness related properties of beef at retail level in the Tshwane Metropole*. Poster presented at the 21<sup>st</sup> Biennial Congress and Exhibition of the South African Association for Food Science and Technology, Durban, South Africa. 6-10 September.

**Van Wyngaard, L., Strydom, P., Cluff, M., Kuhn, Z., Roodt, E. & Hugo, A.** 2015. *Fatty acid analysis of South African beef in the retail market*. Poster presented at the 21<sup>st</sup> Biennial Congress and Exhibition of the South African Association for Food Science and Technology, Durban, South Africa. 6-10 September.

**Xazela, N.M., Chulayo, A.Y., Hugo, A., Strydom, P.E. & Muchenje, V.** 2015. *Sensory evaluation of beef, pork and offal by rural consumers*. Poster presented at the 48<sup>th</sup> Congress of the South African Society of Animal Science (SASAS), Empangeni, KwaZulu-Natal, South Africa. 21-23 September.

**Research Associates:** Profs D Litthauer, J du Preez, and Dr R Ells.

**Secretaries:** Mss M Cohen and I Auld.

**Senior Officers: Professional Services:** Mr S Marais and Ms N-M Agenbag.

**Officers: Professional Services:** Mss Y Makaum, C van Rooyen, D van den Berg, A van Wyk, E Roodt, and Dr G Charimba.

**Senior Officers:** Mss A van der Westhuizen and C Badenhorst.

**Senior Assistant Officer:** Ms E van den Heever.

**Store Assistant:** Ms M Mogopodi.

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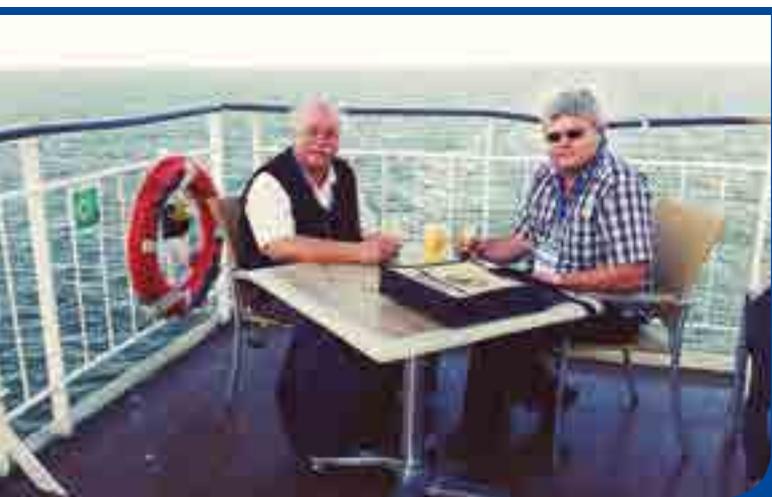


# Department of Physics

## Overview

The Department of Physics is one of the leading physics departments in South Africa, with cutting-edge astrophysics, phosphor, and solid-state research that is internationally recognised. The department has international collaboration with the USA, Europe, India, and China. The department hosts a well-equipped nano surface characterisation laboratory (with state-of-the-art research infrastructure), the observatory (Boyden) with a 1.5 m telescope, and the Naval Hill Planetarium. The main research areas in the department are astrophysics, phosphor materials, and solid-state physics (diffusion, segregation, thin films, and theoretical calculations). The undergraduate and graduate programmes are challenging and well balanced; students exiting these programmes are of high quality and sought after in the industry.

The year 2015 was the first year students could register for a BSc Honours degree with specialisation in Astrophysics. Four students registered for this degree in 2015.



Profs JC Swarts and HC Swart during a tea break at the Advanced Materials World Congress (AMWC), Viking Line Cruise, Stockholm.

## Activities and Achievements

The year 2015 was a successful year for the department. The new Physics building was erected. It hosts four lecturing halls that can accommodate 100 students each, or the four lecturing halls can be combined into a single lecturing hall to accommodate 400 students. Four new laboratories (optical spectroscopy, thin films, solar cells, and astrophysics), several

offices, and a video conference room also form part of the new building. The roof of the Astrophysics laboratory can open to explore the stars at night.

Prof RE Kroon oversaw the NRF national nanotechnology equipment programme grant application for the department. The application was successful and the department was awarded R8.6 million to purchase a tuneable laser-based time-resolved fluorescence spectrophotometer. Profs RE Kroon, HC Swart, and OM Ntwaeaborwa visited Edinburgh Instruments in the UK and Horiba in the USA to assess equipment. It was decided to purchase the new equipment from Edinburgh Instruments, and the new equipment was installed in late November.

Profs Swart (keynote address), Ntwaeaborwa, BF Dejene, Drs LF Koao, Anurag Pandey, and Mr SV Motloung gave presentations at the Advanced Materials World Congress (AMWC), 23–26 August 2015, on the Viking Line Cruise 'M/S Mariella', Baltic Sea from Stockholm, Sweden.

The Phosphor Group (staff and students) gave 18 presentations at Mabula 2015, 6<sup>th</sup> Conference on Photonic Materials, Mabula Game Reserve, South Africa, 4–8 May 2015. Prof Ntwaeaborwa and Ms MYA Yagoub presented their research at SASEC 2015, Third Southern African Solar Energy Conference, 11–13 May 2015, Kruger National Park, South Africa.

Students and staff attended the 60<sup>th</sup> Annual Conference of the South African Institute of Physics, Port Elizabeth, South Africa, 29 June to 3 July 2015. Prof Swart also presented an invited talk entitled "Luminescent Materials" at The International Year of Light Photonics Winter School during the annual South African Institute of Physics (SAIP) conference. Several awards were won at this event by students from the department. These include the MSc Publication 1: Condensed Matter/Materials Science (Mr Simon Ogugua), MSc Publication 2: Semiconductor Physics/Techno (Ms Ponsoho Mokoena), PhD Poster Condensed Mat/Mat Sci (Mr Xinliang Yan), the best Applied Physics MSc poster (Mr LB Erasmus), the best MSc presentations in astrophysics (Ms L Klindt and Mr IP vd Westhuizen), and the best PhD presentation in astrophysics (Mr JM Maritz).

Profs Swart, Ntwaeaborwa, Dejene, and students attended the 13<sup>th</sup> Conference on Laser Ablation (COLA 2015) at Pullman Cairns International Hotel, Cairns, Australia, 31 August to 4 September 2015. Profs Swart and JJ Terblans attended the 1<sup>st</sup> International Conference on Applied Surface Science (ICASS) at Riverside Oriental Hotel, Shanghai, China, 27–30 July 2015. Prof Swart gave invited talks at the 8<sup>th</sup> International Conference on Advanced Materials at Roclam, Bucharest, Romania, 8–11 June, as well as at the EMN Cancun Meeting, Energy Materials Nanotechnology, Cancun, Mexico, 8–11 June 2015.

Prof Jorma Hölsä from the University of Turku, Department of Chemistry, Turku, Finland, and Dr Vinay Kumar from the School of Physics, Shri Mata Vaishno Devi University, Katra, India, were both appointed as research



associates of the Department of Physics. Prof Eric Janzén from Linköping University in Sweden visited the department during May 2015.

The Astrophysics Research Group has acquired and relocated the 20-inch Boller and Chivens telescope from Sutherland to the UFS-Boyden observatory, where it is going to be utilised for follow-up studies of rapidly varying transient sources. The group has made seven presentations at the High Energy Astrophysics in Southern Africa conference (HEASA 2015) held at the University of Johannesburg, 18–20 June 2015, as well as three presentations at Science with SALT workshop (SSC2015) held in October 2015 (STIAS, Stellenbosch). Two presentations were made at Multi-frequency Astrophysics of Compact Cosmic Sources conference (Multi 2015) held in May 2015 in Palermo, Italy, and one presentation at the Golden Age of Cataclysmic Variables and Related Objects Conference (Golden 2015) in September 2015 in Palermo, Italy.

The Astrophysics Research Group made four contributions at the High Energy Phenomena in Relativistic Outflows conference in October 2015, La Plata, Argentina, as well as one contribution at the SKA Postgraduate Conference held in November 2015 at STIAS (Stellenbosch).

In 2015, Dr Andry Rajoelimanana from Madagascar joined the department as a postdoc in the Astrophysics Research Group.

## Degrees Obtained

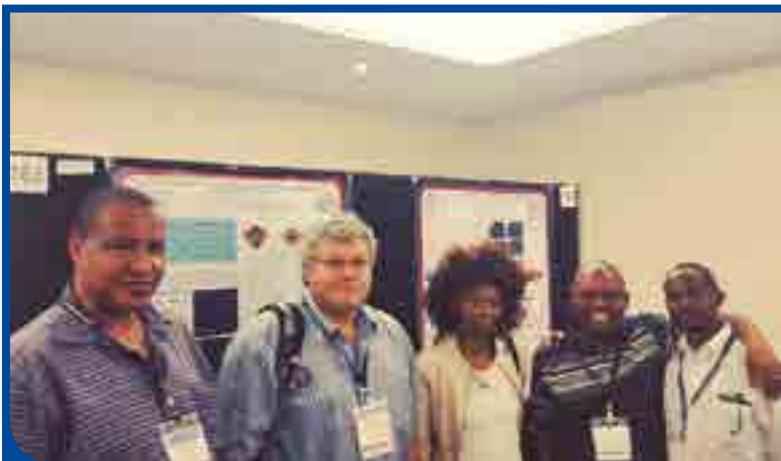
Several students obtained their PhD and MSc degrees during 2015. These include:

- PhD: Drs S Cronje, HJ van Heerden, A Odendaal, KG Tshabalala, EP Barnard, LL Noto, R Nyenge, R Jafer Mohammed, M Yagoub, MA Tshabalala, and SV Motloung.
- MSc: Messrs SM Ogugua, TL Lotha, TD Malevu, FV Molefe, TM Sithole, and J Ungula.

## Student Achievements

It was once again an excellent year for our postgraduate students at the Annual Conference of the South African Institute of Physics (SAIP), where they won several prizes. The winners were:

- Mr LB Erasmus won the best MSc poster in Applied Physics (Supervisors: Profs JJ Terblans and HC Swart).
- Ms L Klindt won the best MSc presentation in Astrophysics (Supervisors: Dr B van Soelen and Prof PJ Meintjes).
- Mr JM Maritz won the best PhD presentation in Astrophysics (Supervisor: Prof PJ Meintjes).
- Ms PP Mokoena won the best MSc publication in Semiconductor Physics (Supervisors: Profs OM Ntwaeaborwa and HC Swart).
- Mr S Ogugua won the best MSc publication in Condensed Matter/Materials Science Physics (Supervisors: Profs OM Ntwaeaborwa and HC Swart).
- Mr IP van der Westhuizen won the best MSc publication in Semiconductor Physics (Supervisors: Dr B van Soelen and Prof PJ Meintjes).
- Mr XL Yan won the best PhD poster in Condensed Matter/Materials Science Physics (Supervisors: Profs JJ Terblans and HC Swart).



Profs BF Dejene, HC Swart, OM Ntwaeaborwa, and PhD students KE Foka and AG Ali during the poster session at the 13<sup>th</sup> Conference on Laser Ablation (COLA 2015, Cairns, Australia).



Profs JJ Terblans and HC Swart arriving at the 1<sup>st</sup> International Conference on Applied Surface Science (ICASS), Riverside Oriental Hotel, Shanghai, China.

## Community Service

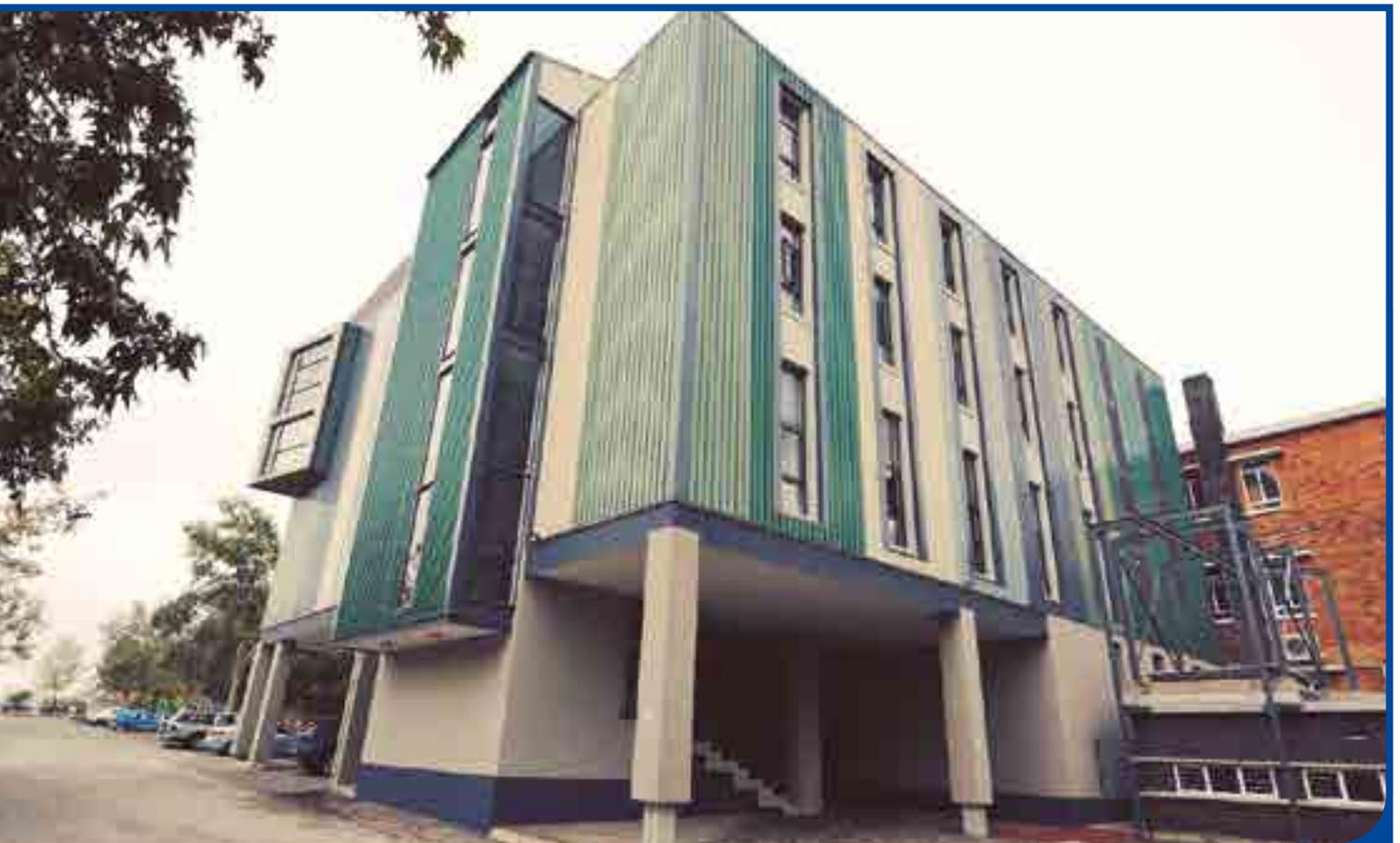
### *The Two Observatories Project*

The Two Observatories Project is an expansion of the project known as the Boyden Observatory and Science Centre Project. The Two Observatories are (1) the Boyden Observatory (approximately 28 km from Bloemfontein) and (2) the Lamont-Hussey Observatory on Naval Hill in the centre of Bloemfontein, which has been converted into a planetarium. The planetarium is often the first point of contact for learners and the general public, whereas Boyden Observatory is usually the venue for intensive workshops, and hosts an astronomy museum and offers “real sky” and telescope experiences. Together, the observatories foster education and the development of eco and astro-tourism in central South Africa.

University events. Revenue generated assists in funding maintenance and educational activities.

### *Environmental Education Hall: Infrastructure Development Project*

The Naval Hill Planetarium was conceptualised as the first component of a more comprehensive development, the Centre for Earth and Space, comprising the planetarium, a museum/exhibition area, a facility for environmental education, and a small entertainment area. During 2015, the Free State Department for Economic and Small Business Development, Tourism and Environmental Affairs (DESTEA) made R5 million available to the UFS for the construction of a hall for environmental education. The site hand-over was on 11 November 2015 and the hall will be completed by mid-2016.



New Physics building.

### *Project Visibility*

The year 2015 was the second year of operations of the Naval Hill Planetarium as part of the Two Observatories project. The planetarium lends a very prominent public profile to the project and is a contact point for the public. Some people are engaged as tourists; some Bloemfontein residents become regular planetarium patrons and the facility plays an important role in education at school and university level. The planetarium has also attracted attention from scientists and astronomers throughout South Africa and abroad. Furthermore, the facility is used as a venue for chamber music concerts and corporate events, as well as for various

### *The planetarium as a national training resource*

During 2015, the Naval Hill Planetarium was designated by the Department of Science and Technology as a training hub (resource) for staff who will be working at other digital planetariums that are being planned for South Africa. The Naval Hill Planetarium has already established a solid core of local planetarium presenters who are honing their skills as presenters and are starting to develop content to show in the full-dome environment. South Africa's next digital planetarium will be the conversion of the Iziko Planetarium from an opto-mechanical to a digital facility in the near future.



An intensive formal training workshop took place over four days in September 2015. It was presented by Sky-Skan. The Digital Sky Academy (DSA) attracted scientists from five South African universities, and Dr Mark SubbaRao from the Adler Planetarium in the United States offered key insights.

#### *Improvements at Boyden Observatory*

The period also saw improvements to the Education Walk at Boyden, with upgrades to viewpoints and paving introduced around buildings and at the entrance to Boyden Observatory where vehicles turn off from the main road.

#### *Improvements at the Naval Hill Planetarium (Lamont-Hussey Observatory)*

Forty custom-made reclining planetarium chairs were procured and installed. A high-end LED data projector was installed, which is used for explanations that supplement the full dome content.

#### *Ongoing activities*

Science communication for the general public: Among numerous activities and public presentations, the Two Observatories project hosted high-profile guest presenters, namely:

- 22 February 2015: Prof Herman Steyn, head of Satellite Engineering and Control Systems at Stellenbosch University (SU).
- 16 April 2015: Prof Patrick Seitzer, Research professor at the University of Michigan and International Patron of the Friends of Boyden Observatory.
- 11 July 2015: Dr Japie van Zyl, assigned to the Jet Propulsion Laboratory at NASA, spoke about the Curiosity mission to Mars. His lecture was streamed live.
- 20 September 2015: Dr Michelle Cluver (University of the Western Cape) spoke about infra-red light.

Activities for students and learners: These included:

- School programmes: Numerous school groups visited Boyden and the planetarium.
- The NEC 302 Community Service Module of the UFS made an important contribution to three township schools, namely Dr Blok, Heatherdale, and Petunia schools.
- The National Astronomy Quiz for Grade 7 learners is an annual competition of the South African Agency for Science and Technology Advancement (SAASTA). A total of 103 schools from the Free State took part in the competition and the final round was held at Boyden on 1 August. Hennenman Primary represented the province at the final event in Johannesburg on 8 October 2015.
- National Science Week activities took place from 1–8 August 2015. Activities for learners, students, teachers, and the public were included.
- Astronomy Fair: Prof Hoffman, postgraduate students from the Department of Physics, and a member of the Astronomical Society of Southern Africa (ASSA) took part in the annual Astronomy Fair on the Qwaqwa Campus on 12 September 2015. Approximately 610 first-year students and 55 learners attended these presentations.

#### *Environment Project*

The environment is a focus of the Two Observatories Project. Presently, we regularly screen *Our Living Climate*, *Nanocam*, and *Fragile Planet*; which are pre-rendered planetarium shows with a focus on the environment. The provincial Department of Environmental Affairs adapted

its Geographical Information System (GIS) of the Free State to show visitors the planetarium's powerful system. The Boyden hill is known for its indigenous vegetation and interesting rock formations. It also offers spectacular views of the topography of the Free State. The northern part of the Boyden hill is accessible to visitors by means of the Charl van der Merwe Education Walk. New paths were laid in the area that were cleared around the Boyden perimeter to make it more accessible to visitors. A new viewpoint was upgraded with the addition of a thatched picnic spot.

#### *Museum (Heritage) Project*

The Boyden Observatory Museum had its first exhibition opening in November 2013. A second museum exhibit, explaining the Mars expeditions of EC Slipher of Lowell Observatory in Flagstaff, Arizona, in 1939, 1954, and 1956, was completed and unveiled in April 2015.

## Staff Matters

Dr M Duvenhage was appointed as a researcher in the department.

The following staff members obtained a PhD in 2015: Drs S Cronje, HJ van Heerden, KG Tshabalala, and M Duvenhage.

## Research Outputs

### Research Articles

**Abbass, A.E., Swart, H.C. & Kroon, R.E.** 2015. Effect of silver ions on the energy transfer from host defects to Tb ions in sol-gel silica glass. *Journal of Luminescence* 160: 22–26.

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The new UFS-Boyden 20-inch Boller and Chivens telescope.

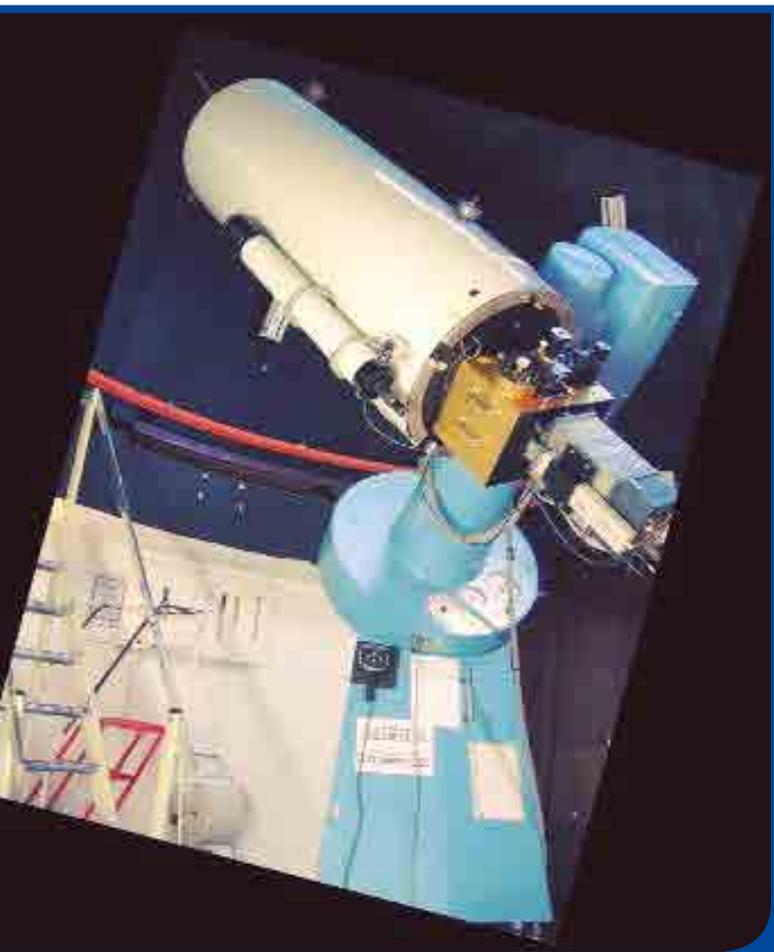
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**Motloung, S.V., Dejene, B.F., Ntwaeaborwa, O.M. & Swart, H.C.** 2015. *Effects of  $\text{In}^{3+}$  doping concentration on the  $\text{MgAl}_2\text{O}_4:x\% \text{ In}^{3+}$  nanophosphors.* Poster presented at the Advanced Materials World Congress (AMWC), Viking Line Cruise 'M/S Mariella', Baltic Sea, Stockholm-Tallinn-Stockholm, Sweden. 23-26 August.

**Motloung, S.V., Dejene, F.B., Swart, H.C. & Ntwaeaborwa, O.M.** 2015. *Influence of varying  $\text{Cr}^{3+}$  mol % in  $\text{MgAl}_2\text{O}_4:0.1\% \text{ Eu}^{3+}, x\% \text{ Cr}^{3+}$  nanophosphor synthesized by sol-gel process.* Poster presented at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.

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**Nyenge, R.L., Swart, H.C. & Ntwaeaborwa, O.M.** 2015. *The influence of the number of pulses and post annealing on the morphology and photoluminescence properties of  $\text{CaS:Eu}^{2+}$  pulsed laser deposited thin films.* Poster presented at the 60<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP), Port Elizabeth, South Africa. 29 June – 3 July.

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**Pandey, A. & Swart, H.C.** 2015. *Luminescence investigation of dual mode emitting  $\text{Ho}^{3+}$  doped tellurite glass.* Paper delivered at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.

**Pandey, A. & Swart, H.C.** 2015. *NIR to visible frequency upconversion in  $\text{CaMoO}_4:\text{Ho}^{3+} - \text{Yb}^{3+}$  phosphor.* Poster presented at the Advanced Materials World Congress (AMWC), Viking Line Cruise 'M/S Mariella', Baltic Sea, Stockholm-Tallinn-Stockholm, Sweden. 23-26 August.

**Pandey, A., Kroon, R.E. & Swart, H.C.** 2015. *Fluorescence behaviour of europium doped  $\text{Gd}_2\text{O}_3$  nanosheets.* Paper delivered at the 60<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP), Port Elizabeth, South Africa. 29 June – 3 July.

**Pathak, T.K., Kumar, V., Swart, H.C. & Purohit, L.P.** 2015. *Effect of doping concentration on the conductivity and optical properties of p-type  $\text{ZnO}$  thin films.* Poster presented at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.

**Paulsen, Z., Onani, M.O., Okil, J.O., Dejene, F.B. & Mahanga, G.M.** 2015. *The Synthesis and Characterization of Magnetic/Luminescent  $\text{Fe}_3\text{O}_4\text{-InP/ZnSe}$  Core-Shell Nanocom.* Poster presented at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.



The first B.Sc Hons (Astrophysics) class Mr JP Marais, Me KM Rambau, Me Mr ID Rammala, and Me H Szegedi.

**Prakash, J., Kumar, V., Kroon, R.E. & Swart, H.C.** 2015. *Embedding of noble metal nanoparticles and study of optical and photoluminescence properties induced by ion irradiation.* Paper delivered at the 60<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP), Port Elizabeth, South Africa. 29 June – 3 July.

**Rajoelimanana, A. & Charles, P.** 2015. *Optical observations of the Be/X-ray binary A0538-66.* Paper delivered at the 60<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP), Port Elizabeth, South Africa. 29 June – 3 July.

**Ramteke, D.D., Gedam, R.S. & Swart, H.C.** 2015. *Conductivity and scaling behavior of  $\text{Nd}^{3+}$  ions containing lithium borate glasses.* Poster presented at 20<sup>th</sup> International Conference on Solid State Ionics (SSI-20), Keystone, Colorado, USA. 14-19 June.

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- Poster presented at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.
- Seed Ahmed, H.A.A., Yousif, A., Swart, H.C. & Kroon, R.E.** 2015. Luminescence of alternating SiO<sub>2</sub>:Tb and SiO<sub>2</sub>:Ce thin films produced by sol-gel spin coating. In *Materials today: Proceedings 2 of the 27<sup>th</sup> International Symposium on Macro- and Supramolecular Architectures and Materials (MAM14)*, Johannesburg, South Africa. 23-27 November. pp. 4111-4117.
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- Shingange, K., Mhlongo, G.H., Motaung, D.E. & Ntwaeaborwa, O.M.** 2015. *Preparation of ZnO nanorods and their gas sensing properties*. Poster presented at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.
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- Swart, H.C., Terblans, J.J., Kroon, R.E., Ntwaeaborwa, O.M., Coetsee, E., Koao, L.F., Dejene, B.F. & Kumar, V.** 2015. *Surface characterization and optical properties of ZnO for LED applications*. Poster presented at the 1<sup>st</sup> International Conference on Applied Surface Science (ICASS), Shanghai, China. 27-30 July.
- Swart, H.C., Terblans, J.J., Kroon, R.E., Ntwaeaborwa, O.M., Yagoub, M.Y.A., Coetsee, E. & Kumar, V.** 2015. *Practical applications of phosphor materials*. Paper delivered at the Advanced Materials World Congress (AMWC), Viking Line Cruise 'M/S Mariella', Baltic Sea, Stockholm-Tallinn-Stockholm, Sweden. 23-26 August.
- Swart, H.C., Terblans, J.J., Kroon, R.E., Ntwaeaborwa, O.M., Yagoub, M.Y.A., Coetsee, E. & Kumar, V.** 2015. *Uses of phosphor materials for practical applications*. Paper delivered at the 8<sup>th</sup> International Conference on Advanced Materials (Rocam 2015), Bucharest, Romania. 7-10 July.
- Swart, H.C., Terblans, J.J., Ntwaeaborwa, O.M., Kroon, R.E., Coetsee, E. & Kumar, V.** 2015. *Surface characterization and optical properties of phosphor materials*. Paper delivered at the Energy Materials Nanotechnology (EMN) Meeting, Cancun, Quintana Roo, Mexico. 8-11 June.
- Tebele, A.S., Motloung, S.V. & Dejene, F.B.** 2015. *Effects of catalyst: Ba molar ratio on the structure and luminescence properties of BaCO<sub>3</sub>:1% Eu<sup>3+</sup>, 2% Dy<sup>3+</sup> phosphors synthesized using sol-gel process*. Proceedings of the 59<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP2014), University of Johannesburg, South Africa. 7-11 July. pp. 138-143.
- Tsega, M., Kuo, D-H., Wubet, W. & Dejene, F.B.** 2015. *Effects of the copper content on the structural and electrical properties of Cu<sub>2</sub>ZnSnSe<sub>4</sub> bulks used in thinfilm solar cells*. Poster presented at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.
- Tshabalala, Z.P., Motaung, D.E., Mhlongo, G.H. & Ntwaeaborwa, O.M.** 2015. *Characterization of TiO<sub>2</sub> nanostructures prepared by microwave method for gas sensing*. Poster presented at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.
- Ungula, J. & Dejene, F.B.** 2015. *Comparison of optical and luminescence properties of as prepared and annealed ZnO nanoparticles synthesized using sol-gel method*. Paper delivered at the 60<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP), Port Elizabeth, South Africa. 29 June – 3 July.
- Ungula, J. & Dejene, F.B.** 2015. *Effect of solvent medium on the material properties of ZnO nanoparticles synthesized by sol-gel method*. Poster presented at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.
- Urgessa, Z.N., Mbulanga, C.M., Tankio Djiokap, S.R., Botha, J.R., Duvenhage, M.M. & Swart, H.C.** 2015. *The defect passivation effect of hydrogen on the optical properties of solution-grown ZnO nanorods*. Paper delivered at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.
- Van der Westhuizen, I.P., Van Soelen, B. & Meintjes, P.J.** 2015. *Hydrodynamical simulations of relativistic astrophysical jets*. Proceedings of the 3<sup>rd</sup> Annual Conference on High Energy Astrophysics in Southern Africa (HEASA 2015), University of Johannesburg, South Africa. 18-20 June. pp. 017.1-017.8.
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- Van Soelen, B., Klindt, L., Meintjes, P.J., Bottcher, M., Vaisanen, P. & Hanlon, L.** 2015. *Search for very High Energy Candidate sources among the Fermi Sources*. Proceedings of the Mondello Workshop 2014: Frontier Research in Astrophysics (FRAPWS2014), Palermo, Italy. 29 May 2014. pp. 020-1-020-8.
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- Van Soelen, B., Meintjes, P.J., Odendaal, A., Klindt, L. & Armstrong, R.** 2015. *Optical spectroscopy of PSR B1259-63 around the 2014 periastron passage*. Paper delivered at the 60<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP), Port Elizabeth, South Africa. 29 June – 3 July.
- Van Soelen, B., Van der Westhuizen, I.P., Meintjes, P.J., Hanlon, L., Murphy, D., Martin-Carrillo, A., Klindt, L. & Van Heerden, H.J.** 2015. *Optical observations of very high energy sources from the Boyden Observatory*. Proceedings of the 3<sup>rd</sup> Annual Conference on High Energy Astrophysics in Southern Africa (HEASA 2015), University of Johannesburg, South Africa. 18-20 June. pp. 007.1-007.8.
- Visser, H.G., Brink, A., Alexander, O., Swart, H.C., Duvenhage, M.M. & Ntwaeaborwa, O.M.** 2015. *Structure and Spectroscopic Properties of M(Qn)<sub>3</sub> complexes (M = Aluminium, Gallium, Indium, Europium; Qn = 8-hydroxyquinoline and derivatives thereof)*. Paper delivered at the 6<sup>th</sup>

Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.

**Wako, A., Dejene, F.B. & Swart, H.C.** 2015. *Structural and luminescence properties of SrAl<sub>2</sub>O<sub>4</sub>:Eu<sup>2+</sup>, Dy<sup>3+</sup>/Nd<sup>3+</sup> phosphor thin films grown by pulsed laser deposition.* Poster presented at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.

**Wako, A.H., Dejene, F.B. & Swart, H.C.** 2015. *Characterization of cerium doped yttrium gadolinium aluminate garnet (Y-Gd)<sub>3</sub>Al<sub>5</sub>O<sub>12</sub>:Ce<sup>3+</sup> phosphor thin films fabricated by pulsed laser deposition.* Proceedings of the 59<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP2014), University of Johannesburg, South Africa. 7-11 July. pp.150-155.

**Wako, A.H., Dejene, F.B. & Swart, H.C.** 2015. *Influence of alkaline earth metal cations; Ca<sup>2+</sup>, Sr<sup>2+</sup> and Ba<sup>2+</sup> on the structural and optical properties of MAI<sub>2</sub>O<sub>4</sub>: Eu<sup>2+</sup>, Nd<sup>3+</sup> phosphors.* Poster presented at the 60<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP), Port Elizabeth, South Africa. 29 June – 3 July.

**Wako, A.H., Dejene, F.B. & Swart, H.C.** 2015. *Thermoluminescence (TL) study of β-stimulated BaAl<sub>2</sub>O<sub>4</sub>:Eu<sup>2+</sup>,Dy<sup>3+</sup> phosphor.* Poster presented at the 60<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP), Port Elizabeth, South Africa. 29 June – 3 July.

**Wium, D.J. & Van Soelen, B.** 2015. *AUTOCAL: A software application for the calibration of stellar magnitudes.* Proceedings of the 59<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP2014), University of Johannesburg, South Africa. 7-11 July. pp. 404-409.

**Yagoub, M.Y.A., Swart, H.C. & Coetsee, E.** 2015. *UV-Vis-NIR quantum cutting suitable for c-Si solar cell application.* Proceedings of the 3<sup>rd</sup> South

African Solar Energy Conference (SASEC2015), Skukuza, Kruger National Park, South Africa. 11-13 May. pp. 471-475.

**Yan, X., Liu, Y., Swart, H.C., Wang, Y. & Terblans, J.J.** 2015. *A quantification evaluation of the depth resolution of AES depth profiling of Cu/Ni multilayer thin films using the MRI model.* Poster presented at the 60<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP), Port Elizabeth, South Africa. 29 June – 3 July.

**Yan, X., Liu, Y., Swart, H.C., Wang, Y. & Terblans, J.J.** 2015. *Study of the interdiffusion in Cu/Ni multilayer thin films by Auger electron spectroscopy depth profiling.* Paper delivered at the 60<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP), Port Elizabeth, South Africa. 29 June – 3 July.

**Yan, X.L., Liu, Y., Swart, H.C., Wang, J.Y. & Terblans, J.J.** 2015. *Investigation of interdiffusion and depth resolution in Cu/Ni multilayer by means of AES depth profiling.* Paper delivered at the 1<sup>st</sup> International Conference on Applied Surface Science (ICASS), Shanghai, China. 27-30 July.

**Yihunie, M.T. & Dejene, F.B.** 2015. *Selenization dependence of morphological, structural and electrical properties of Cu<sub>2</sub>ZnSn(S,Se)<sub>4</sub> thin films deposited by one-step sputtering.* Paper delivered at the 60<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP), Port Elizabeth, South Africa. 29 June – 3 July.

**Yousif, A., Ntwaeaborwa, O.M. & Swart, H.C.** 2015. *Luminescence properties of CaO:Bi<sup>3+</sup> phosphor.* Poster presented at the 6<sup>th</sup> Conference on Photonic Materials (SACPM), Mabula Game Lodge, Bela-Bela, Limpopo, South Africa. 4-8 May.

## Staff

**Senior Professor:** Prof HC Swart.

**Professors:** Profs BF Dejene, OM Ntwaeaborwa, PJ Meintjes, WD Roos, and JJ Terblans.

**Associate Professors:** Profs MHJ Hoffman and RE Kroon.

**Senior Lecturer:** Dr RA Harris.

**Lecturers:** Drs LF Koao, B van Soelen, KG Tshabalala, Messrs RO Ocaya, and SV Motloun.

**Senior Researcher:** Dr E Coetzee-Hugo.

**Researcher:** Dr M Duvenhage.

**Senior Officer: Professional Services:** Mr SJ Motloun.

**Officers: Professional Services:** Drs S Cronje and HJ van Heerden.

**Officer:** Ms K Cronje.

**Assistant Officer:** Ms Y Loots.

## Contact Details

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# Department of Zoology and Entomology

## Overview

The Department of Zoology and Entomology saw two major changes occurring in 2015. The first change was the end of an era when Prof Jo (JG) van As retired as HOD after 27 years. However, while Prof Van As retired, he has not left the department. He is still actively involved in the department; he teaches a third-year Zoology course, two honours courses, and is still the supervisor and promoter of several postgraduate students.

The second major change for the department was that the third-year excursion to De Hoop Nature Reserve in 2015 was the last to this amazing place. Due to escalating costs, this annual tradition that started in 1995 is no longer sustainable. In the future, our third-year excursion will be to the grass fields, koppies, rivers, and dams of the Free State. The Entomology students had their annual excursion to Bankfontein close to the Van der Kloof Dam. Several research trips were also undertaken (see Research).

Our annual postgraduate seminar day and year-end departmental function were hosted by the Department of Zoology on the Qwaqwa Campus in November 2015. As always, this proved not only hugely successful, but also very necessary in order for students to be made aware of the various research activities and groups that are available and present. A total number of 32 students reported on their research. The guest speakers for the occasion were Drs Candice Jansen van Rensburg and Emile Bredenhand.



Dr Candice Jansen van Rensburg descending into the sinkhole of the Bakwena Cave in Irene, Pretoria.

## Staff Achievements

- Prof S vdM Louw has been running collaborative soil ecology programmes with colleagues in Sweden and Australia.
- Prof S vdM Louw was elected as vice president to the executive committee of the Entomological Society of Southern Africa from 2015 to 2017.
- Dr Vaughn R Swart was awarded his PhD in Environmental Management.
- Dr Candice Jansen van Rensburg and co-authors received the ATKV prize in 2015 for their article entitled “Die karst-ekologie van die Bakwenagrot (Gauteng)” in *Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* (South African Journal for Science and Technology).

## Student Achievements

- Prof S vdM Louw – Two MSc students completed their dissertations on the ecology of soil mesofauna. Both students will submit in January 2016.
- Mr Ian Cloete is busy with an interdisciplinary Entomology and Plant Pathology master’s degree on the role of insects and pathogens on gall formation on *Acacia* spp. in the Northern Cape. The fieldwork is ongoing.
- Ms Tanya Smit, a master’s student, is busy with a project on fruit fly incidence on table grapes along the Orange River in the Northern Cape.
- Prof S vdM Louw, Dr V R Swart, and Mr DeV Fourie together with students presented papers at XIX<sup>th</sup> Congress of the Entomological Society of Southern Africa at Rhodes University in Grahamstown.

The following students received acknowledgement at the faculty’s annual prize-giving ceremony for being the best in the following categories:

- Ms Ann Posthumus for best student in Zoology, second year.
- Ms Liezl Whitehead for best student in Entomology, second year.
- Ms Albie Steyn for best student in Zoology, third year.
- Ms Bianca Kay for best student in Entomology, third year.
- Mr Adriaan Jordaan for best honours student in Zoology.
- Ms Tshepiso Motolo for best honours student in Entomology.

## Special Achievements

### Prof S vdM Louw

- Member of HortGro Science Advisory Panel for Entomology in the Western Cape.
- Appointed to the Foundational Biodiversity Information Programme (FBIP) steering committee of the South African National Biodiversity



Institute (SANBI) in Pretoria, Gauteng.

- Member of SubTrop Research Consortium in Mpumalanga for stinkbug management on avocado, litchi, mango, and macadamia.
- Three-year closed tender for fruit fly management research on table grapes along the Orange River awarded by the Northern Cape Department of Agriculture and Rural Development.

#### Prof S vdM Louw and Dr VR Swart

- Three-year closed tender for fruit fly management research on table grapes along the Orange River awarded by the Northern Cape Department of Agriculture and Rural Development.

## Research Activities

Ongoing research in the department is concentrated amongst ten research groups. The research activities of some of the groups are provided below.

### 1. Applied Agricultural Entomology – Mr De Villiers Fourie

Mr Fourie continues with collaborative work with the stinkbug research group and Nelspruit ARC. The group is involved in the management of the sucking bug complex on subtropical fruit and nuts in South Africa, including avocado, macadamia nuts, mangoes, and litchis – amongst others. During 2015, Mr Fourie attended and presented talks at the national macadamia growers symposium.

Current and planned research projects include working towards the determination of temperature thresholds for the two-spotted stinkbug (*Bathycoelia distincta*), a key hemipteran pest on macadamia nuts. The research will contribute to the development of a degree model as a management tool.

Furthermore, funding was obtained from the International Research Action Committee (IRAC) for the continuance of a comprehensive study to be conducted on possible pyrethroid resistance developing in the two-spotted stinkbug on macadamia in the Nelspruit and Levabu regions. The aim of this study is to examine, in collaboration with the stinkbug working group and IRAC, whether multigenerational genetic resistance is developing towards synthetic pyrethroids and to aid in the development and establishment of a sustainable resistance management programme to assist growers in the future. The study is ongoing.

A new collaborative study applying both entomology and plant pathology disciplines has been initiated. The three-year study will investigate the vector potential of various avocado pests and furthermore investigate the pathogen potential of various fungi pathogens. The study commenced at the end of 2015 and will be conducted in the Nelspruit and Levabu regions of South Africa.

### 2. Aquatic Ecology – Profs Linda Basson and Liesl van As

A research trip was undertaken to the Leseding Research Camp in Samachima, Botswana, during the winter recess. This was attended by Profs Jo and Liesl van As and Linda Basson, as well as several of their postgraduate students. Dr S Cawood from the Centre for African Studies joined staff members on this trip.

### 3. Arachnology – Dr Charles Haddad

Early in October, Dr Franticek Stahlavsky and his two students (Charles University, Prague) visited the Arachnid Systematics and Ecology lab of Dr Charles Haddad to carry out fieldwork and prepare chromosome slides for later analysis. They were accompanied on the field trip to the Eastern Cape and KwaZulu-Natal by Mr Jan-Andries Neethling, a former student in this lab and currently a researcher at the National Museum. From October to mid-December, Dr Galina Azarkina, a taxonomist based at the Siberian Branch of the Russian Academy of Sciences, visited South Africa to identify jumping spider material from various collections. She spent three weeks doing collaborative research with Dr Haddad, and during the rest of the trip she visited the Iziko South African Museum, KwaZulu-Natal Museum, University of Venda, and the ARC – Plant Protection Research Institute.



Research trip, Okavango River, Botswana. From left to right: Prof Liesl van As, Mr Gerhard de Jager (MSc student), Ms Isabel Human (PhD student), Dr Stephanie Cawood (Centre for African Studies), and Prof Jo van As.

#### National and International Collaboration

- Dr Ansie Dippenaar-Schoeman (ARC – Plant Protection Research Institute, Pretoria): South African National Survey of Arachnida.
- Dr Stano Pekár (Masaryk University, Prague): Spider predation biology.
- Dr Jiri Kral and Dr Franticek Stahlavky (Charles University, Prague): Arachnid karyology.
- Dr Galina Azarkina (Russian Academy of Sciences, Novosibirsk): Spider systematics.
- Dr Matjaz Kuntner (Slovenian Academy of Sciences, Ljubljana): Spider reproductive biology and evolution.
- Dr Rudy Jocqué (Royal Museum for Central Africa, Tervuren): Spider systematics.

### 4. Dipterology and Environmental Entomology – Dr Vaughn R Swart

The research focuses on Dipterology with a focus on Taxonomy, Veterinary Entomology, and fruit flies.

#### Research collaboration:

- Dr Robert Copeland, International Centre of Insect Physiology and Ecology, Nairobi (New species of Diptera: Vermileonidae).
- Dr Norman Woodley, Systematic Entomology Laboratory, Smithsonian Institution, Washington, D.C.
- Charl Craig, Stark Ayres, Onion Research.

### 5. Etho-ecology – Mr Hennie Butler

The etho-ecology study group focuses on various aspects of animal behaviour in their natural environment. Many of these studies are focused on problem solving with regards to whether animals are influenced by man or cause damage to humankind.

Hennie Butler, in collaboration with the Department of Medical Microbiology and Virology, is undertaking a small mammal zoonotic disease surveillance. The project will survey pathogens in small mammals collected for biodiversity and conservation studies, and to add to museum research collections.

### 6. Forensic Entomology and Veterinary Entomology – Dr Sonja Brink

The research focus is on Forensic Entomology and Veterinary Entomology. Members of the research group attended a mosquito identification workshop in June 2015. The workshop was a skills building initiative of the National Institute for Communicable Diseases and EcoHealth Alliance.

Two Forensic Entomology MSc students will submit their work for evaluation in January 2016. They also delivered a presentation at the XIX<sup>th</sup> Congress of the Entomological Society of Southern Africa at Rhodes University in Grahamstown.

### 7. Herpetology – Prof Neil Heideman and Ms Lindi Heyns

Research in the herpetology group includes work done by Mr Adriaan Jordaan on the taxonomy and ecology of one of the legless lizard species, *Acontias*, in the Postmasburg and Prieska areas. Genetic analyses showed that this is a new species, which he will investigate further and describe. Work by Mr Zhongning Zhao on the highly polymorphic tent tortoise, *Psammodromus tentorius*, also continued with extensive fieldwork and morphometric analyses on museum specimens. A manuscript for publication on a detailed comparative study of the histology of the eye of two scotopic and one photopic lizard species by Mr Zhongning Zhao is nearing completion.

### 8. Insects on New Crops Programme and Soil Ecology – Prof S vdM Louw

Research focuses primarily on the biodiversity and ecology of soil mesofauna.

Research collaboration:

- Dr Gerhard Prinsloo, research fellow at the ARC – Plant Protection Research Institute, Pretoria (Insects on South African crops).
- Mr Matthew Addison, HortGro Science, Stellenbosch (Arthropod soil ecology for application in pome fruit industry).
- Dr Charlene Janion-Scheepers, University of Melbourne, Australia (Collembola expert and collaborator regarding soil mesofauna research).
- Prof Klaus Birkhofer, Lund University, Sweden (Soil ecology in apple orchards in the Western Cape).
- Prof Janne Bengtsson, Swedish University of Agricultural Sciences, Uppsala, Sweden (Soil ecology in apple orchards in the Western Cape).

### 9. Nematology – Dr Candice Jansen van Rensburg

Currently, research in this group is focused on plant parasitic and free-living freshwater nematodes occurring in the Free State province. Free-living aquatic nematodes are currently studied at various localities in the Free State. The study group hopes to increase the current knowledge on freshwater nematodes, especially from wetlands ecosystems.

### 10. Tick Research Unit – Ms Ellie van Dalen

Research includes evaluation of results from tick collections sent in from various areas in South Africa and tested for the presence of tick resistance against the commercially available acaricides to be able to monitor the spread of tick resistance over time. In collaboration with Dr Christene Maritz from the University of Pretoria, conventional testing is correlated with molecular expression of resistance. Plant extracts from different cultural remedies and their efficacy against different tick species were also investigated in collaboration with Dr Gerda Fouché from the CSIR.

The Tick Resistance Testing Facility renewed collaboration with pharmaceutical companies (Bayer, Virbac, and Elanco) to provide the facility with tick collections from problem areas to face the challenge of preventing the development of tick resistance against chemical control.

Molecular determination of resistance development and the correlation to field resistance profiles were further investigated in collaboration with Ms Samantha Baron, a PhD student from the laboratory of Dr Christine Maritz of the Department of Genetics at the University of Pretoria.

Preliminary meetings with Dr Chris Daborn, International Veterinary Consultant, currently evaluating tick control problems in Kenya, were conducted to discuss possible future collaboration in the battle against tick resistance development in Africa.

## Interdisciplinary Research

Prof Jo van As collaborates with Dr Stephanie Cawood from the Centre for African Studies (Faculty of Humanities). They are both involved as promoters of a PhD student, Ms Isabel Human. Dr Cawood also joined the Aquatic Ecology research team on a field trip to Botswana in 2015 as it formed part of the research for Ms Human's PhD.

## Community Service

As part of the year project of Mr Kenny Lesenyeho, an honours student, communal farmers in the vicinity of Welkom were visited and advised on tick control management strategies. The department also donated several unused microscopes to a secondary school in Kuils River. Their teacher completed his studies at the UFS.

## Postgraduate Students

Thirty-two postgraduate students from both the Main Campus and Qwaqwa Campus reported on their research during the annual postgraduate seminar day, which took place on the Qwaqwa Campus in November 2015.

The following postgraduate students delivered reports: Leon Barkhuizen – PhD in Zoology (Promoter: Prof JG van As); Louise Coetzee – PhD in Zoology (Promoter: Prof JG van As); Nicolene De Klerk – MSc in Entomology (Supervisor: Prof SvdM Louw); Nadine Jacobs – MSc in Zoology (Supervisor: Mr HJB Butler); Katlego Mogorosi – MSc in Zoology (Supervisor: Prof LL van

As); Jan-Andries Neethling MSc in Zoology (Supervisor: Dr C Haddad); Carl Pohl – MSc in Zoology (Supervisor: Dr NL Avenant); Vaughn Swart – PhD in Environmental Management (Promoter: Prof S vdM Louw); and Pieter Swanepoel – MSc in Zoology (Supervisor: Prof LL van As).

## Research Outputs

### Research Articles

**Adendorff, J., Mohase, L., Louw, S.vdM. & Janlielsohn, A.** 2015. Alexin™ treatment boosts defence responses in wheat against Russian wheat aphid (*Diuraphis noxia*) infestation. *South African Journal of Science* 98: 205-206.

**Dippenaar-Schoeman, A.S., Haddad, C.R., Foord, S.H., Lyle, R., Lotz, L.N. & Marais, P.** 2015. South African National Survey of Arachnida (SANSAs): Review of current knowledge, constraints and future needs for documenting spider diversity (Arachnida: Araneae). *Transactions of the Royal Society of South Africa* 70: 245-275.

of Arachnology, Ansie Dippenaar-Schoeman. *African Invertebrates* 56: 269-283.

**Haddad, C.R. & Mbo, Z.** 2015. Five new species of the Afrotropical dark sac spider genus *Messapus* Simon, 1898 (Araneae: Corinnidae). *Zootaxa* 4057: 385-398.

**Haddad, C.R., Foord, S.H., Fourie, R. & Dippenaar-Schoeman, A.S.** 2015. Effects of a fast-burning spring fire on the ground-dwelling spider assemblages (Arachnida: Araneae) in a central South African grassland habitat. *African Zoology* 50: 281-292.

**Horak, I.G., Jordaan, A.J., Nel, P.J., Van Heerden, J., Heyne, H. & Van Dalen, E.M.** 2015. Distribution of endemic and introduced tick species in Free State Province, South Africa. *Journal of the South African Veterinary Association* 86(1): Art. 1255.

**Moravec, F. & Van As, L.L.** 2015. *Procamallanus* (*Procamallanus*) spp. (Nematoda: Camallanidae) in fishes of the Okavango River, Botswana, including the description of *P. (P.) pseudolaeviconchus* n. sp. parasitic in *Clarias* spp. (Clariidae) from Botswana and Egypt. *Systematic Parasitology* 90: 137-149.



Staff and students at the Koppie Alleen beach, De Hoop Nature Reserve, at the last third-year Zoology excursion to this reserve.

**Grobbelaar, A., Van As, L.L., Van As, J.G. & Butler, H.J.B.** 2015. Pathology of eye and brain of fish infected with diplostomids, Southern Africa. *African Zoology* 50(2): 181-186.

**Grobbelaar, A., Van As, L.L., Van As, J.G. & Butler, H.J.B.** 2015. Pathology of eye and brain of fish infected with diplostomids, southern Africa. *African Zoology* 50: 181-186.

**Haddad, C.R.** 2015. A revision of the southern African two-eyed spider genus *Diploglena* (Araneae: Caponiidae). *African Invertebrates* 56: 343-63.

**Haddad, C.R. & Dippenaar-Schoeman, A.S.** 2015. Diversity of non-acarine arachnids of the Ophathe Game Reserve, South Africa: Testing a rapid sampling protocol. *Koedoe* 57(1255): 1-15.

**Haddad, C.R. & Foord, S.H.** 2015. The life and times of Africa's First Lady

**Moravec, F. & Van As, L.L.** 2015. *Procamallanus* (*Spirocamallanus*) spp. (Nematoda: Camallanidae) from fishes of the Okavango River, Botswana, including *P. (S.) serranochromis* n. sp. parasitic in *Serranochromis* spp. (Cichlidae). *Systematic Parasitology* 90: 152-164.

**Moravec, F. & Van As, L.L.** 2015. Studies on ascaridid, oxyurid and enoplid nematodes (Nematoda: Spirurida) from fishes of the Okavango River, Botswana. *Folia Parasitologica* 62: 039.

**Moravec, F. & Van As, L.L.** 2015. Studies on some spirurids (Nematoda: Spirurida) from fishes of the Okavango River, Botswana. *Systematic Parasitology* 91: 119-138.

**Petráková, L., Líznarová, E., Pekár, S., Haddad, C.R., Sentenská, L. & Symondson, W.O.C.** 2015. Discovery of a monophagous true predator, a specialist termite-eating spider (Araneae: Ammoxenidae). *Scientific Reports* 5(14013): 1-10.

**Roff, J. & Haddad, C.R.** 2015. *Pasilobus dippenarae* sp. n. (Araneae: Araneidae), a new species of bird-dropping spider from South Africa, with a key to the Afrotropical species. *African Invertebrates* 56: 445-454.

**Swart, V.R., Kirk-Spriggs, A.H. & Copeland, R.S.** 2015. A new species of *Alhajarmyia* Stuckenberg (Diptera: Vermileonidae), the first wormlion fly described from East Africa and its biogeographical implications. *Zootaxa*, 4044(4): 556-566.

**Van As, J.G.** 2015. A brief history of freshwater fish parasitology in Southern Africa. *African Zoology* 50: 93-107.

**Van As, L.L. & Van As, J.G.** 2015. Branchiuran parasites (Crustacea: Branchiura) from fishes in the Okavango (Botswana) and Zambezi (Namibia) Systems. *African Journal of Aquatic Sciences* 40: 9-20.

**West, D.T., Van As, J.G. & Van As, L.L.** 2015. Surface water quality in the Okavango Delta panhandle, Botswana. *African Journal of Aquatic Science* 40: 359-372.

#### Report

**Van Dalen, E.M.S.P.** 2015. In vitro exposure of larvae from *Rhipicephalus microplus* and *Rhipicephalus decoloratus* to 85 different plant extractions at 1g per 100ml (1% solution) for efficacy testing. Report to Dr Kevin Wellington, CSIR Biosciences, South Africa. Report number PRTF14/04 CSIR.

#### Book

**Prinsloo, G.L. & Uys, V.M.** (editors). 2015. *Insects of cultivated plants and natural pastures in Southern Africa*. Hatfield, Pretoria: Entomological Society of Southern Africa.

#### Chapters in Book

**Louw, S.vdM.** 2015. Amaranth. In *Insects of Cultivated Plants and Natural Pastures in Southern Africa*, edited by G.L. Prinsloo & V.M. Uys. Hatfield, Pretoria: Entomological Society of Southern Africa. pp. 262-265.

**Louw, S.vdM.** 2015. Kenaf. In *Insects of Cultivated Plants and Natural Pastures in Southern Africa*, edited by G.L. Prinsloo & V.M. Uys. Hatfield, Pretoria: Entomological Society of Southern Africa. pp. 294-296.

**Louw, S.vdM.** 2015. Pistachio. In *Insects of Cultivated Plants and Natural Pastures in Southern Africa*, edited by G.L. Prinsloo & V.M. Uys. Hatfield, Pretoria: Entomological Society of Southern Africa. pp. 412-417.

**Swart, V.R.** 2015. Pecan. In *Insects of Cultivated Plants and Natural Pastures in Southern Africa*, edited by G.L. Prinsloo & V.M. Uys. Hatfield, Pretoria: Entomological Society of Southern Africa. pp. 406-411.

#### Conference Contributions

**Adendorff, J., Jankielsohn, A., Louw, S.vdM. & Mohase, L.** 2015. *Screening for three different categories of host plant resistance to Russian wheat aphid (Diuraphis noxia) in Alexin™ treated varieties*. Proceedings of the XIX<sup>th</sup> Congress of the Entomological Society of Southern Africa (ESSA) and the 37<sup>th</sup> Congress of the Zoological Society of Southern Africa (ZSSA): Invasion Biology, Rhodes University, Grahamstown, South Africa. 12-15 July. pp. 5.

**Badenhorst, H. & Louw, S.vdM.** 2015. *Influences on mesofaunal occurrence in agricultural soils of the Free State, South Africa, with emphasis on clay percentage*. Proceedings of the XIX<sup>th</sup> Congress of the Entomological Society of Southern Africa (ESSA) and the 37<sup>th</sup> Congress of the Zoological Society of Southern Africa (ZSSA): Invasion Biology, Rhodes University, Grahamstown, South Africa. 12-15 July. pp. 8.

**Basson, L. & Van As, J.G.** 2015. *How do trichodinids (Ciliophora: Peritrichia) survive adverse conditions?* Paper delivered at the 9<sup>th</sup> International Symposium on Fish Parasites (9ISFP), Valencia, Spain. 31 August – 4 September.

**Butler, H.J.B. & Van Eeden, L.J.** 2015. *Isolated small mammal communities: A scrutiny of the island rule*. Paper delivered at the 12<sup>th</sup> African Small Mammal Symposium, Mantasoa, Madagascar. 12-19 April.

**Cloete, I., Louw, S.vdM. & Greyzenhout, M.** 2015. *Possible causal agents of gall induction on native Acacia species in the Northern Cape Province, South Africa*. Proceedings of the XIX<sup>th</sup> Congress of the Entomological Society of Southern Africa (ESSA) and the 37<sup>th</sup> Congress of the Zoological Society of Southern Africa (ZSSA): Invasion Biology, Rhodes University, Grahamstown, South Africa. 12-15 July. pp. 22.

**Fourie, DeV., Schoeman, S. & Louw, S.vdM.** 2015. *Investigation of possible pyrethroid resistance development in two-spotted stinkbug, Bathycoelia distincta (Hemiptera: Pentatomidae), on macadamia in South Africa*. Proceedings of the XIX<sup>th</sup> Congress of the Entomological Society of Southern Africa (ESSA) and the 37<sup>th</sup> Congress of the Zoological Society of Southern Africa (ZSSA): Invasion Biology, Rhodes University, Grahamstown, South Africa. 12-15 July. pp. 36.

**Heideman, N.J.L.** 2015. *Threatened fossorial skinks pose an interesting challenge to conservation strategies: The case of Scelotes gronovii and S. kasneri (Lacertilia: Scincidae) from the Western Cape coast, South Africa*. Poster presented at the Joint 27<sup>th</sup> International Congress for Conservation Biology (ICCB) and the 4<sup>th</sup> European Congress for Conservation Biology (ECCB): Mission Biodiversity: Choosing new paths for conservation, Montpellier, France. 2-6 August.



Profs Jo and Liesl van As in Spain during the 9<sup>th</sup> International Symposium on Fish Parasites.

**Jacobs, N. & Butler, H.J.B.** 2015. *Agonistic behaviour of sable antelope (Hippotragus niger Harris, 1838): Implications for captive management.* Paper delivered at the Southern African Wildlife Management Association (SAWMA) Symposium, Kimberley, South Africa. 6-10 September.

**Louw, S.vdM.** 2015. *Alternative thinking in soil health management.* Paper delivered at the Southern African-Nordic Centre (SANORD) Soil Health & Biological Control Workshop, Stellenbosch, South Africa. 30 September.

**Louw, S.vdM.** 2015. *Namibia, land of sand – The Biologist's Paradise.* Invited lecture delivered at the Hoogland Wildlife Society, Bethlehem, South Africa. 30 May.

**Louw, S.vdM.** 2015. *Pest aspects of cultivated cactus pear and amaranth in South Africa.* Paper delivered at the South Africa – Mexico Bilateral Cactus Pear Workshop, Bloemfontein, South Africa. 23-24 January.

**Louw, S.vdM. & Smith, J.** 2015. *Litter decomposition and home field advantage as a soil health strategy: A South African case study.* Proceedings of the XIX<sup>th</sup> Congress of the Entomological Society of Southern Africa (ESSA) and the 37<sup>th</sup> Congress of the Zoological Society of Southern Africa (ZSSA): Invasion Biology, Rhodes University, Grahamstown, South Africa. 12-15 July. pp. 62.

**Muller, B.S., Miller, R.M. & Louw, S.vdM.** 2015. *Systematics and biogeography of South African shootflies, Atherigona s. str. (Diptera: Muscidae).* Proceedings of the XIX<sup>th</sup> Congress of the Entomological Society of Southern Africa (ESSA) and the 37<sup>th</sup> Congress of the Zoological Society of Southern Africa (ZSSA): Invasion Biology, Rhodes University, Grahamstown, South Africa. 12-15 July. pp. 79.

**Smit, T., Louw, S.vdM. & Swart, V.R.** 2015. *Ecological trends of Diptera pests on grapes in the Northern Cape.* Paper delivered at the XIX<sup>th</sup> Congress of the Entomological Society of Southern Africa (ESSA) and the 37<sup>th</sup> Congress of the Zoological Society of Southern Africa (ZSSA): Invasion Biology, Rhodes University, Grahamstown, South Africa. 12-15 July.

**Smit, T., Swart, V.R. & Louw, S.vdM.** 2015. *Dynamics of fructivorous and florivorous Diptera along multiple gradients of the Orange River, Northern Cape.* Proceedings of the XIX<sup>th</sup> Congress of the Entomological Society of Southern Africa (ESSA) and the 37<sup>th</sup> Congress of the Zoological Society of Southern Africa (ZSSA): Invasion Biology, Rhodes University, Grahamstown, South Africa. 12-15 July. pp. 111.

**Van As, J.G.** 2015. *Adaptations and evolution towards a parasitic way of life.* Paper delivered at the 9<sup>th</sup> International Symposium on Fish Parasites (9ISFP), Valencia, Spain. 31 August – 4 September.

**Van As, L.L.** 2015. *Overview of hypersymbionts /parasites found associated with parasitic crustacean.* Paper delivered at the 9<sup>th</sup> International Symposium on Fish Parasites (9ISFP), Valencia, Spain. 31 August – 4 September.

**Vermeulen, M., Swart, W.J. & Gryzenhout, M.** 2015. *Fusarium species associated with decayed and healthy tissue of Amaranthus cruentus and three weevil species in South Africa.* Paper delivered at the 49<sup>th</sup> Congress of the Southern African Society for Plant Pathology (SASPP), Bain's Game Lodge, Bloemfontein, South Africa. 18-21 January.

## Staff

**Distinguished Professor:** Prof L Fourie.

**Professors:** Profs L Basson, S vdm Louw, and JG van As.

**Associate Prof:** Prof LL van As.

**Senior Lecturers:** Drs C Haddad and A le Roux.

**Lecturers:** Drs E Bredenhand, S Brink, C Jansen van Rensburg, PM Leeto, VR Swart, J van As, Mss M van As, E van Dalen, and Mr H Butler.

**Junior Lecturers:** Mr DeV Fourie.

**Researcher/Research Assistant:** Mr TW Lesoana.

**Research Associates:** Drs KW Christison, NA Rayner, NL Avenant, J Botha-Brink, MS Mtshali, K Nowak, and AM Tsotetsie.

**Officers: Professional Services:** Mss CI Human, MP Sithole, and Mr JM Mabena.

**Senior Assistant Officers:** Mss SAM Teele and I Erasmus.

## Contact Details

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# Academic Centres

# Disaster Management Training and Education Centre for Africa

## Overview

UFS-DiMTEC celebrated its tenth anniversary in 2015, which involved various internationally renowned scientists in centenary lectures and workshops. The Block Course presented in Durban during February was once again a highlight, showcasing the latest research on Vulnerability and Disaster Reduction. UFS-DiMTEC is also proud to have had students assisting in Nepal after the earthquake in April. Towards the end of 2015,



Janoz Pasztor (Assisted Secretary General on Climate Change, Office of UN Secretary General), James Obrinsky (former President MSF), Andries Jordaan (UFS-DiMTEC), and Rosalind Cornforth (Head Forecaster UK Meteorological Service).



Mr JA Belle was elected to the Executive Committee of the Disaster Management Institute of Southern Africa (DMISA) as chairperson of the Free State branch.

UFS-DiMTEC played a major role in establishing Disaster Management as a professional designation by facilitating the training of assessors required for designation approval. The year was concluded by the publication of *Book of Abstracts* which reflects the research conducted by students during the past ten years.

## Staff Achievements

In June 2015, Prof Jordaan was one of 23 international experts invited by the office of the Secretary General of the United Nations to participate in a climate resilience workshop in Genève, Switzerland.

## Student Achievements

PhD student Ms Cinde Greyling participated in the Three Minute Thesis competition, founded by the University of Queensland and presented by the UFS Postgraduate School. She was one of the top PhD presenters at the regional competition and was consequently invited to the national competition, where she came in fourth place.

## Activities

Workshops organised and facilitated as part of DiMTEC's centenary celebrations include the following:

- Working with nature to build resilient communities.
- Building resilient communities through media and communication.
- Global Resilience through Insurance and Index-based Risk Transfer Products.
- Climate and Global Resilience: Challenges for Science and Education.
- PhD Block Course – From vulnerability to resilience.

## Community Service

Mr Schalk-Willem van der Merwe, one of our DiMTEC students, was part of the Gift of the Givers response team that assisted victims of the Nepal earthquake.

The WRC Drought Research Team, under leadership of Prof Jordaan, trained 190 emerging and small-scale farmers and 120 extension officers in the Eastern Cape on drought resiliency.



Andries Jordaan, Sibongiseni Ngema, Troy Govender, Olivia Kunguma, Chris Skinner, Alice Ncube, and Dante Mashile.



PhD Block Course 2015, Durban.

## 2015 UFS-DiMTEC Graduates

### PhD Graduate:

- Greyling, C. A narrative communication approach towards drought resilience for foundational phase children.

### Master's Degree Graduates:

- Dlamini, MG. The impact of storms on teaching and learning in the Hhohho Region of Swaziland.
- Gamedze, NN. Behavioural factors contributing to the transmission of HIV/Aids among the youth.
- Koch, HMA. Chemical and biological incidents: Preparedness of Ekurhuleni North Emergency Services responders.
- Masha, D. Attitudes and practices of teachers in the implementation of the health promotion programme to mitigate health risk factors at schools: A case study of Mankweng circuit, Limpopo province.
- Mashebe, MP. Impact of floods on rural livelihoods of people residing in food prone areas: A case study of Luhonono Community, Namibia.
- Mgwebi, AZ. The impact of shack fires in Duncan Village informal residents in East London, Eastern Cape province.
- Moncho, L. Analysis of coping capacity measures by women in livestock protection during drought: A case study in Kuruman.
- Moshoke, SL. Emergency preparedness and analysis of the application of triage in Mangaung Metropolitan hospitals, Free State province, South Africa.
- Moyo, S. Fire disaster preparedness in secondary schools in Reigate District, Bulawayo, Zimbabwe.
- Muhomba, C. The level of awareness and preparedness on safety and security issues at the University of the Free State.
- Mutero, W. Economic impact of private land invasion on illegal land occupants in South Africa: A case study of SANRAL land invasion by landless Lwandle community members in Strand, Cape Town.
- Muradzikwa, G. Investigation of the effects of veld fire hazards in Zimbabwe: A case study of Goromonzi, South Constituency.
- Ndebele, SB. Food for assets programming as a drought migratory strategy: A case study of Insiza District, Zimbabwe.
- Sambayi, S. The social impacts of flooding: A case study of Tokwe-Mukosi floods, Chivi District, Zimbabwe.

## Research Outputs

### Research Articles

**Belle, J.A. & Hlalele, M.B.** 2015. Vulnerability assessment of agricultural drought hazard: A case of Koti Se-Phola Community council, Thabana Morena, Mafekeng District in Lesotho. *Journal of Geography & Natural Disasters*: 10.4172/2167-0587.100000143.

**Kunguma, O. & Ncube, A.** 2015. Combating HIV and/or AIDS: A challenge to Millennium development goals for disaster managers in the Southern African Development Community. *Journal of Disaster Risk Studies* 8(2): 1-10.

**Ncube, A., Jordaan, A.J. & Mabela, B.M.** 2015. Assessing the knowledge, attitudes and practices regarding cholera preparedness and prevention in Ga-Mampuru village, Limpopo, South Africa. *Journal of Disaster Risk Studies* 8(2): 10.4102/jamba.v8i2.164.

**Niemand, A., Jordaan, A.J. & Minnaar, H.** 2015. Some international perspectives on legislation for the management of human induced safety risks. *Journal of Disaster Risk Studies* 8(2): 10.4102/jamba.v8i2.170.



Mr Schalk van der Merwe.

### Chapter in Book

**Jordaan, A.J.** 2015. Food insecurity, drought and climate change: The case of Karamoja, Uganda. In *Living Land*, edited by J. Griffiths. UK: UNCCD & Tudor Rose. pp. 142-145.

### Conference Contributions

**Jordaan, A.J.** 2015. *Disaster risk reduction in Africa: Case of development or poor governance*. Keynote address delivered at the Inaugural Disaster Risk Management Conference, University of Venda, Polokwane, Limpopo, South Africa. 2 March.

**Jordaan, A.J.** 2015. *Drought in the Northern Cape: Climate change or not?* Paper delivered at the Agri Northern Cape 36<sup>th</sup> Annual Conference, Kimberley, South Africa. 18-19 August.

**Jordaan, A.J.** 2015. *Drought indicator selection: Case studies from Africa*. Paper delivered at the 1<sup>st</sup> Dresden Nexus Conference (DNS 2015): Global Change, Sustainable Development Goals and the Nexus Approach, United Nations Institute for Fluxes and Resources (UNU-FLORES), Dresden, Germany. 25-27 March.

**Jordaan, A.J.** 2015. *Global resilience through Smart Scientific Solutions*. Paper delivered at the 30<sup>th</sup> Annual Conference of the Disaster Management Institute of South Africa (DMISA), Hartenbos, South Africa. 9-10 September.

**Jordaan, A.J.** 2015. *Is drought to blame for food insecurity in Karamoja, Uganda? Social indicators for drought risk*. Paper delivered at the 10<sup>th</sup> Interdisciplinary Social Sciences Conference, Split, Croatia. 11-14 June.

**Koch, H., Mutero, W., Kunguma, O. & Ncube, A.** 2015. *Operative risk assessments for building a xenophobia-free South Africa through media and communication interventions*. Paper delivered at the 30<sup>th</sup> Annual Conference of the Disaster Management Institute of South Africa (DMISA), Hartenbosch, South Africa. 9-10 September.

**Shavaba, S. & Jordaan, A.J.** 2015. *Perceptions, responses and views on drought impact amongst land reform beneficiaries in the Eastern Cape, South Africa*. Paper delivered at the 9<sup>th</sup> Dealing with Disasters International (DwD2015) Conference: Health Centred Disaster Risk Reduction: A new agenda for a new era, Northumbria University, Newcastle-Upon-Tyne, UK. 17-18 September.

## Staff

**Lecturers:** Prof AJ Jordaan, Mss A Ncube, O Kunguma, and Mr JA Belle.

**Part-time Lecturers:** Prof B Grové, Drs E du Plessis, R Bragg, D Chikobvu, M Schutte-Smith, A Ogundejji, C Barker, Mss L Nogabe, M Joubert, L de Wet, and Mr W Ellis.

**Part-time Contract Lecturers:** Dr H Booysen, Ms J Swanepoel, Messrs SW

Carstens, A Kesten, and M Procter.

**Researchers/Research Assistants:** Ms F Mabano, Messrs A Maipisi, and C Mashimbye.

**Senior Assistant Officers:** Mss G van Copenhagen and A van Straten.

## Contact Details

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# Centre for Environmental Management

## Overview

The Centre for Environmental Management (CEM), established in 1994, celebrated its 21<sup>st</sup> year of existence during 2015. Over this time, the CEM has established an envied niche for itself in South Africa. This niche is based on three intertwined components: the master's and doctoral programmes in Environmental Management, short courses, and a research and contract component.

The CEM was created in 1994 mainly to train environmental managers. Within the context of a growing global awareness of socio-ecological interdependence and governments' responsibility to respond to international treaties by developing environmental policies and legislation, the need for people with postgraduate knowledge and expertise in environmental management became apparent. The first three students were admitted in July 1994, with further intakes of five and four students in January and July 1995 respectively. The number of students increased steadily over the years, and in 2015, 40 students representing various SADC countries were selected from more than 140 applications. In 2015, the number of master's graduates delivered by the CEM surpassed the 400 mark, and a staff member from the CEM, Dr Tascha Vos, became the tenth PhD graduate in Environmental Management.



CEM staff for 2015: Front, from left to right: Mr P Hoffman, Mss C Venter, S Esterhuysen, and M Kemp. Back, from left to right: Mr S Thibiri, Dr T Vos, Ms Q Mkhale, Drs F Buschke, M Avenant, Mss D Kolesky, M Watson, and T Soci. Absent: Dr O Olofade and Mr F Sokolic.

Being an established centre of expertise in aquatic-related research, the CEM reinstated the BSc Honours in Limnology in 2015, with two students successfully completing the programme. It is the only dedicated limnology programme in South Africa.

The CEM's research output has been growing steadily over the past ten years. Even though the CEM's initial mandate was to coordinate the Master

of Environmental Management programme, it was important to develop research in environmental management – not only to serve the wider community of environmental managers, but also to support and ensure quality postgraduate training. The CEM's research associates have played an integral role in growing the centre's research outputs, and together with the more than 30 lecturers from the industry, greatly contribute to the academic quality of our teaching and research programmes.

A highlight in 2015 was the Second African Water Symposium in conjunction with the Sixth Orange River Basin Symposium hosted by the CEM in October. Twenty-five oral presentations under the theme "Systems thinking in Environmental Water Management" were delivered over two days.

In 2015, the CEM's teaching and research capacity was markedly increased by the appointment of three new lecturers, Ms Surina Esterhuysen (from January 2015) and Drs Olusola Olofade and Falko Buschke (from March 2015). Ms Theresa Soci joined the CEM in August 2015 as coordinator of the Master of Environmental Management programme.

Sadly, we had to say goodbye to four colleagues in 2015: Prof Maitland Seaman who retired in 2014, but acted as Director until February 2015; Ms Marie Watson who retired after 26 years at the UFS; Ms Hanri van Jaarsveld, and Ms Hettie Human.

## Staff Achievements

Dr Tascha Vos obtained her PhD in Environmental Management at the Summer Graduation. The title of her dissertation was "A study on periphyton as indicator of water-quality in regulated rivers".

Dr Falko Buschke published a paper on the geographic distributions of mammal species in sub-Saharan Africa in the journal *Global Ecology and Biogeography*, the top-ranked journal in the category "Physical Geography", with an impact factor of 7.24.

Dr Olusola Olofade was invited as an expert panel reviewer on two panels of the National Research Foundation (NRF), namely the DAAD-NRF Master's and Doctoral Scholarships – Natural, Earth and Environmental Sciences Disciplines: Chemistry, Ecology, Earth Sciences, Environment, Microbiology, Botany and Zoology panel from 24 to 26 November 2015, and the DST-NRF Geo and Marine Sciences Free-standing Innovation and Scarce Skills 2016 Call Virtual Panel from 7 to 15 December 2015.

Prof Tony Turton, an affiliated professor with the CEM, was invited to serve an advisory role on the editorial board of a book series named *Sustainable Water Developments – Resources, Management, Treatment, Efficiency and Reuse*.

## Student Achievements

Ms Megan Emmett won both the Maitland Seaman Prize for best master's student in Environmental Management 2015, and the Centre for Environmental Management Prize for the best mini-dissertation in Environmental Management 2015. Ms Emmett achieved an average mark of 85% for her master's. The prizes will be awarded by Prof Maitland Seaman, the previous Director of the CEM, at the Faculty of Natural and Agricultural Sciences' prize-giving ceremony in April 2016.

Mr Uakendisa Muzuma from Namibia won the Dr Limpho Letsela Prize for the best foreign African student in Environmental Management 2014. The prize, in memory of a former CEM staff member, will be presented by Mr Obed Letsela at the prize-giving ceremony in 2015.

## Activities

### Dr Falko Buschke

Dr Falko Buschke attended the 27<sup>th</sup> International Congress for Conservation Biology in Montpellier, France. While there, he teamed up with a group of South African conservation scientists to form the South African Chapter of the Society for Conservation Biology. He also visited the Vrije Universiteit Brussel and the KU Leuven in Belgium, where he and his collaborators, Prof Bram Vanschoenwinkel and Dr Tom Pinneel, developed a computer simulation framework to assess the effects of climate change on the biology of temporary water bodies.

### Second African Water Symposium

During October, the CEM hosted the second African Water Symposium in conjunction with the Sixth Orange River Basin Symposium. This two-day event included invited and contributed presentations around the theme "Systems Thinking in Environmental Water Management". This provided a unique opportunity to bring together people from different disciplines – ecology, agriculture, engineering, and journalism – as well as different sectors – private, public, NGO, and academic – around the common theme of water management.

Dr Jackie King, an expert in environmental flow requirements of rivers, delivered the opening keynote address. Dr Harry Biggs (associated with the Association for Water and Rural Development at the University of the Witwatersrand) delivered the second keynote address on adaptive management in complex social-environmental systems. In addition to these invited talks, there were also 22 contributed talks that included research on aquatic systems in South Africa, Lesotho, Namibia, Swaziland, and Nigeria.

The symposium included a panel discussion that aimed to devise a roadmap toward effective water quality management in Africa. This discussion was moderated by Dr Olusola Ololade of the CEM and its main findings were published as a commentary in the March 2016 issue of the *South African Journal of Science*.

### Biomonitoring Free State Rivers

The CEM has been monitoring 11 sites on the Modder, Riet, and Caledon rivers since 2000. The monitoring included measurements of water

quality, algae, macro-invertebrates, fish, riparian vegetation, and geomorphology. This data record spanning over 17 years provides valuable insight into a regulated non-perennial river in the drier areas of South Africa.

### Modder-Riet Catchment Management Forum

Ms Marie Watson, Dr Tascha Vos, and Ms Marinda Avenant represented the CEM on the Modder-Riet Catchment Management Forum in 2015. The main objective of this forum, an institutional committee of the Department of Water Affairs and Sanitation, is to promote the responsible management of the Modder and Riet River catchments. Representatives from various stakeholders attend the quarterly meetings of the forum.



Ms Marie Watson busy assessing aquatic macroinvertebrate integrity.

### Orange River Catchment Management Agency Regional Steering Committee

Mss Marinda Avenant, Marie Watson, and Dr Joh Henschel (research associate of the CEM) formed part of the Orange River Catchment Management Agency Regional Steering Committee. The main task of the steering committee was to oversee the establishment of the Orange Catchment Management Agency, which will be primarily responsible for managing water resources in the catchment in the future.

### Geographical Information Systems Facility at the Centre for Environmental Management

Mr Frank Sokolic, a recognised expert and consultant on Geographical Information Systems (GIS), continued his close collaboration with the CEM by spending a week every month at the CEM. This facility has been exceptionally fruitful. By having the opportunity to discuss with him their GIS challenges first hand, the centre's students and staff have benefited greatly from the GIS solutions he has provided. He has also presented valuable environmentally oriented GIS courses to students and outsiders, and provides supervision to master's students.

### Short courses

The CEM hosted the following short learning programmes in 2015:

- The Wetland Introduction and Delineation (16–20 March) and Wetland Rehabilitation (17–19 November) courses were presented under the leadership of Dr Piet-Louis Grundling at Rietvlei Nature Reserve and Chrissiesmeer respectively.
- Mr Frank Sokolic presented the Introduction to GIS and GPS (March and September) and Intermediate GIS (March and October) courses.

under Prof PAL le Roux from the Department of Soil, Crop and Climate Sciences at the UFS.

### A study on the distribution of alien trees in the Bloemfontein part of the Mangaung Municipal Area

Prof Maitland Seaman, together with Mr Frank Sokolic and Ms Marthie Kemp, have launched a study to estimate the loss of water caused by alien trees. Large trees, especially in the form of exotic eucalyptus trees



BSc Honours students Mss Q Mkabile and C Venter doing fieldwork.

## Research

### Strategic Environmental Assessment (SEA) on shale gas for the Karoo

Mss Marthie Kemp, Surina Esterhuysen, and Dr Daan Toerien (research associate at the CEM) were involved in the strategic environmental assessment for shale gas development in the Karoo. The SEA started in 2015 and is due for completion in 2016. The interactive vulnerability map developed by the CEM as part of a recent study funded by the Water Research Commission (WRC) was taken up in the strategic assessment as an example of how spatial representation of mitigation measures for risk can be presented; and some of the information is also used for mapping of the SEA mitigation measures. The monitoring framework presented in this WRC report also serves as a basis for making regulatory recommendations in the SEA.

Mss Marinda Avenant, Marie Watson, Surina Esterhuysen, and Dr Joh Henschel (research associate at CEM), were also involved in writing chapters in the book *Hydraulic fracturing in the Karoo: Critical perspectives*, a JUTA publication which is currently in press.

### Hill slopes and ephemeral water bodies

Prof Maitland Seaman is involved in a study exploring the concept of water movement on hill slopes and relating it to a single set of hill slope pool samples from the Southern Granite Supersite in the Kruger National Park in March 2015, where work is being carried out by a multidisciplinary team

(bluegums), have added significantly to the evapo-transpirative loss of water from the area. The loss of water must be weighed against the benefits that these trees offer, including their value as sources of firewood.

### Management and conservation of biodiversity

Dr Falko Buschke set out to establish a research programme on the management and conservation of biodiversity. The activities of this programme focus on the effectiveness of using biodiversity offsets to mitigate the effects of human-induced impacts. In addition, this programme aims to study ecological resilience in the agricultural landscapes of the eastern Free State by identifying and characterising ecological refuges that could act as safe havens for biodiversity in the face of forecasted climate change.

### DAAD Project – Alliance for Wetlands – Research and Restoration (AllWet RES)

The CEM was one of the core partners of a German-South African research project on wetlands funded by DAAD (the German Academic Exchange Service). This project, which focused on the improvement of knowledge about the possibilities and limitations of restoration of degraded wetlands in the northern Maputland area, South Africa, produced a number of PhD and MSc graduates and provided participating staff members and students the opportunity to visit two prestigious universities in Munich and Berlin, and meet with German students and lecturers in similar fields as their own. Ms Lulu Pretorius and Dr Piet-Louis Grundling (research associate of the CEM) played a central role in the project, which came to an end in 2015.



### Biodiversity monitoring at Kolomela Mine

The CEM, in collaboration with the National Museum, the Department of Soil, Crop and Climate Sciences, and the Department of Zoology and Entomology, has been conducting a biomonitoring programme at Kolomela Mine close to Postmasburg since 2010. The first phase of the study, which investigated the impact of dust and dewatering on local biodiversity, came to an end at the end of 2015, with phase two commencing in January 2016.

## Community Service

### Aquatic monitoring of Loch Logan

For the last seven years the CEM has been monitoring the ecological condition of the urban impoundment, Loch Logan, which is the central focus of Bloemfontein's Waterfront development. The information thus derived has been shared with the water body's owners (the Mangaung Local Municipality) and the owners of the Waterfront development for use in the management of the lake. The monitoring, conducted by Dr Tascha Vos and postgraduate students from the CEM, provides valuable practical training in limnology.

### Careers Day

For the past 22 years, Prof Seaman, the previous director of CEM, and staff of the CEM have been central to the organisation and presentation of the Rotary Careers Day, first at St Andrews School, and presently at Eunice Secondary School. It is a career information day, at which learners (who earlier indicated their preferences) have dedicated discussions with professionals representing learners' first, second, and third career choices in sessions of two hours. About 40 professionals give their time to explain what their professions involve.

### International Collaboration

Dr Falko Buschke currently collaborates with Prof Bram Vanschoenwinkel of the Vrije Universiteit Brussel, as well as Dr Tom Pincheel of the KU Leuven in Belgium. He is also currently working on a project with Ms Susie Brownlie, the internationally recognised expert on biodiversity offsets from De Villiers-Brownlie Associates in Cape Town.

Dr Olusola Ololade and Ms Surina Esterhuyse collaborated with Dr Audrey Levine, a Fulbright specialist from Washington D.C., USA, on writing a chapter entitled "The water-energy-food nexus from a South African perspective" for the book *Water-Energy-Food Nexus: Theories and Practices*, published by AGU/Wiley.

### Postgraduate Students

The CEM delivered 24 graduates in the Master in Environmental Management programme at the 2015 Winter Graduation Ceremony. Of these, 13 were from South Africa and 11 from other SADC countries.

Two doctorates in Environmental Management were conferred in 2015: Dr Vaughn Swart graduated at the Winter Graduation Ceremony, and Dr Tascha Vos at the Summer Graduation Ceremony.

Two students, Mss Qawekazi Mkabile and Carike Venter, graduated from the BSc Honours in Limnology after the programme was reinstated by the CEM in 2015.

### Staff Matters

- Ms Marie Watson retired at the end of 2015 as principal professional officer after a successful career of 26 years at the UFS. Ms Watson was responsible for the coordination of the aquatic research programmes at the CEM.
- Ms Surina Esterhuyse, a professional officer at the centre, was promoted to lecturer as from 1 January 2016.
- Drs Falko Buschke and Olusola Ololade were appointed as lecturers from March 2015.
- Ms Hanri van Jaarsveld left the centre at the end of April 2015 to pursue a career in environmental management consulting.
- Ms Hettie Human left the centre's service at the end of July 2015.
- Ms Theresa Soci joined the centre as course coordinator for the Master of Environmental Management programme at the beginning of August 2015.
- Ms Marinda Avenant received a 20-years long-service award.

## Research Outputs

### Research Articles

- Bennett, B.M. & Kruger, F.J.** 2015. Forestry in reconstruction South Africa: Imperial visions, colonial realities. *Britain and the World* 8(2): 225-245.
- Bezuidenhout, H., Bradshaw, P.L., Bradshaw, M. & Zietsman, P.C.** 2015. Landscape units of Mokala National Park, Northern Cape Province, South Africa. *Navorsing van die Nasionale Museum* 31(1): 1-27.
- Bezuidenhout, H., Kraaij, T. & Baard, J.** 2015. Persistent effects of chemicals used to control shrub densification in semi-arid savanna. *Earth Science Research* 4(1): 31-39.
- Brink, J.S., Bousman, C.B. & Grün, R.** 2015. A reconstruction of the skull of *Megalotragus priscus* (Broom, 1909), based on a find from Erfkroon, Modder River, South Africa, with notes on the chronology and biogeography of the species. *Palaeoecology of Africa* 33: 71-94.
- Buschke, F.T., Brendonck, L. & Vanschoenwinkel, B.** 2015. Simple mechanistic models can partially explain local but not range wide co-occurrence of African mammals. *Global Ecology and Biogeography* 24: 762-773.
- Cleef, A., Grundling, P.-L. & Joosten, H.** 2015. Mountain Peatlands. *Mires and Peat* 15: 1-3.
- Codron, J., Duffy, K.J., Avenant, N.L., Sponheimer, M., Leitch, J., Paine, O., Sandberg, P. & Codron, D.** 2015. Stable Isotope Evidence for Trophic Niche Partitioning in a South African Savanna Rodent Community. *Current Zoology* 61(3): 397-411.
- De Mieri, M., Du, K., Neuburger, M., Saxena, P., Zietsman, P.C., Hering, S., Van der Westhuizen, J.H. & Hamburger, M.** 2015. hERG channel inhibitory daphnane diterpenoid orthoesters and polycephalones A and B with unprecedented skeletons from *Gnidia polycephala*. *Journal of Natural Products* 78: 1697-1707.
- Du Plessis, J.J., Avenant, N.L. & De Waal, H.O.** 2015. Quality and quantity of the scientific information available on black-backed jackal and caracals: Contributing to human-predator conflict management? *South African Journal of Wildlife Research* 45(2): 138-157.
- Du, K., De Miere, M., Saxena, P., Phungula, K., Wilhelm-Mouton, A., Hrubaru, M., Van Rensburg, E., Zietsman, P., Hering, S. & Hamburger, M.** 2015. HPLC-Based activity profiling for hERG channel inhibitors in South African medicinal plant *Galena africana*. *Planta Medica* 81(12/13): 1154-1162.

Dufour, C.M.S., Meynard, C., Watson, J., Rioux, C., Benhamou, S., Perez, J., Du Plessis, J.J., Avenant, N., Pillay, N. & Ganem, G. 2015. Space use variation in co-occurring sister species: Response to environmental variation or competition? *PLOS ONE* 10(2): 1-15.

Grootjans, A.P., Jansen, A.J.M., De Hullu, P.C., Joosten, H., Bootsma, A. & Grundling, P. 2015. In search of spring mires in Namibia: The Waterberg area revisited. *Mires and Peat* 15: 1-11.

Grundling, P., Clulow, A.D., Price, J.S. & Everson, C.S. 2015. Quantifying the water balance of Mfabeni Mire (iSimangaliso Wetland Park, South Africa) to understand its importance, functioning and vulnerability. *Mires and Peat* 16: 1-11.

Grundling, P., Linström, A., Fokkema, W. & Grootjans, A.P. 2015. Mires in the Maluti mountains of Lesotho. *Mires and Peat* 15: 1-11.

Hauptfleisch, M.L. & Avenant, N.L. 2015. Integrating small mammal community variables into aircraft-wildlife collision management plans at Namibian airports. *Integrative Zoology*. 10(6): 515-530.

Hempson, G.P., Archibald, S., Bond, W.J., Ellis, R.P., Grant, C.C., Kruger, F.J., Kruger, L.M., Moxley, C., Owen-Smith, N., Peel, M.J.S., Smit, I.P.J. & Vickers, K.J. 2015. Ecology of Grazing Lawns in Africa. *Biological Reviews* 90(3): 979-994.

Henschel, J.R. 2015. Locust times – monitoring populations and outbreak controls in relation to Karoo natural capital. *Transactions of the Royal Society of South Africa* 70(2): 135-143.



The MEM class of 2015.

Kruger, F. 2015. Palaeobiology of the South Africa savanna and lessons for modern ecologists. *Transactions of the Royal Society of South Africa* 70(2): 117-125.

Kruger, F. 2015. Review: Forest hydrology and catchment management: An Australian Perspective, 2015. *International Forestry Review* 17(4): 510-512.

Odendaal, C., Seaman, M.T., Kemp, G., Patterton, H.E. & Patterton, H. 2015. An LC-MS/MS based survey of contaminants of emerging concern in drinking water in South Africa. *South African Journal of Science* 111(9/10): 160-165.

Ololade, O. & Annegram, H.J. 2015. Dynamics of land use/cover changes and landscape fragmentation analysis in Rustenburg area, South Africa. *African Journal of Economic and Sustainable Development* 4(3): 234-253.

Seward, P., Xu, Y. & Turton, A. 2015. Using backcasting to explore ways to improve the national water department's contribution to good groundwater governance in South Africa. *Water International* 40(3): 446-462.

Smith, P., Brink, J.S., Hoffman, J.W., Bam, L.C., Nshimirimana, R. & De Beer, F.C. 2015. The late middle Pleistocene upper third molar from Florisbad: Metrics and morphology. *Transactions of the Royal Society of South Africa* 70(3): 233-244.

Toerien, D. 2015. Economic value addition, employment, and enterprise profiles of local authorities in the Free State, South Africa. *Cogent Social Sciences* 1(1): 1-21.

Toffolo, M.B., Brink, J.S. & Berna, F. 2015. Bone diagenesis at the Florisbad spring site, Free State Province (South Africa): Implications for the taphonomy of the Middle and Late Pleistocene faunal assemblages. *Journal of Archaeological Science: Reports* 4: 152-163.

Turton, A. 2015. Sitting on the horns of a dilemma: Water as a strategic resource in South Africa. *South African Institute of Race Relations* 6(22): 1-28.

Van Aardt, A., Bousman, C.B., Brink, J.S., Brook, G.A., Jacobs, Z., Du Preez, P.J., Rossouw, L. & Scott, L. 2015. First chronological, palaeoenvironmental, and archaeological data from the Baden-Baden fossil spring complex in the western Free State, South Africa. *Palaeoecology of Africa* 33: 117-152.

#### Research Reports

Hobbs, P., Day, L., Coetzee, H., Hohne, D., Mosetsho, M., Chevallier, L., Rosewarne, P., Ewart-Smith, J., Rivers-Moore, N., Kemp, M. & Esterhuysen, S. 2015. Water resources, both on the surface and underground. In: *Zero Order Draft: Strategic Environmental Assessment for Shale Gas Development in South Africa* (v3.0). Online.

Mulders, J., Harris, K., Crafford, J., Grundling, P.-L. & Grundling, A. 2015. *Deliverable 6: Report that investigates and demonstrates the social-economic value of peatlands in South Africa*. Report prepared by the Centre for Wetlands Research and Training and Prime Africa consultants for the Water Research Commission (WRC), Pretoria, South Africa. WRC Project K5/2346.

Seaman, M.T., Sokolic, F. & Kemp, M. 2015. *A study on the distribution of alien trees in the Bloemfontein part of the Mangaung Municipal Area*. Report prepared by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa for the Mangaung Municipality, Bloemfontein, South Africa.

Seaman, M.T., Watson, M. & Vos, A.T. 2015. *State of the Modder, Riet and Caledon Rivers 2013-2015*. Report prepared by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa.

Venter, A. & Mitchell, S. 2015. *Framework for the management of wetlands within catchments where ESKOM operates*. Report to Water Research Commission (WRCC), Pretoria, South Africa. WRC Report no. 2222/1/15.

#### Book

Bennett, B.M. & Kruger, F.J. 2015. *Forestry and water conservation in South Africa: History, science and policy*. Canberra: Australian National University Press.

#### Chapters in Books

Audouin, M., Burns, M., Weaver, A., Le Maitre, D., O'Farrell, P. & Du Toit, R. 2015. An introduction to sustainability science and its links to sustainability assessment. In: *Handbook of sustainability assessment*, edited by A. Morrison-Saunders, J. Pope and A. Bond. Massachusetts, USA: Edward Elgar Publishing. pp. 321-348.

**Gowlett, J.A.J., Brink, J.S., Herries, A.I.R., Hoare, S., Onjala, I. & Rucina, S.M.** 2015. At the heart of the African Acheulean: The physical, social and cognitive landscapes of Kilombe. In: *Settlement, society and cognition in human evolution*, edited by F. Coward, R. Hosfeld, M. Pope and F. Wenban-Smith. Cambridge, UK: Cambridge University Press. pp. 75-93.

**Toerien, D.F.** 2015. New utilization/conservation dilemmas in the Karoo, South Africa: Potential economic, demographic and entrepreneurial consequences. In: *Arid and semi-arid environments: Bio-geodiversity, impacts and environmental challenges*, edited by G. Ferguson. Hauppauge, New York: Nova Science Press. Chapter 4.

**Turton, A.R.** 2015. Hydropolitics and Transboundary River Basin Management nuances in the southern African development community. In: *New approaches to governance of natural resources: Insights from Africa*, edited by A. Grant, W.R.N. Compaoré and M.I. Mitchell, M.I. Basingstoke, UK: Palgrave Macmillan. Chapter 11.

**Turton, A.R.** 2015. Managing the unintended consequences of mining: Acid Mine Drainage in Johannesburg. In: *Urban Water Reuse Handbook*, edited by S. Eslamian. Boca Raton, USA: CRC Press. pp. 551-562.

**Turton, A.R.** 2015. When gold mining ends: An environmental catastrophe for Johannesburg. In: *New South African Review 5*, edited by D. Pillay, G.M. Khadiagala, P. Naidoo and R. Southall. Johannesburg, South Africa: Wits University Press. pp. 120-141.

#### Conference Contributions

**Avenant, N. & Watson, J.** 2015. *Small mammal succession in the Grassland Biome, South Africa*. Paper delivered at the 12<sup>th</sup> African Small Mammal Symposium, Mantasoa, Madagascar. 12-18 April.

**Benda, P., Cervený, J. & Avenant, N.** 2015. *The bat fauna of Lesotho*. Paper delivered at the 12<sup>th</sup> African Small Mammal Symposium, Mantasoa, Madagascar. 12-18 April.

**Bootsma, A., Khoza, S., Grootjans, A.P. & Grundling, P.** 2015. *The characteristics of the Matlabas Mire: Preliminary findings and implications for conservation management*. Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba (NWI): Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20-23 October.

**Brink, J.S., Holt, S. & Kolska Horwitz, L.** 2015. Preliminary findings on Macro-Faunal Taxonomy, Taphonomy, Biochronology and Palaeoecology from the Basal Layers of Wonderwerk Cave, South Africa. In: *Proceedings of the 13<sup>th</sup> Pan-African Congress on Prehistory and Related Studies: Preserving African Cultural Heritage*, edited by I. Thiaw & H. Bocoum, Dakar. 1-7 November. pp. 137-147.

**Bukhosini, S., Pretorius, L., Grundling, P., Elshehawi, S. & Grootjans, A.** 2015. *(Why) is Vazi North surviving?* Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba (NWI): Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20-23 October.

**Buschke, F.** 2015. *A crash-course in conservation entrepreneurship*. Poster presented at the Joint 27<sup>th</sup> International Congress for Conservation Biology (ICCB) and the 4<sup>th</sup> European Congress for Conservation Biology (ECCB): Mission Biodiversity: Choosing new paths for conservation, Montpellier, France. 2-6 August.

**Buschke, F.** 2015. *Making robust management decisions without empirical data*. Paper delivered at the 2<sup>nd</sup> African Water Symposium in conjunction with the 6<sup>th</sup> Orange River Basin Symposium, University of the Free State, Bloemfontein, South Africa. 7-8 October.

**Buschke, F.T., Pinceel, T., Vanschoenwinkel, B. & Brendonck, L.** 2015. *Using stage-class matrix population models of the fairy shrimp Branchiopodopsis wolffi to quantify the sensitivity of life-history parameters to forecasted*

*climate change*. Paper delivered at the 2015 Annual Conference of the South African Society for Aquatic Scientists (SASAQS): Water resource research, policy and people, Champagne Sports Resort, Drakensberg, South Africa. 28 June – 02 July.

**Erlbeck, F., Muhar, A., Guerrero, N., Sliva, J. & Grundling, P.** 2015. *Concept of a Wetland Education Training and Communication Center in kwaNgwanase (eManguzi), KwaZulu-Natal, South Africa*. Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba (NWI): Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20-23 October.

**Esterhuysen, S.** 2015. *Development of an interactive vulnerability map and monitoring strategy for unconventional oil and gas extraction in South Africa*. Invited paper delivered at the WRC Research Development and Innovation Symposium and Water-Tech Summit, Birchwood Hotel and Conference Centre, Boksburg, South Africa. 16-18 September.

**Esterhuysen, S.** 2015. *Water resources in South Africa: Major challenges faced*. Invited paper delivered at the Iphakade Water Works Workshop, Bloemfontein, South Africa. 2-6 November.



Ms M Emmett and Prof M Seaman. Ms Emmett won the prizes for best student and best mini-dissertation in 2015.

**Gabriel, M., Galka, M., Rooskoff, N., Zeitz, J., Grundling, P. & Van Huysteen, C.** 2015. *A deep look into two peatlands of Northern KZN: Plant macrofossil analysis as a method to uncover a peatlands genesis*. Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba (NWI): Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20-23 October.

**Grundling, A.T., Abd Elbasit, M.A.M., Grundling, P., Bukhosini, S. & Pretorius, M.L.** 2015. *Potential of peat fire mapping for the Vazi peatland using thermal imagery and supported by ecohydrological observation*. Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba (NWI): Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20-23 October.

**Grundling, P.** 2015. *The impact of catchment degradation on the ability of peatlands in South Africa to sequester carbon*. Paper delivered at the Sustainable Soil Management Symposium, Stellenbosch, South Africa. 5-6 November.

- Grundling, P. & Grundling, A.T.** 2015. *Taking the sting out of remote sensing: using Google Earth Pro in wetland rehabilitation planning*. Paper delivered at the DEA GIS Day: Cutting through boundaries, hosted by the Department of Environmental Affairs and the Directorate Enterprise Geospatial Information Management (EGIM), Pretoria, South Africa. 28–29 October.
- Grundling, P., Grootjans, A.P. & Elshehawi, S.** 2015. *Storing peat or stoking climate change fires?* Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba (NWI): Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20–23 October.
- Hamilton, N., Ololade, O. & Moja, S.** 2015. *An assessment of the impact of industrial effluent on surface water quality and human health: A case of Lusushwana River in Matsapha Industrial site, Swaziland*. Paper delivered at the 2<sup>nd</sup> African Water Symposium in conjunction with the 6<sup>th</sup> Orange River Basin Symposium, University of the Free State, Bloemfontein, South Africa. 7–8 October.
- Hartl, V., Guerrero, N., Kollmann, J., Lunau, S., Meyer, K., Pretorius, L. & Zungu, M.** 2015. *Awareness-raising concept for the sustainable small-scale farming in Maputaland, South Africa*. Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba (NWI): Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20–23 October.
- Henschel, J.R.** 2015. *Brown Locust populations across time and space: enlightened observations instead of blind pursuit*. Paper delivered at the XIX<sup>th</sup> Congress of the Entomological Society of Southern Africa (ESSA) and the 37<sup>th</sup> Congress of the Zoological Society of Southern Africa (ZSSA): Invasion Biology, Rhodes University, Grahamstown, South Africa. 12–15 July.
- Kruger, F., Bennett, B. & Seaman, M.T.** 2015. *What can history tell us about catchment resilience? A case study of the Sabie River catchment*. Paper delivered at the 2<sup>nd</sup> African Water Symposium in conjunction with the 6<sup>th</sup> Orange River Basin Symposium, University of the Free State, Bloemfontein, South Africa. 7–8 October.
- Kruger, F.J.** 2015. *Forest genetic resources in South Africa. Challenges of land degradation, climate change and rural poverty*. Paper delivered at the XIV<sup>th</sup> World Forestry Congress: Forest and people: Investing in a sustainable future, Durban, South Africa. 7–11 September.
- Kruger, F.J.** 2015. *Preservation of the vegetation of the south western Cape: Part of a historic science continuum*. Paper delivered at the Colloquium on “Conservation of the natural vegetation of the Cape Floristic Region, in honour of Christiaan Wicht: Seventy years on”, hosted by the Royal Society of South Africa (RSSAf) and the Centre for Invasion Biology (CIB), Stellenbosch, South Africa. 13 April.
- Mitchell, S. & Venter, A.** 2015. *A framework for managing wetlands on Eskom property*. Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba (NWI): Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20–23 October.
- Pretorius, L. & Sliva, J.** 2015. *ALLWET and All-dry: Introducing the ALLWET-RES project as well as a very degraded peatland*. Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba (NWI): Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20–23 October.
- Pretorius, L. & Van Huyssteen, C.** 2015. *Soil colour as indicator of organic carbon in wetlands in Maputaland*. Poster presented at the 1<sup>st</sup> Annual Scientific Iphakade Workshop: Water Works 2015, University of the Free State, Bloemfontein, South Africa. 2–6 November.
- Pretorius, L., Bukhosini, S., Elshehawi, S., Grootjans, A. & Grundling, P.** 2015. *Why is Vazi surviving – understanding the endurance of a small (but deep) peatland within a state plantation*. Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba (NWI): Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20–23 October.
- Pretorius, L., Sliva, J., Meyer, K. & Grundling, A.** 2015. *Promoting the wise use and rehabilitation of wetlands through community participation and training: A proposed model*. Poster presented at the 4<sup>th</sup> Young Water Professional-ZA Biennial and 1<sup>st</sup> African Young Water Professional Conference, Pretoria, South Africa. 16–18 November.
- Prinsloo, E., Avenant, M. & Avenant, N.** 2015. *Small mammals in a suite of indicators to determine the instream water requirements for South African dryland rivers*. Poster presented at the 12<sup>th</sup> African Small Mammal Symposium, Mantasoa, Madagascar. 12–18 April.
- Seaman, M.T.** 2015. *Hill slopes and ephemeral water bodies*. Paper delivered at the 2<sup>nd</sup> African Water Symposium in conjunction with the 6<sup>th</sup> Orange River Basin Symposium, University of the Free State, Bloemfontein, South Africa. 7–8 October.
- Toader, A.C., Gabriel, M., Roszkopf, N., Zeitz, J. & Pretorius, L.** 2015. *Pedologic and Stratigraphic Studies of Two Degraded Peatlands in Maputaland, KwaZulu-Natal*. Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba (NWI): Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20–23 October.
- Turton, A.** 2015. *The need for transdisciplinarity arising from the Holocene/Anthropocene transition – Some ideas from water conflict resolution in South Africa*. Paper delivered at the Aquatic Sciences 2015 Conference organised by the Association for the Sciences of Limnology & Oceanography (ASLO): Global and Regional Perspectives – North Meets South, Granada, Spain. 22–27 February.
- Turton, A.** 2015. *The state as a major polluter of water: What’s good for the goose should also be good for the gander?* Paper delivered at the 2<sup>nd</sup> African Water Symposium in conjunction with the 6<sup>th</sup> Orange River Basin Symposium, University of the Free State, Bloemfontein, South Africa. 7–8 October.



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**Affiliate Professor:** Prof A Turton.

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**Research Associates:** Prof MT Seaman, Drs NL Avenant, H Bezuidenhout, JS Brink, D Codron, NB Collins, P Grundling, JR Henschel, FJ Kruger, SA Mitchell, DF Toerien, A Weaver, and PC Zietsman.

**Course Coordinators:** Mss H van Jaarsveld and T Soci.

**Chief Professional Officer:** Ms M Watson.

**Senior Professional Officer:** Ms ME Kemp.

**Professional Officer:** Dr AT Vos and Ms HS Human.

**Assistant Professional Officer:** Ms D Kolesky.

**Assistant Researchers:** Mss L Pretorius, Q Mkabile, and Mr PA Hoffman.

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Centre for

# Lengau Agricultural Development



Hobhouse farmers' day.



Sussex bull.

## Overview

Since the MoU with the Mangaung Municipality was declared null and void, not much has happened at Lengau. We still have eight black farmers who use our cattle, sheep, and pig facilities. These farmers are all equipped to brand their animals according to the law, animal welfare programme, and animal improvement scheme. BKB and PMI have been negotiating the takeover of the centre for more than two years but it has not been finalised yet. We have negotiated with Andre Kock & Son auctioneers to take over the auctioning facilities.

The Lengau Agricultural Development Centre's Agricultural Skills Development, Training and Mentorship Programme is an initiative aimed at being an engaged faculty of the UFS by utilising its academic capacity and facilities to face the challenges of sustainable agriculture in the region, country, and continent.

Lengau Development Centre, as one of the three experimental farms of the UFS, was earmarked for agricultural skills development and training of emerging farmers, farm workers, and entrepreneurs in agricultural business. The buildings, facilities, and a portion of the land of the Sydenham Experimental Farm were used for animal and crop production, as well as alternative natural and agricultural skills development opportunities in value-adding and marketing.

The facilities at Lengau Development Centre were upgraded and utilised in an extensive manner to address the needs of newly settled and prospective emerging and commercial black farmers. Services range from livestock auctioneering, herd improvement, branding, dehorning, castration, primary herd, and basic and advanced food gardening. Lengau also serves as a centre for education of undergraduates and postgraduates, mentors, farmers, and black entrepreneurs in many aspects of livestock, crop farming, and agri-business. Almost R7.5 million was invested by the UFS over the past ten years to upgrade and manage the facility.



## Staff

**Farm Manager:** Dr MC van der Westhuizen.

**Administrative Manager:** Ms A Smith.

**Assistant Officer:** Mr J Barnard.

**Student:** Mr J Parker.

**Farm Workers:** Mss A Sebonyane, E Sebonyane, Messrs T Khubeka, P Somi, S Motswari, P Ramatekoane, P Moriribela, S Bavuma, and A Khumalo.

**Security:** Messrs A Khoele, E Maqala, E Selepe, and A Mkaka.

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# Centre for Microscopy

## Overview

The Centre for Microscopy is a research facility of the faculty, housing advanced electron microscopes and which primarily supports researchers and students of the University. External researchers from the Central University of Technology (CUT), the private sector, and a number of researchers from other local and international institutions also periodically undertake research projects at the centre. At least 30 research areas with 85 researchers and students conducted microscopic- and nanotechnology-based research in 2015. Sample preparations are undertaken by centre personnel in collaboration with the requirements of applicants. Indicated below are user numbers during the past four years:

2012	2013	2014	2015
64	72	76	85

It is noteworthy that laboratory preparation time of samples for the number of researchers in 2015 took an accumulated 967 hours prior to any microscopic analysis.

## Activities

The microscope usage by different users and departments is indicated in the following table.

Department	Usage hours		
	CLSM	SEM	TEM
Cardiothoracic Surgery	-	37	31
Centre (Image processing, support, training)	7	75	20
Chemistry	-	16	39
Geology	-	9	-
Haematology	-	5	-
Engineering	-	2	-
Institute for Groundwater Studies	-	6	-
Microbial, Biochemical and Food Biotechnology	14	87	83
Physics	-	278	21
Plant Sciences	5	79	-
Zoology and Entomology	3	48	-
<b>External researchers/projects:</b>			
Central University of Technology	6	17	6
Dalhousie University, Halifax, Nova Scotia, USA	7	10	4
<b>Total Usage</b>	<b>42</b>	<b>669</b>	<b>204</b>

### Research and Training Activities

Honours students from the departments of Zoology and Entomology (DRK/ENT614) and Microbial, Biochemical and Food Biotechnology (MKB/BOC614) attended practical presentations concerning the preparation of material and handling of equipment.

Undergraduate students (second-year) from the departments of Zoology and Entomology, Plant Sciences, and Engineering Sciences (EnSci) attended demonstrations regarding microscopy research.

An international researcher, Greg Potter, from Dalhousie University in Halifax, Nova Scotia, Food Science programme in the Process Engineering and Applied Science Department, visited the centre. In collaboration with Dr Chantel Swart-Pistor, a project entitled "Compositional and ultrastructural characterisation of the SMA strain of *Saccharomyces*" (yeast species) formed an integral part of their research with scanning and transmission electron microscopy, as well as confocal microscopy at the centre.

The centre is in the process of changing its name to the Laboratory for Microscopy. This is undertaken according to the latest requirements of the University. A visit was undertaken by Prof Van Wyk to the Van Leeuwenhoek Centre for Advanced Microscopy (LCAM) in Amsterdam to discuss and compare operational affairs of similar centres in Europe. The requirements and outputs of such centres in Europe appear to be much less than the required proposal for centres at the University.

### New JEOL Scanning Electron Microscope

The installation of the JEOL 7800 SEM, valued at R10.1 million, was completed by mid-2014. The first support for users and the final training of staff (about 70 hours) formed a major part of the activities for 2015. Accordingly, a workshop was presented in collaboration with the South African JEOL company, Advanced Laboratory Solutions, in the application of cathodoluminescence (CL). A CL specialist, Dr Paul Spellward (GATAN, Abingdon, United Kingdom), presented the workshop. The workshop was attended by seven university personnel members from the Centre of Microscopy and the departments of Physics and Geology, including two external researchers; one from the University of the Western Cape and another from Botswana International University of Science and Technology.

### Maintenance Aspects

The transmission electron microscope (TEM) which used running water for its cooling systems was upgraded with an enclosed water circulator at a cost of R69 000. Prof Van Wyk also routinely conducts maintenance on the microscopes, which involved approximately 35 hours with an estimated cost saving of R31 000 in 2015 (based on rates that external companies quoted for similar maintenance on the microscopes).

## Research Outputs

### Research Articles

**Abbass, A.E., Swart, H.C. & Kroon, R.E.** 2015. Effect of silver ions on the energy transfer from host defects to Tb ions in sol-gel silica glass. *Journal of Luminescence* 160: 22–26.

**Abbass, A.E., Swart, H.C. & Kroon, R.E.** 2015. White luminescence from sol-gel silica doped with silver. *Journal of Sol-Gel Science and Technology* 76: 708–714.

**Borgonie, G., Linage-Alvarez, B., Ojo, A.O., Mundle, S.O.C., Freese, L.B., Van Rooyen, C., Kuloyo, O., Albertyn, J., Pohl, C.H., Cason, E.D., Vermeulen, J., Pienaar, C., Litthauer, D., Van Niekerk, H., Van Eeden, J., Lollar, B.S., Onstott, T.C. & Van Heerden, E.** 2015. Eukaryotic opportunists dominate the deep-subsurface biosphere in South Africa. *Nature Communications* 6: 8952.

**Gohain, M., Kumar, V., Van Tonder, J.H., Swart, H.C., Ntwaeaborwa, O.M. & Bezuidenhout, B.C.B.** 2015. Nano  $\text{CuFe}_2\text{O}_4$ : An efficient, magnetically separable catalyst for transesterification of  $\beta$ -ketoesters. *RSC Advances* 5: 18792–18976.

**Harris, R., Terblans, J.J. & Swart, H.C.** 2015. Microstructure Engineering of Binary Alloy Thin Films through Monte Carlo Simulation of Pt/Al Thin-film Precipitate-evolution. *Materials Today: Proceedings* 2: 4100–4110.

**Kumar, V., Gohain, M., Van Tonder, J.H., Ponra, S., Bezuidenhout, B.C.B., Ntwaeaborwa, O.M. & Swart, H.C.** 2015. Synthesis of quinoline based heterocyclic compounds for blue lighting application. *Optical Materials* 50: 275–281.

**Kumar, V., Ntwaeaborwa, O.M., Holsa, J., Motaung, D.E. & Swart, H.C.** 2015. The role of oxygen and titanium related defects on the emission of  $\text{TiO}_2:\text{Tb}^{3+}$  nano-phosphor for blue lighting applications. *Optical Materials* 46: 510–516.

**Madu, U.L., Ogundeji, A.O., Mochochoko, B.M., Pohl, C.H., Albertyn, J., Swart, C.W., Allwood, J.W., Southam, A.D., Dunn, W.B., May, R.C. & Sebolai, O.M.** 2015. Cryptococcal 3-hydroxy fatty acids protect cells against amoebal phagocytosis. *Frontiers in Microbiology* 6: 1351.

**Manhas, M., Kumar, V., Agarwal, G., Ntwaeaborwa, O.M. & Swart, H.C.** 2015. Crystal structure and kinetic studies of gamma exposed  $\text{Ca}_3\text{B}_2\text{O}_6:\text{Tb}^{3+}$  nanophosphor. *Indian Journal of Physics* 89: 899–906.

**Mhlongo, G.H., Motaung, D.E. & Swart, H.C.** 2015.  $\text{Pd}^{2+}$  doped ZnO nanostructures: Structural, luminescence and gas sensing properties. *Materials Letters* 160: 200–205.

**Mochane, M.J. & Luyt, A.S.** 2015. The effect of expanded graphite on the thermal stability, latent heat, and flammability properties of EVA/wax phase change blends. *Polymer Engineering and Science* 55: 1255–1262.

**Mofokeng, J.P. & Luyt, A.S.** 2015. Dynamic mechanical properties of PLA/PHBV, PLA/PCL, PHBV/PCL blends and their nanocomposites with  $\text{TiO}_2$  as nanofiller. *Thermochimica Acta* 613: 41–53.

**Mofokeng, J.P. & Luyt, A.S.** 2015. Morphology and thermal degradation studies of melt-mixed poly(lactic acid) (PLA)/poly( $\epsilon$ -caprolactone) (PCL) biodegradable polymer blend nanocomposites with  $\text{TiO}_2$  as filler. *Polymer Testing* 45: 93–100.

**Mofokeng, J.P. & Luyt, A.S.** 2015. Morphology and thermal degradation studies of melt-mixed PLA/PHBV biodegradable polymer blend nanocomposites with  $\text{TiO}_2$  as filler. *Journal of Applied Polymer Science* 132: 42138.

**Molaba, M.P., Dudić, D. & Luyt, A.S.** 2015. Influence of the presence of medium-soft paraffin wax on the morphology and properties of iPP/silver nanocomposites. *Express Polymer Letters* 9: 901–915.



Training in the application of cathodoluminescence (CL) on the JEOL 7800 microscope by Dr Paul Spellward from the UK (front left) for personnel. Ms Puseletso Mokoena (Physics) sits front right, and at the back (from left to right) are Mss Megan Purchase (Geology), Hanlie Grobler (Microscopy), and Prof Ted Kroon (Physics).



Dr Eric Reitz (director at LCAM in Amsterdam) and Prof Pieter van Wyk during his visit to LCAM to discuss and compare operational affairs of European microscope centres with those in South Africa.

**Molefe, F.V., Koao, L.F., Dejene, B.F. & Swart, H.C.** 2015. Phase formation of hexagonal wurtzite ZnO through decomposition of  $\text{Zn}(\text{OH})_2$  at various growth temperatures using CBD method. *Optical Materials* 46: 292–298.

**Motloung, S.V., Dejene, F.B., Swart, H.C. & Ntwaeaborwa, O.M.** 2015. Effects of  $\text{Cr}^{3+}$  mol% on the structure and optical properties of the  $\text{ZnAl}_2\text{O}_4:\text{Cr}^{3+}$  nanocrystals synthesized using sol-gel process. *Ceramics International* 41: 6776–6783.

**Noto, L.L., Ntwaeaborwa, O.M., Yagoub, M.Y.A. & Swart, H.C.** 2015. Enhancement of persistent luminescence of  $\text{ZnTa}_2\text{O}_6:\text{Pr}^{3+}$  by addition  $\text{Li}^+$ ,  $\text{Na}^+$ ,  $\text{K}^+$  and  $\text{Cs}^+$  ions. *Materials Research Bulletin* 70: 545–552.

**Noto, L.L., Yagoub, M.Y.A., Ntwaeaborwa, O.M. & Swart, H.C.** 2015. Persistent photoluminescence emission from SrTa<sub>2</sub>O<sub>6</sub>:Pr<sup>3+</sup> phosphor prepared at different temperatures. *Ceramics International* 41: 8828-8836.

**Nyenge, R.L., Shaat, S.K.K., Noto, L.L., Mokoena, P.P., Swart, H.C. & Ntwaeaborwa, O.M.** 2015. TOF SIMS analysis, structure and photoluminescence properties of pulsed laser deposited CaS:Eu<sup>2+</sup> thin films. *Journal of Luminescence* 167: 172-178.

**Nyenge, R.L., Swart, H.C. & Ntwaeaborwa, O.M.** 2015. Luminescent properties, intensity degradation and X-ray photoelectron spectroscopy analysis of CaS:Eu<sup>2+</sup> powder. *Optical Materials* 40: 68-75.

**Ogugua, S.N., Shaat, S.K.K., Swart, H.C. & Ntwaeaborwa, O.M.** 2015. Optical properties and chemical composition analyses of mixed rare earth oxyorthosilicate (R<sub>2</sub>SiO<sub>5</sub>, R=La, Gd and Y) doped Dy<sup>3+</sup> phosphors prepared by urea-assisted solution combustion method. *Journal of Physics and Chemistry of Solids* 83: 109-116.

**Pajović, J.D., Dojčilović, R., Božanić, D.K., Kaščáková, S., Réfrégiers, M., Dimitrijević-Branković, S., Vodnik, V.V., Milosavljević, A.R., Piscopiello, E., Luyt, A.S. & Djoković, V.** 2015. Tryptophan-functionalized gold nanoparticles for deep UV imaging of microbial cells. *Colloids and Surfaces B: Biointerfaces* 135: 742-750.

**Pawade, V.B., Swart, H.C. & Dhoble, S.J.** 2015. Review of rare earth activated blue emission phosphors prepared by combustion synthesis. *Renewable and Sustainable Energy Reviews* 52: 596-612.

**Som, S., Kumar, V., Kumar, V., Gohain, M., Pandey, A., Duvenhage, M.M., Terblans, J.J., Bezuindenhoud, B.C.B. & Swart, H.C.** 2015. Dopant

distribution and influence of sonication temperature on the pure red light emission of mixed oxide phosphor for solid state lighting. *Ultrasonics Sonochemistry* 28: 79-89.

**Yousif, A., Kroon, R.E., Coetsee, E., Ntwaeaborwa, O.M., Seed Ahmed, H.A.A. & Swart, H.C.** 2015. Luminescence and electron degradation properties of Bi doped CaO phosphor. *Applied Surface Science* 356: 1064-1069.

**Yousif, A., Som, S., Kumar, V. & Swart, H.C.** 2015. Comparison and analysis of Eu<sup>3+</sup> luminescence in Y<sub>3</sub>Al<sub>5</sub>O<sub>12</sub> and Y<sub>3</sub>Ga<sub>5</sub>O<sub>12</sub> hosts material for red lighting phosphor. *Materials Chemistry and Physics* 166: 167-175.

#### Conference Contributions

**Dithebe, K., Pohl, C.H., Swart, C.W., Coetsee, E., Van Wyk, P.W.J., Lodolo, E. & Swart, C.W.** 2015. *Gas bubble discovery in fermenting yeasts*. Poster presented at the 32<sup>nd</sup> International Specialized Symposium on Yeast (ISSY32): Yeast biodiversity and biotechnology in the 21<sup>st</sup> century, Perugia, Italy. 7-11 November.

**Kgotle, E., Dithebe, K., Pohl, C.H., Swart, H.C., Coetsee, E., Van Wyk, P.W.J. & Swart, C.W.** 2015. *Gas bubble formation in fermenting and non-fermenting yeasts*. Poster presented at the 32<sup>nd</sup> International Specialized Symposium on Yeast (ISSY32): Yeast biodiversity and biotechnology in the 21<sup>st</sup> century, Perugia, Italy. 7-11 November.

**Saaiman, S., Pohl, C.H., Van Wyk, P.W.J. & Swart, C.W.** 2015. *Exposing gas bubbles in the fungus Rhizopus oryzae*. Poster presented at the 32<sup>nd</sup> International Specialized Symposium on Yeast (ISSY32): Yeast biodiversity and biotechnology in the 21<sup>st</sup> century, Perugia, Italy. 7-11 November.

## Staff

**Professor:** Prof PWJ van Wyk.

**Lecturer:** Dr CW Swart-Pistor.

**Assistant Officer:** Ms H Grobler.

**Contract Appointment:** Ms P Mokoena.

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# Centre for Sustainable Agriculture, Rural Development and Extension

## Overview

Since our inception in 1994, the Centre for Sustainable Agriculture, Rural Development and Extension (CENSARD) was placed at the forefront of professional training, offering an interdisciplinary overview of the agricultural environment and constantly developing innovative and interactive collaboration initiatives. During the course of the 2015 academic year, the centre, under new leadership, shifted its focus from everyday activities to curriculum development in order to provide a more comprehensive and relevant degree in Sustainable Agriculture. The newly formatted degree will entail more mobility between NQF qualification levels and increase accessibility for both the private and public arena.



Dr Precious Tirivanhu, Mrs N Tirivanhu (Dr Tirivanhu's mother), and niece Tinotenda Hanyani with Prof IB Groenewald at the 2015 graduation ceremony, where Dr Tirivanhu was awarded his PhD degree.

## Staff Achievements

The SASAE Floating Trophy for Young Professional 2015 was awarded to Dr JA van Niekerk for demonstrating a combination of service leadership and participation in conferences. The award was bestowed on 4 June 2015 at the Annual SASAE Congress held at Ingwenyama, White River.

## Student Achievements

During the 2015 academic year, 52 first-year students registered for the two-year master's programme. In addition, 38 second-year students completed their master's degrees in Sustainable Agriculture (MSA).

In June 2015, 81 students enrolled for the Advanced Diploma in Sustainable Agriculture, which is presented for Agricultural Extension Advisors in Dohné in the Eastern Cape. Towards the end of the 2015 academic year, an additional 83 graduates completed their qualifications. The centre registered five PhD candidates during the course of 2015 and one PhD. Dr Precious Tirivanhu completed his PhD thesis entitled "Systematic integration of knowledge and dialogue in Mhakwe Comprehensive Community Initiative in Zimbabwe". He utilised a methodology not commonly used within the African context which is anchored in a multi-sectoral, multi-stakeholder, and multi-level approach to bring about holistic changes within communities.

## Activities

The centre again played a crucial role in the organisation of the *Landbouweekblad* Conference hosted on campus on 5 and 6 October 2015, where 250+ attendees were addressed by experts in various fields of agriculture.

## Research

The Food and Agricultural Organization (FAO) of the United Nations contracted CENSARD to evaluate good management practices in agricultural extension in the different provinces in South Africa; the first province in which the research will be conducted is the Western Cape province. The results of this research project will be published and presented at international congresses.

One of our PhD students, Ms Jacqui-Anne Middleton, is researching the impact of public-private partnerships on schooling in rural communities in the central region of South Africa. As an educator for 22 years, Jacqui-Anne's passion has always been teaching, and through the Centre for Sustainable Agriculture she has been able to combine her two loves – education and the sustainability of rural communities. Of particular interest to her are the various models of public-private partnerships in education and whether a foolproof model can be developed specifically to boost rural education, which is a crisis in South Africa, even after 22 years

of democracy. To this end, Jacqui-Anne is embedding herself into the communities that support and are dependent on merino sheep farming for their livelihoods in the central Karoo area of South Africa.

Mr JW Swanepoel commenced with his research on the “Commercialisation of Western Cape small farmers and improving food security through agricultural extension by developing the value chain: A case study of Western Cape typologies”. The focus of the research is based on the resolve that in order for subsistence and small-scale farmers to escape their current situation and grow financially and to improve food security, they will have to produce on a commercial scale. A direct result of commercialisation is gaining access to the value chain. A thorough extension system can contribute significantly to the commercialisation of subsistence and small-scale farmers. It can also aid to ensuring food security for households in the Western Cape. His research is instrumental in the paradigm shift from rural household to commercial farming.

## National and International Collaboration

The Centre for Sustainable Agriculture has a close relationship with FAO of the United Nations in Rome. The head of the division for extension, Dr Magdalena Blum, is involved with curriculum development and class presentation at the centre.

Ms Hlamalani Ngwenya has become involved with the centre in presenting classes and assisting in curriculum development. She is involved with the Global Forum for Rural Advisory Services (GFRAS), where she plays a large role in curriculum development.

## Staff Matters

Prof Izak Groenewald, who was the pillar of strength for the centre and instrumental in its establishment and success over the past 20 years, retired in the middle of 2015. His initiatives and passion for the centre and its students and staff will be treasured and long remembered.

## Research Outputs

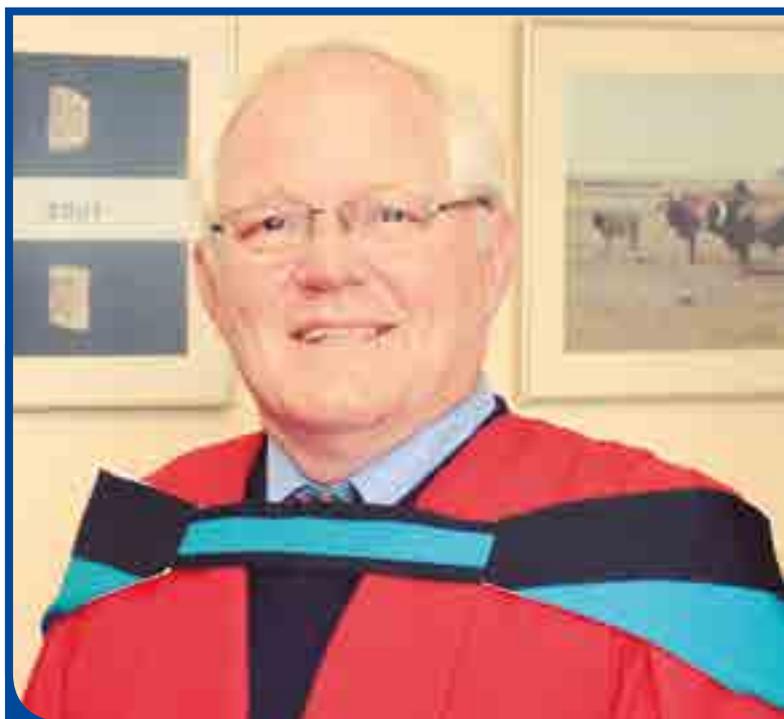
### Research Articles

**Groenewald, I.B., Nkosi, B.D., Meeskeb, R., Langaa, T., Motianga, M.D., Modibaa, S. & Mkhizea, N.R.** 2015. Effects of ensiling forage soybean (*Glycine max* (L.) Merr.) with or without bacterial inoculants on the fermentation characteristics, aerobic stability and nutrient digestion of the silage by Damara. *Small Ruminant Research* 134: 90-96.

**Groenewald, I.B., Nkosi, B.D., Meeskeb, R., Langaa, T., Motianga, M.D., Mutavhatsindia, T.F., Thomasa, R.S. & Baloyida, J.J.** 2015. The influence of ensiling potato hash waste with enzyme/bacterial inoculant mixtures on the fermentation characteristics, aerobic stability and nutrient digestion of the resultant silages by rams. *Small Ruminant Research* 127: 28-35.



Dr JA Van Niekerk hosting a PhD workshop in Durban, KwaZulu-Natal, in 2015.



Prof IB Groenewald.

**Tirivanhu, P., Matondi, P.B. & Groenewald, I.B.** 2015. Comprehensive community initiative: Evaluation of a transformation system in Mhakwe Community in Zimbabwe. *Development Southern Africa Journal* 32(6): 785-800.

**Van Niekerk, J.A., Mahlobogoane, M. & Tirivanhu, P.** 2015. The transfer of intergenerational knowledge for sustainable commercial farming in Mpumalanga Province of South Africa: Lessons for extension. *Journal of the South African Association for Agricultural Extension* 43(1): 66-77.

**Van Niekerk, J.A., Odunze, D. & Ndlovu, S.** 2015. Assessment of factors that impact on the viability of contract farming: A case study of maize and soya beans in Mashonaland west and central provinces in Zimbabwe.

*Suid-Afrikaanse Tydskrif vir Landbouvoortligting / South African Journal for Agricultural Extension* 43(2): 78-90.

**Zwane, E.M., Van Niekerk, J.A. & Groenewald, I.B.** 2015. Does participation in agriculture improve output: An experience from Limpopo's broadening agricultural services and extension delivery (based) programme. *International Journal of Agricultural Extension*: 2311-6110.

#### Conference Contribution

**Maré, H.P. & Maré, F.A.** 2015. *A decision support model for the adoption of precision agriculture practices*. Proceedings of the 20<sup>th</sup> International Farm Management Congress of the International Farm Management Association, Quebec, Canada. pp. 129-137.

## Staff

**Senior Lecturers:** Dr JA van Niekerk.

**Researchers/Research assistants:** Dr P Tirivanhu and Ms SD Ndlovu.

**Professors Extraordinaire:** Profs E Nesamuvuni and Alice Pell.

**Research Associates:** Prof IB Groenewald, Drs C Dlamini, D Nkosi, F Terblanche, E Zwane, and K Davis.

**Officers: Professional Services:** Mrs G Green, Mrs R Coetzee, and Ms A Calitz.

## Contact Details

**Dr Johan (JA) van Niekerk**

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# Paradys Experimental Farm

## Overview

Paradys Experimental Farm is located 14 km from the UFS Main Campus. During the last year, the experimental farm downscaled to three agricultural branches; namely sheep and cattle farming and lapa rental. The core function of Paradys Experimental Farm is to act as an



Paradys farmers' day.



Sewing class.

extension of the Department of Animal, Wildlife and Grassland Sciences for research and practical application of theoretical knowledge in practice for undergraduate and postgraduate students. The experimental farm is also used for the empowerment of commercial and emerging farmers in livestock and crop cultivation.

Each year is started by welcoming the prospective Agriculture students and their parents on the experimental farm and taking them on a tour of each branch. In this way, good cooperation between Agriculture students is formed from an early stage and a foundation is laid for parents and students to feel at home at the UFS. One hundred and fifty parents and students were involved in this prestigious function. The day demonstrated the faculty's dedication towards agricultural training, and the workshop gave parents the opportunity to meet lecturers and ask them questions.

Paradys Experimental Farm once again accommodated students in the cattle branch as part of a farm management and theory internship. As such, these students were exposed to the practice and the challenge of the agricultural sector on the farming level. The internship system is designed to grant continuity to the management system, and senior students are required to continuously mentor junior students in the respective business branches.

Paradys especially focuses on establishing sustainable farming practices on the experimental farm. The primary goal of establishing such practices is to stimulate agricultural business and to expose students to all the trends in the agricultural sector. Structural changes were made in all the branches in order to succeed in this goal. The development of some of the non-sustainable branches is currently attended to. The processes are already in a very advanced stage and will probably be completed in the next two years.

More than 956 undergraduate students attended practical demonstrations on the experimental farm. The experimental farm offers especially students who do not come from farms the opportunity to better understand the experience of agricultural business and to apply it to their studies in a more relevant manner. The implemented methods stimulate their interest and their insight into the industry. Learners from Lesotho visited the farm, where lectures and demonstrations were presented to stimulate their interest in agriculture.

The contribution of the experimental farm to the agricultural business and communities progressed significantly in the last year.

### Sheep Branch

Mr J Barnard is in charge of the day management of the flock.

Despite 2015 being an extraordinarily dry year, the sheep branch performed really well. The conception in the flock of 135 ewes was 90%,

and the lambing percentage was 167%. The latter was due to the fact that 85% of the ewes had multiple births.

Synchronisation and AI were used to inseminate the ewes. Of all the lambs that were born, the mortality rate was only 3%.

Various practical sessions on sheep physiology and management were presented to UFS students and schools. The flock currently consists of 135 ewes and 56 replacement ewes.

#### **Beef Cattle Branch**

Mr J Barnard is in charge of the day management of the herd. The conception of the Afrikaner herd of cows was 80%. The stud animals currently consist of 147 breeding cows. In addition, a cross system was implemented with Simmentaler, of which 45 Afrikaner cows were mated with a Simmentaler bull. The cross system will be extended to a three-point cross which will result in Afrisim. This was also the first year where a pure white Afrikaner calf was born, which is a good indication of the diversity in the UFS flock's genetics.

Various practical sessions were presented about the management and handling of cattle. The practical sessions were attended by UFS students and school learners.

Various types of feed were planted to provide food for the sheep and cattle, especially considering the drought our country experienced.

#### **Lapa Branch**

Ms A Smith manages the lapa.

The lapa is a popular venue for weddings, farmers' days, fundraising projects, and general functions. The lapa can accommodate 120 people for weddings and there is also room in the garden area. The garden and the surroundings are the perfect setting for photographs. During farmers' days and workshops, the lapa can accommodate 180 people. We have also presented many UFS workshops and departmental year-end functions. Some of the functions held in the lapa in 2015 include the following:

- Senwes presented two farmers' days at the lapa; one with the latest technology for soil cultivation and the other with the latest medicine for internal parasites in sheep.
- The experimental farm hosts Top Pig's annual pig information day for students and farmers, during which farmers can market their latest products.
- ER 24, together with the police, had their annual training sessions on the experimental farm.
- A successful art exhibition and music/song night was also hosted at the lapa, where the music enchanted everyone.
- School training days were also presented, where primary and secondary schools from Lesotho brought their learners to promote their interest in agriculture.
- Various churches host their annual year-end function at the lapa, with a picnic for all the members. On Sundays they also have country sport and public worship in the lapa and in the garden.

## Staff

**Farm Manager:** Dr MC van der Westhuizen.

**Administrative Manager:** Ms Amanda Smith.

**Assistant Officer:** Mr Johan Barnard.

**Student:** Mr Jethro Parker.

**Farm Workers:** Mss A Seboniyane, E Seboniyane, Messrs T Khubeka, P Somi, S Motswari, P Ramatekoane, P Moriribela, and A Ikhumalo.

**Security:** Messrs A Khoele, E Maqala, E Selepe, and A Mkaka.

## Contact Details

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# Project EnSci

# Engineering Sciences

## Overview

The programme in Engineering Sciences started in 2014 and currently has 36 students enrolled over three years. The degree, known as a BSc majoring in Physics and Engineering subjects, provides a foundation in Physics with an additional focus on the required foundational skills in



Ms Friedemarie Kuschke, third from left, second-year EnSci student, won Top Tutor for Natural and Agricultural Sciences, as well as overall Top Tutor at the Academic Student Tutorial and Excellence Programme 2015.



Students attending practical work at SA Truck Bodies, f.l.t.r. Damund de Klerk, Shaundré van den Berg, JP Swanepoel, Friedemarie Kuschke, Jonathan Sterling, Seani Pandelane.

Engineering Sciences. This empowers the successful graduate with the flexibility to choose between several possibilities to suit his/her career interests, namely:

- Enter the work environment;
- Continue with postgraduate Physics studies; or
- Pursue further discipline-specific engineering studies at another university acknowledging the UFS modules.

After successful completion of two years at another university, an additional BEng degree can be obtained. Current possible disciplines are civil, mechanical, mechatronic, electrical, and electronic engineering.

## Progress

Engineering Sciences has completed the development of 20 of the required 29 new engineering-related teaching modules. Phase 1 (of 8) of the Engineering Sciences building has been completed, providing staff and lecturing facilities for up to 90 students. Practical equipment for laboratories is currently being acquired and a fully equipped workshop is under construction.

Engineering Sciences is also building capacity to enter the Energy Engineering, Energy Management, and Energy Auditing sector through the training of staff; with the first MSc postgraduate research theme being the storage of passive solar energy in underfloor heat storage mediums.

Engineering Sciences is currently expanding the agreements with other universities to accept UFS graduates from two to four universities.

## Staff Matters

Engineering Sciences consist of two full-time staff members, namely the project manager, Mr Louis Lagrange, and senior assistant officer, Ms Christine du Toit, as well as two full-time academic staff members, Prof Hendrik Marx and Mr Ben Swart. Thirteen additional part-time, temporary lecturers are engaged to lecture until permanent staff can be sourced.



Staff members: Mr Louis Lagrange, Prof Hendrik Marx, Mr Ben Swart, and Mr Jaco Homann.

## Staff

**Professor:** Prof HJ Marx.  
**Senior Lecturer:** Mr LF Lagrange.

**Lecturer:** Mr BJ Swart.  
**Senior Assistant Officer:** Ms C du Toit.

## Contact Details

**Mr Louis Lagrange**  
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# Institute for Groundwater Studies (IGS)

## Overview

Since its establishment in 1974, the Institute for Groundwater Studies (IGS) has shown a gradual growth in the number of postgraduate students. The institute is proud of the continued quality and excellence in pursuit of the strategic priorities of the UFS. The enthusiasm and commitment of the institute's personnel and students were once again clearly illustrated in 2015. The personnel's determination and the will to work hard in the fields of research, teaching, and learning, and the continued support of the faculty and senior UFS management to achieve even higher levels of success, are gratefully acknowledged.

The institute's focus on its vision and mission can be seen in the research outputs and other activities. The vision of the institution is to be the preeminent groundwater institution in Africa for academic training and research. The mission of the institution is:

- to produce world-class postgraduate students who can apply their knowledge to ensure sustainable groundwater resources;
- to produce high-quality research that is relevant and practically applicable; and
- to serve the community through students, research, and actions that will empower stakeholders to manage groundwater sustainability.



The first Iphakade Workshop and Student Conference, organised by Dr Francois Fourie of the IGS, was held from 2–6 November 2015 on the Main Campus of the UFS.

## Student Achievements

The IGS Dux prize for the best honours student in Geohydrology was awarded to Ms Lizanne Bredenkamp, who had an average of 80%. Ms Bredenkamp is currently enrolled for her MSc degree in Geohydrology.

## Special Achievements

The new SADC Groundwater Management Institute (SADC GMI) will strengthen the UFS footprint in Africa and will be fully operational in 2016. The SADC GMI will have its offices in the IGS building on the Main Campus. The UFS will be responsible for the financial side of the operation. The IGS, SADC member states, and the World Bank are collaborating on this project, which will build sustainable groundwater management across regional borders. Universities in the region tendered for the project, but the IGS' proposal towered above the rest. The SADC GMI will strengthen the capacity of institutions to establish sustainable groundwater management. It will promote the management and development of groundwater infrastructures, and advance knowledge about national and transboundary groundwater. With the establishment of the new institute, research will be conducted, knowledge shared, and capacity built. According to Prof Vermeulen (Director: IGS), research has shown that groundwater is a primary source of water for more than 70% of the 250 million people in the drought-prone SADC region. The rapid expansion of commercial farming and industry is putting great pressure on water resources; for example, 67% of all water is used in agriculture. The SADC GMI is about distributing knowledge across the SADC region. The official collaboration between the UFS, the World Bank, and the SADC countries will contribute to the achievement of this goal.

The first Iphakade Workshop and Student Conference organised by Dr Francois Fourie was held from 2–6 November 2015 on the Main Campus of the UFS. The main purpose of the workshop was to raise awareness among the delegates of the challenges we face in terms of our water resources, and to stimulate their interest in finding solutions to problems.

Themes were developed around the hydrological cycle, addressing the importance of water in each component of this cycle, as well as its sensitivity to impacts from human activity. Specific focus was placed on the water challenges faced in South Africa.

During the workshop, 23 specialists from various academic, governmental, and private institutions were invited to give presentations on their specific fields of expertise in water. Approximately 40 Iphakade students, representing various South African universities, attended the workshop and student conference. During the student conference, 15 students delivered oral presentations on their postgraduate research.



The workshop also included three field excursions:

- A visit to the Rustfontein Water Treatment Works, which allowed the participants to gain insight into the processes involved in the purification and supply of potable municipal water, as well as the current challenges faced in meeting the growing demand for water.
- During an excursion to the Paradys Experimental Farm, participants were exposed to a number of geophysical techniques commonly used in groundwater exploration, as well as to the techniques used to determine the volumes of water that can be sustainably abstracted from a water borehole.
- While visiting the Florisbad Quaternary Research Station, the participants learned about the interesting and particular hydrogeological conditions that exist at the site and how these conditions relate to the rich fossil finds associated with the thermal springs that occur at the site.

## Research

All the academic staff are involved in research (e.g. Water Research Commission, Department of Water Affairs, Coaltech, Sasol, and software development) and consulting projects (e.g. mining, water provision) in the industry. Projects currently amount to close to R10 million. This ensures that we stay in touch with what the industry wants and also generate money for research and bursaries.

## International Collaboration

The IGS received a visit from Mr Shammy Puri, the Secretary-General of the International Association of Hydrogeologists (IAH). The aim of the visit was to further cooperation between the IAH and IGS regarding transboundary aquifers in the SADC region. The IAH is a scientific and educational charitable organisation for scientists, engineers, water managers, and other professionals working in the fields of groundwater resource planning, management, and protection. The IAH is the leading international society for the science and practice of hydrogeology, and is a globally recognised information source and facilitator for the transfer of groundwater knowledge.

Mr Shammy Puri was elected Secretary-General of the IAH in 2008, and chaired the Commission on Transboundary Aquifer Resources Management (TARM) from 1998 to 2011. During his visit, Mr Puri also presented lectures to the postgraduate students at the institute on transboundary aquifers. He was also invited by the dean of the Faculty of Natural and Agricultural Sciences, Prof Neil Heideman, to present the faculty prestige lecture later this year.

## Postgraduate Students

The 2015 year was filled with achievements and was especially good for the institute in terms of postgraduate student numbers. The institute had

a record number of 94 students enrolled in 2015 for the honours, MSc, and PhD degrees. The students who exit these programmes are highly trained.

It is important that the students at the IGS are exposed to the practical issues of groundwater. A field trip from June to July is arranged annually for the new students to at least two different locations.

Students spend the first two days in the field, studying the interaction between geology and groundwater flow. The second part of the field trip may include a mine, a power station, or a petrochemical site. Groundwater plays an important role in the industry, especially regarding water volumes and the availability and the contamination thereof.

During the Mining course, a trip is organised to a mine for conceptualisation.



From left to right: Prof Neil Heideman, dean of the Faculty of Natural and Agricultural Sciences, Mr Shammy Puri, Secretary-General of the IAH, and Prof Danie Vermeulen, director of the IGS.



Field trip of postgraduate students in 2015.

## Staff Matters



Dr Abdon Atangana.

Dr Abdon Atangana, postdoctoral researcher at the IGS, has been appointed from 1 July 2015 at the IGS as senior researcher. Dr Atangana brought a new dimension to the word “productive”. Over the past few years Dr Atangana has published several articles in accredited journals and presented papers at international conferences in the USA, Turkey, and Thailand. Dr Atangana is truly the embodiment of the UFS’ core value of inspiring excellence.

## Research Activities

A significant and sustained number of research outputs was produced in 2015. The IGS’ winning recipe for its high number of research outputs is time management and excellent research capabilities.

Ms Amy Allwright (Groundwater modelling lecturer and PhD student) was given the opportunity to attend the FEFLOW conference on Modelling the World of Groundwater with MIKE by DHI in Berlin, Germany, in September 2015. The go-to conference for groundwater modellers worldwide concluded with great success. The FEFLOW Conference – Modelling the World of Groundwater with MIKE, Powered by DHI, is held once every three years. This year’s session was attended by close to 100 groundwater experts: consultants, researchers, and engineers from the private sector and government agencies around the world. The event was a gem for industry experts interested in keeping up to date with the current topics of groundwater modelling, learning about new FEFLOW applications, and building and expanding their networks. The conference was headed by seven globally renowned keynote speakers, and experienced FEFLOW users also presented and shared their modelling knowledge. The organising committee also presented awards for the best poster and oral presentations.

The Tenth International Conference on Acid Rock Drainage and the International Mine Water Association’s Annual Meeting, ICARD-IMWA 2015, was held from 21–24 April 2015 at the Grand Hyatt Hotel in Santiago,

Chile. Over 400 delegates from 31 countries attended 186 presentations.

Participants had a chance to visit the facilities of Los Pelambres Mine on the field trip that generated great interest amongst the professionals. ICARD is the world’s leading event in acid rock drainage and takes place every three years. IMWA is the first international scientific technical association dedicated to mine water issues since its founding in 1979. Mr Eelco Lukas, Ms Lore-Mari Deysel, and Prof Danie Vermeulen from the IGS presented papers at this conference.

The International Conference on Groundwater Vulnerability – From Scientific Concept to Practical Application was held in Poland from 25–29 May 2015. The conference was organised by the University of Silesia and the Polish Chapter of the IAHR. The following topics were proposed for coverage during the conference:

- Development of the vulnerability concept; intrinsic or specific vulnerability maps.
- Groundwater vulnerability assessment for different groundwater systems.
- Groundwater vulnerability assessment in urbanised and heavily transformed mining areas.
- Uncertainty in vulnerability assessment methods.
- Validation of vulnerability maps.
- Vulnerability maps in practical land use management.
- New issues in vulnerability mapping in the context of the EU-WFD/GWPD.
- Groundwater vulnerability.
- Groundwater pollution risk.

The paper entitled “Aquifer vulnerability assessment of the Dahomey Basin using RTt method” (by Dr Oke Saheed, Prof Danie Vermeulen, and Dr Modreck Gomo) was accepted. The presenter of the paper, Dr Oke Saheed, is one of our postdoc researchers, who obtained his PhD in Geohydrology in December 2015.

Dr Gomo attended the American Association for the Advancement of Science (AAAS) and the Third World Academy of Sciences (TWAS) Diplomacy Workshop from 29 November to 4 December 2015 in Trieste, Italy. The workshop offered a platform to learn and gain skills on aspects related to communication and diplomacy for sustainable development and management of water resources.

The 14<sup>th</sup> Groundwater Division of the Geological Society of South Africa Conference took place at Muldersdrift from 21–23 September 2015. The Biennial Ground Water Division Conference is the premier groundwater conference in South Africa and covers a broad spectrum of research and development, policy and regulation, and implementation areas. Groundwater is no longer a mysterious resource that is hidden; we can describe it using well-established laws, as well as with direct and indirect observations. It is a major and strategic resource in South Africa and will become even more so in the future as we look at alternative water supply options. The following postgraduate students and staff members presented papers at the conference: Ms Dakalo Makhokha, Mr Kobus Haumann, Ms Musiwa Luruli, Ms Manthofeela Makoae, Ms Lebohang Molaba, Mr Teboho Shakhane, Ms Lizanne Bredenkamp, Mr Freek van Deventer, Mr Jean van Niekerk, and the following staff members: Prof Danie Vermeulen, Mr Eelco Lukas, Mr Paul Lourens, Ms Lore-Mari Deysel, Drs Johan van der Merwe,



Francois Fourie, and Modreck Gomo.

Dr Oke Saheed, one of our postdoc researchers, presented a paper at the Eighth Quantity Surveying conference on the Main Campus of the UFS. The conference's main theme was "Cementing the future" and was held from 14–16 October 2015.

## Research Outputs

### Research Articles

**Aphane, V. & Vermeulen, P.** 2015. Acid mine drainage and its potential impact on the water resources in the Waterberg coalfield. *Applied Mathematical Modelling* 118: 55-77.

**Atangana, A.** 2015. Modeling the Enzyme Kinetic Reaction. *Acta Biotheoretica* 1-18.

**Atangana, A.** 2015. Extension of the sumudu homotopy perturbation method to an attractor for one-dimensional keller-segel equations. *Applied Mathematical Modelling* 39(10): 2909-2916.

**Atangana, A.** 2015. A new defy for iteration methods. *Journal of Applied Analysis and Computations* (3): 273-283.

**Atangana, A.** 2015. On the stability and convergence of the time-fractional variable order telegraph equation. *Journal of Computational Physics* 293: 104-114.

**Atangana, A.** 2015. Numerical analysis of time fractional three dimensional diffusion equation. *Thermal Science* 19(1): 7-12.

**Atangana, A.** 2015. Extension of the resistance, inductance, capacitance electrical circuit to fractional derivative without singular kernel. *Advances in Mechanical Engineering* 7(6): 1-6.

**Atangana, A.** 2015. A novel model for the Lassa Hemorrhagic Fever: Deathly disease for pregnant women. *Neural Computing and Applications* 26: 1895-1903.

**Atangana, A. & Alkahtani, B.S.T.** 2015. Analysis of the Keller-Segel Model with a Fractional Derivative without Sinular Kernel. *Entropy* 17(6): 4439-4453.

**Atangana, A. & Alabaraoye, E.** 2015. A possible modification of groundwater flow equation using coordinate transformations. *Water Science and Technology: Water Supply* 15(2): 278-287.

**Atangana, A. & Alabaraoye, E.** 2015. On the modified groundwater flow equation: Analytical solution via iteration method. *Hydrological Processes* 29(19): 4284-4292.

**Atangana, A. & Baleanu, D.** 2015. On modelling the groundwater flow within a confined aquifer. *Romanian Journal of Physics* 60(3-4): 573-582.

**Atangana, A., Baleanu, D. & Ahmed, A.** 2015. New properties of conformable derivative. *Open Mathematics* 13: 889-898.

**Atangana, A., Baleanu, D., Yang, X. & Mohamed I Al Qurash, M.** 2015. On the nonlinear perturbation ( $n$ ), Rosenau-Hyman equation: A model of nonlinear scattering waves. *Advances in Mathematical Physics* 15: 1-8.

**Atangana, A. & Goufo, E.** 2015. Solution of diffusion equation with local derivative with new parameter. *Thermal Science* 19(1): 231-238.

**Atangana, A. & Nieto, J.J.** 2015. Numerical solution for the model of RLC circuit via the fractional derivative without singular kernel. *Advances in Mechanical Engineering* 700: 1-7.

**Batogna, R.G. & Atangana, A.** 2015. Comparison of two iteration methods for solving nonlinear fractional partial differential equations. *International Journal of Mathematical Models and Methods in Applied Sciences* 9: 105-

113.

**Dubey, R.S., Saad, B., Alkahtani, Badr Saad, T. & Atangana, A.** 2015. Analytical solution of space-time fractional fokker-planck equation by homotopy perturbation sumudu transform method. *Mathematical Problems in Engineering* 1-7

**Gomo, M. & Vermeulen, D.** 2015. An investigative comparison of purging and non-purging groundwater sampling methods in Karoo aquifer monitoring wells. *Journal of African Earth Sciences* 103: 81-88.

**Goufo, E. & Atangana, A.** 2015. Extension of fragmentation process in a kinetic-diffusive wave system. *Thermal Science* 19(1): 13-23.

**Goufo, E. & Atangana, A.** 2015. A model of the groundwater owing within a leaky aquifer using the concept of local variable order derivative. *Journal of Nonlinear Science and Applications* 8(5): 763-775.

**Kumar, D., Purohit, S., Secer, A. & Atangana, A.** 2015. On generalized fractional kinetic equations involving generalized bessel function of the first kind. *Mathematical problem in Engineering*: 1-7.

### Book

**Atangana, A.** 2015. *Local derivative with new parameter: Theory, methods and applications*. Elsevier: Academic Press.

### Chapter in Book

**Atangana, A.** 2015. Application of fractional calculus to epidemiology. In *Fractional dynamics*, edited by C. Cattani, H.M. Srivastava and Xiao-Jun Yang. Berlin, Germany: De Gruyter. Chapter 10.

### Conference Contributions

**Bredenkamp, L.** 2015. *Hydraulic fracturing and Water Resources: Separating fact from fiction*. Paper delivered at the 14<sup>th</sup> Biennial Groundwater Conference: From theory to action, Groundwater division (GWD) of the Geological Society of South Africa (GSSA), Muldersdrift, South Africa. 21-23 September.

**Deysel, L.** 2015. *An Acid Base accounting study of the coal-bearing formations in the Waterberg coalfield*. Paper delivered at the 14<sup>th</sup> Biennial Groundwater Conference: From theory to action, Groundwater division (GWD) of the Geological Society of South Africa (GSSA), Muldersdrift, South Africa. 21-23 September.

**Fourie, F.** 2015. *Introduction to National Groundwater Strategy*. Paper delivered at the 14<sup>th</sup> Biennial Groundwater Conference: From theory to action, Groundwater division (GWD) of the Geological Society of South Africa (GSSA), Muldersdrift, South Africa. 21-23 September.

**Gomo, M.** 2015. *Effects of artefacts other than horizontal groundwater flux on a single-borehole tracer dilution test: Field evidence*. Paper delivered at the 14<sup>th</sup> Biennial Groundwater Conference: From theory to action, Groundwater division (GWD) of the Geological Society of South Africa (GSSA), Muldersdrift, South Africa. 21-23 September.

**Haumann, K.** 2015. *Investigating the impact of fertilizer effluent disposed in quarries on groundwater quality*. Paper delivered at the 14<sup>th</sup> Biennial Groundwater Conference: From theory to action, Groundwater division (GWD) of the Geological Society of South Africa (GSSA), Muldersdrift, South Africa. 21-23 September.

**Lourens, P.J.H.** 2015. *Investigating the influence of fine ash leaching in a tailings dam on the underlying aquifers*. Paper delivered at the 14<sup>th</sup> Biennial Groundwater Conference: From theory to action, Groundwater division (GWD) of the Geological Society of South Africa (GSSA), Muldersdrift, South Africa. 21-23 September.

Africa. 21–23 September.

**Lukas, E. & Vermeulen, P.D.** 2015. *A management plan towards the flooding of an open-cast mine with adjacent underground sections.* Paper delivered at the 10<sup>th</sup> International Conference on Acid Rock Drainage (ICARD) & the International Mine Water Association's (IMWA) Annual Meeting (ICARD-IMWA 2015), Grand Hyatt Hotel, Santiago, Chile. 21–24 April.

**Lukas, E.** 2015. *A management plan towards the flooding of an open-cast mine with adjacent underground sections.* Paper delivered at the 14<sup>th</sup> Biennial Groundwater Conference: From theory to action, Groundwater division (GWD) of the Geological Society of South Africa (GSSA), Muldersdrift, South Africa. 21–23 September.

**Makhokha, D. & Fourie, F.** 2015. *A systematic approach to the interpretation of conductivity anomalies across intrusive dolerite dykes and sills in the Karoo supergroup.* Paper delivered at the 14<sup>th</sup> Biennial Groundwater Conference: From theory to action, Groundwater division (GWD) of the Geological Society of South Africa (GSSA), Muldersdrift, South Africa. 21–23 September.

**Makoe, M., Molaba, L., Van der Merwe, J. & Fourie, F.** 2015. *Investigating the potential of using groundwater associated with a ring dyke to augment the municipal water supply to Bloemfontein.* Paper delivered at the 14<sup>th</sup> Biennial Groundwater Conference: From theory to action, Groundwater division (GWD) of the Geological Society of South Africa (GSSA), Muldersdrift, South Africa. 21–23 September.

**Mphambukeli, T.N. & Oke, S.A.** 2015. *Towards sustainability: Practical options for irrigation water conversation at the Bloemfontein campus of the University of the Free State.* Paper delivered at the 8<sup>th</sup> Annual Quantity Surveying Research Conference 2015: Cementing the future,

Bloemfontein, South Africa, 15–16 October.

**Oke, S.A., Vermeulen, P.D. & Gomo, M.** 2015. *Aquifer vulnerability assessment of the Dahomey Basin using RTt method.* Paper delivered at the International Groundwater Vulnerability Conference: Groundwater vulnerability – from scientific concept to practical application, Ustron, Poland. 25–29 May.

**Shakhane, T. & Fourie, F.** 2015. *Quantifying groundwater-surface water exchange fluxes based on the steady state riparian area aquifer water balance.* Paper delivered at the 14<sup>th</sup> Biennial Groundwater Conference: From theory to action, Groundwater division (GWD) of the Geological Society of South Africa (GSSA), Muldersdrift, South Africa. 21–23 September.

**Van Deventer, F.** 2015. *Modelling recharge in an opencast coal mining environment, applying model parameters on a catchment scale.* Paper delivered at the 14<sup>th</sup> Biennial Groundwater Conference: From theory to action, Groundwater division (GWD) of the Geological Society of South Africa (GSSA), Muldersdrift, South Africa. 21–23 September.

**Van Niekerk, J.** 2015. *Water balance calculations in a rehabilitated environment.* Paper delivered at the 14<sup>th</sup> Biennial Groundwater Conference: From theory to action, Groundwater division (GWD) of the Geological Society of South Africa (GSSA), Muldersdrift, South Africa. 21–23 September.

## Staff

**Director:** Prof PD Vermeulen.

**Affiliate Associate Professor:** Prof KT Witthüser.

**Affiliated Researchers:** Prof JF Botha and Dr J van der Merwe.

**Senior Researcher:** Dr A Atangana.

**Researchers/Geohydrologists:** Drs FD Fourie, M Gomo, Messrs SS de Lange, and E Lukas.

**Junior Lecturer:** Ms A Allwright.

**Research Assistant:** Mr PJH Lourens.

**Chief Officer:** Financial Manager: Ms L Rust.

**Officer: Professional Services:** Ms A Rossouw.

**IGS Laboratory:**

**Deputy Director (IGS Laboratory):** Ms L-M Deysel.

**Assistant Director (IGS Laboratory):** Ms E de Necker.

**Assistant analyst:** Ms H Human.

**Officer:** Mss WC Geyer and N Gaonkile.

**Assistant Officer:** Ms J Smith.

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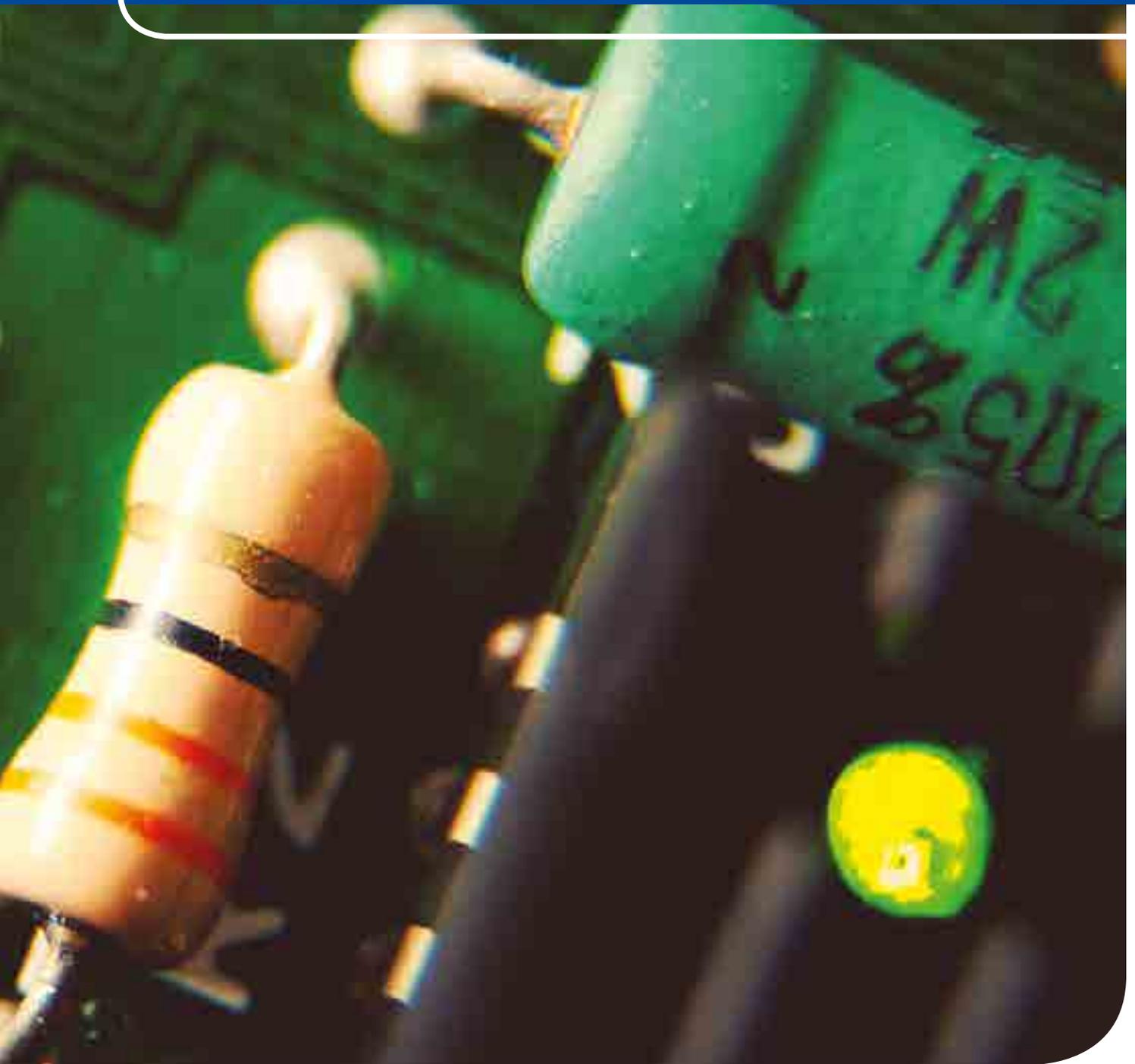
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# Academic Support Units

# Workshop

# Electronic Division

## Overview

The activities of the Electronics Division in 2015 were mainly dominated by the installation of security systems in the new Physics and Biotechnology buildings. At times it was very difficult to cope with all our duties. Our division saved the UFS an estimated R1.2 million by doing the work. The installation of these type of systems will, however, no longer be done by the Electronic Division because the UFS decided to outsource these types of installations.

The estimated saving for the Faculty of Natural Sciences for the past year is R4 258 800.00. This amount is calculated by taking the actual number of working hours minus the internal administration hours multiplied by R700.00. We repaired the following expensive apparatus: Versaprobe, XPS, ICP, SAM600, XRD, SAM700, Potensioestat, Access Control, and numerous other instruments.

An estimated amount of R2 500 000 was saved while repairing the above apparatus. The total savings amount is in the region of R6 758 800.

## Work Activities

A total of 442 work requisitions were received the past year, representing 931 apparatus. Of this number, 32 were for development projects. Some were new and others were extensions of existing systems, as well as the upgrading of older systems, as shown in Table 2 and 3.

Of a possible 6 096 working hours, 6 084 were actively used. Percentage-wise the active usage is calculated at 99.8%. The possible hours were calculated at 7.25 hours per day per person present.

Table 1 lists 33 departments and divisions that made use of the services of the Electronics Division. This is shown in 1 (Department); 2 (Total time spent); and 3 (Percentage of Total).

Table 1:

Department	Total time spent	Percentage
Agricultural Economics	60	0.99%
Animal, Wildlife and Grassland Sciences	70	1.15%
Architecture	30	0.49%
Biotechnology	1172	19.26%
Centre for Environmental Management	3	0.05%
Centre for Sustainable Agriculture	3	0.05%
Chemistry	395	6.49%
Computer Sciences and Informatics	354	5.82%
Dean's Office	8	0.13%
Electronics	34	0.56%
Engineering Science	17	0.28%
Exercise and Sport Science	3	0.05%
Geography	61	1.00%
Geology	100	1.64%
Haematology and Cell Biology	4	0.07%
Institute for Groundwater Studies	207	3.41%
Instrumentation	1	0.02%
Internal Administration	495	8.13%
Library and Information Services	2	0.03%
Mathematics and Applied Mathematics	60	0.99%
National Control Laboratory	13	0.21%
Outside Work	124	2.04%
Parexel	2	0.03%
Pharmacology	19	0.31%
Physical Recourses	46	0.76%
Physics	1745	28.68%
Plant Sciences	591	9.71%
Soil, Crop and Climate Sciences	294	4.83%
South Campus	4	0.07%
Theology	3	0.05%
Urban and Regional Planning	15	0.25%
Virology	12	0.20%
Zoology and Entomology	137	2.25%
<b>Total</b>	<b>6 084</b>	<b>100.00%</b>

Table 2 lists completed projects for different departments.

**Table 2:**

Department	Apparatus
Physics	57 x Access Control 26 x Alarm System 22 x Camera System 12 x Air-conditioner Off Control 1 x 0-1000V Power Supply Unit 1 x SMS Power Alarm System
Biotechnology	17 x Access Control 9 x Camera System 1 x Micro Brewery
Computer Sciences and Informatics	19 x Camera System 21 x Alarm System 1 x Access Control
Soil, Crop and Plant Sciences	3 x Display Boards 1 x Ground Temperature Controller
South Campus	2 x Video Intercom 2 x Camera System
Geology	1 x Access Control 1 x Camera System
Pharmacology	1 x Electronic Heat Block Control
Plant Sciences	2 x Growth Chamber Upgrade
Geography	6 x Camera System

Table 3 lists projects that are in progress.

**Table 3:**

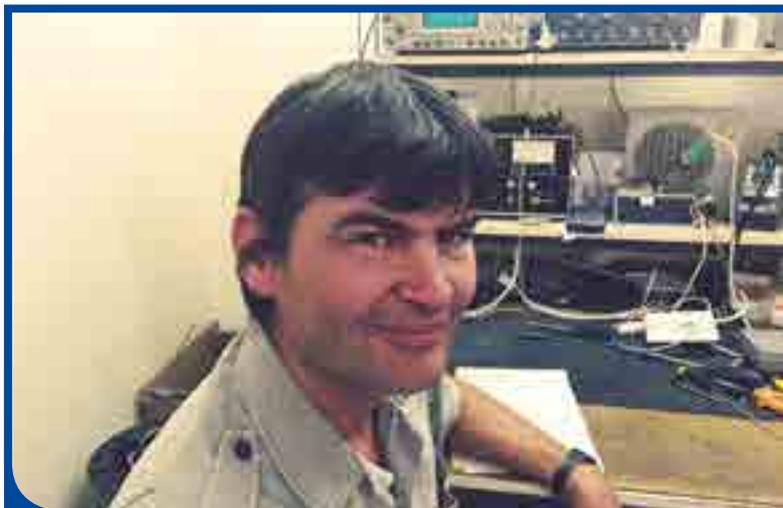
Department	Apparatus
Physics	Fourier Synthesiser Sound Amplifier Potentiostat PID Temperature Controller Plating Power Supply
Zoology and Entomology	Pulsars for Tortious

Table 4 shows the time spent on the different faculties.

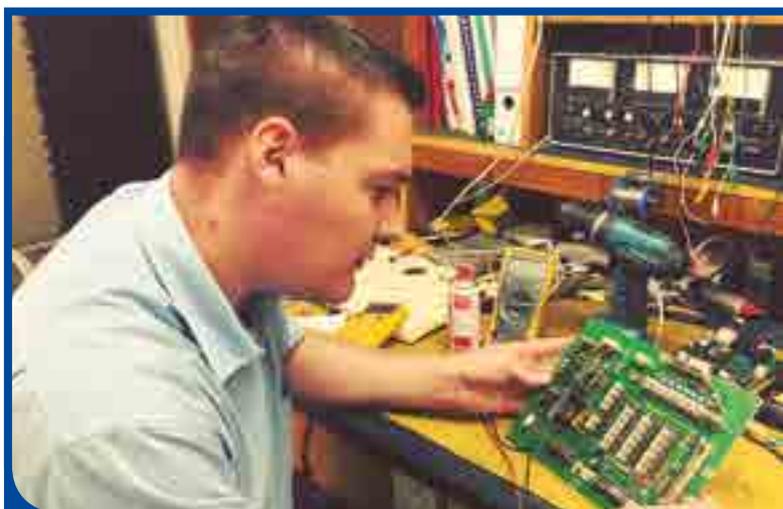
**Table 4:**

Faculty	Total time spent	Percentage
Natural and Agricultural Sciences	5 865.00	96.40%
Other	219.00	3.60%

A total of 2 421 (39.79%) hours were spent on development, 3 168 (52.07%) hours on maintenance, and 495 (8.14%) hours on administration.



Mr Henri Roodt.



Mr Mark Jackson.



Messrs Adriaan Hugo, Innes Basson, Denver De Koker, Henri Roodt, and Mark Jackson.

## Staff

**Head of Department:** Mr AB Hugo.

**Control Technicians:** Messrs I Basson, HJ Roodt, and MH Jackson.

## Contact Details

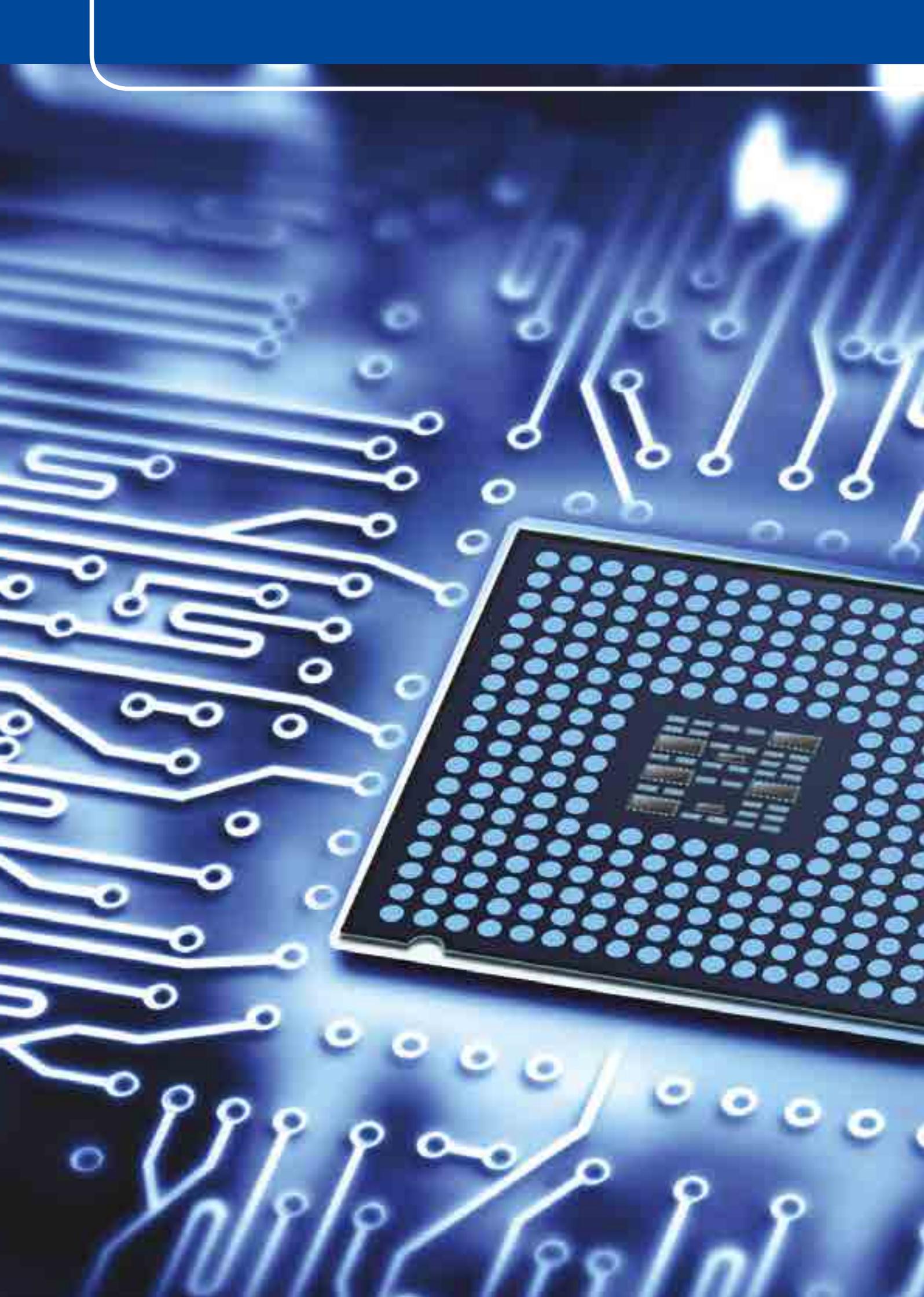
### Mr AB Hugo

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# Workshop Instrumentation

## Overview

As a year that can only be described as an exacting one for Instrumentation, 2015 was a year with many developments. Four new employees were appointed in the department. Messrs BJ Crous, control technician; LS Jones, technical assistant; WJR Storm, technical aid; and L Moses, technical aid; are the new appointees. The new personnel contributed much to the department and these changes have had a great impact on the workings of the department.

Mr Barend Crous started in the new year and he was specially sourced for the new CNC machines that were purchased by the department. Instrumentation wishes the new staff a long and a prosperous career at the UFS.

## Activities

This outline will show the work and number of orders, as well as the time taken to complete these orders, for the various departments both in and outside the Faculty of Natural and Agricultural Sciences. Off-campus work is indicated too. Annual and sick leave will also be indicated. The overview shows the accountable hours of the department in 2015.

Table 1 shows the working hours spent on each of the departments in the Faculty of Natural and Agricultural Science (internal departments).

**Table 1:**

Internal departments	Number of work orders	Hours spent on the work orders
Chemistry	28	220
Physics	31	280
Electronics	6	6
Geology	6	90
IGS	4	31
Plant Sciences / Genetics / Plant Cultivation	16	67
Soil and Harvest Sciences / Climatology	20	103
Zoology and Entomology	7	229
Animal, Wildlife and Grassland Sciences	6	21
Food Science	4	60
Pharmacology	2	18
Various small departments	3	68

Biotechnology/Microbiology	39	380
Computer Science and Information Technology	3	24
Geography	1	4
Office (work done by line manager)	-	980
<b>Total: Internal Departments</b>	<b>176</b>	<b>2581</b>

Table 2 shows the working hours spent on departments outside the Faculty of Natural and Agricultural Science (external departments).

**Table 2:**

External departments and off-campus work (Third Stream)	Number of work orders	Hours spent on the work orders
Environmental Management	2	161
Faculty Management	3	11
National Control Labs	9	1610
Cardiothoracic / Haematology / Medical Physics	10	50
Paraxell	8	71
SADoCoL	7	64
<b>Total: External departments</b>	<b>37</b>	<b>-</b>
<b>Total: Invoices for off-campus work</b>	<b>232</b>	<b>2 020</b>
<b>Total for 2015</b>	<b>445</b>	<b>6 407</b>

Table 3 shows the total sick and annual leave taken by staff of the Instrumentation Division during 2015.

**Table 3:**

Leave	Week days	Hours
Sick leave	15	120
Annual leave	114	920
<b>TOTAL</b>	<b>129</b>	<b>1 040</b>

Table 4 provides a summary of how the staff of the Instrumentation Division spent the hours during 2015.

**Table 4:**

Type of hours	Hours accountable for in 2015
Annual and sick leave	1 040
Hours worked	6 407
<b>TOTAL</b>	<b>7 447</b>

## Goals for the Future

For the Instrumentation Division, during the next year we have to move closer to our goals by working smarter and by utilising our resources to their full potential. Instrumentation will attempt to supply a better, faster service to all departments that require a service from us. We would like to include ourselves in striving for the vision of the UFS: to become an international leader in the field of research.



Flow water jet cutting stainless steel.



Haas UMC750 continuous 5-axis milling machine.

## Staff

**Line Head:** Mr PDS Botes.

**Control Technicians:** Messrs JPW Rautenbach, NJ Kruger, and BJ Crous.

**Technical Assistant:** Mr LS Jones.

**Technical Aides:** Messrs WJR Storm and L Moses.

## Contact Details

**Mr P Botes**

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# Qwaqwa Campus

# Qwaqwa Campus Chemistry Department

## Overview

The department offers organic, inorganic, physical, and analytical chemistry at undergraduate level, with a polymer science honours programme. The success rates were mostly satisfactory, with a few modules having less than a 50% pass rate. The year 2015 saw the retirement of Prof Luyt, which left a huge gap within the department as far as postgraduate training and research output are concerned. We, however, had three of our permanent staff members obtaining their PhD's (unfortunately one of them resigned at the end of the year), thus helping to fill the gap left by Prof Luyt.



Ms Gumedé, a PhD student working on a DSC.

## Staff Achievements

Three of our staff members completed their PhD's, namely Drs PJ Mofokeng, SJ Sefadi, and MJ Mochane.

## Student Achievements

The department's success rates are depicted in the table below:

### Pass rates for Chemistry, 2015 first semester

Module	Students enrolled	Students failed	Students passed
CHEM1412	118	14	99 (83.9%)
CHEM1532	141	34	107 (75.9%)
CHEM1551	115	11	104 (90.4%)
CHEM2614	77	23	54 (70.1%)
CHEM2632	79	29	50 (63.3%)
CHEM3714	45	15	30 (66.7%)
CHEM3734	44	8	36 (81.8%)
CMPR6814	5	0	5 (100%)
CMPA6814	6	0	6 (100%)
CMPP6814	6	0	6 (100%)
CMPO6814	4	0	4 (100%)

### Pass rates for Chemistry, 2015 second semester

Module	Students enrolled	Students failed	Students passed
CHEM1561	106	2	104 (98.11%)
CHEM1622	105	36	69 (65.71%)
CHEM1642	109	40	83 (76.15%)
CHEM2624	67	34	33 (49.25%)
CHEM2642	46	2	44 (95.65%)
CHEM3724	47	15	32 (68.09%)
CHEM3744	43	14	29 (67.44%)
CMPA6824	6	6	6 (100%)
CMPB6824	6	6	6 (100%)
CMPC6824	6	6	6 (100%)
CMPR6808	6	6	6 (100%)

## Research

The Polymer Science research group under Prof Luyt had five master's and three PhD students, as well as one postdoctoral fellow. Dr Molefe has one master's student.

The department visited the CSIR polymer division in Port Elizabeth as part of a drive to establish research linkages, and interest was shown by both parties in possible collaboration in 2016.



## Community Service

The department was involved in the open day and the national science week activities organised by the provincial Department of Education: Thabo Mofutsanyana District.

## Staff Matters

- Prof AS Luyt retired.
- Dr M Mochane resigned.
- Dr L Hlalele was appointed as a lecturer.

## Research Outputs

### Research Articles

**Dudić, D., Luyt, A.S., Marinković, F., Petronijević, I., Dojčilović, J. & Kostoski, D.** 2015. The effect of gamma irradiation on the thermal behaviour of dielectric properties of linear low-density/carbon black semiconductive composites. *Radiation Physics and Chemistry* 107: 89–94.

**Mochane, M.J. & Luyt, A.S.** 2015. Synergistic effect of expanded graphite, diammonium phosphate and Cloisite 15A on flame retardant properties of EVA and EVA/wax phase change blends. *Journal of Materials Science* 50: 3485–3494.

**Mochane, M.J. & Luyt, A.S.** 2015. The effect of expanded graphite on the thermal stability, latent heat and flammability properties of EVA/wax phase change blends. *Polymer Engineering & Science* 55: 1255–1262.

**Mochane, M.J. & Luyt, A.S.** 2015. The effect of expanded graphite on the physical properties of conductive ethylene vinyl acetate (EVA)/wax phase change blends for thermal energy storage. *Polymer Composites* (published online).

**Mofokeng, J.P. & Luyt, A.S.** 2015. Morphology and thermal degradation studies of melt-mixed PHBV/PCL biodegradable polymer blend nanocomposites with TiO<sub>2</sub> as filler. *Journal of Materials Science* 50: 3812–3824.

**Mofokeng, J.P. & Luyt, A.S.** 2015. Morphology and thermal degradation studies of melt-mixed PLA/PHBV biodegradable polymer blend nanocomposites with TiO<sub>2</sub> as filler. *Journal of Applied Polymer Science* 132: 42138.

**Mofokeng, J.P. & Luyt, A.S.** 2015. Dynamic mechanical properties of PLA/PHBV, PLA/PCL, PHBV/PCL blends and their nanocomposites with TiO<sub>2</sub> as nanofiller. *Thermochimica Acta* 613: 41–53.

**Mofokeng, J.P. & Luyt, A.S.** 2015. Morphology and thermal degradation studies of melt-mixed poly(lactic acid) (PLA)/poly( $\epsilon$ -caprolactone) (PCL) biodegradable polymer blend nanocomposites with TiO<sub>2</sub> as filler. *Polymer Testing* 45: 93–100.

**Mokhothu, T.H., Luyt, A.S., Morselli, D., Bondioli, F. & Messori, M.** 2015. Influence of in situ-generated silica nanoparticles on EPDM morphology, thermal, thermomechanical and mechanical properties. *Polymer Composites* 36: 825–833.

**Motsoeneng, T.S., Van Reenen, A.J. & Luyt, A.S.** 2015. Structure and properties of a  $\beta$ -nucleated polypropylene impact copolymer. *Polymer International* 64: 222–228.

**Pionteck, J., Valdez, E.M.M., Piana, F., Omastová, M., Luyt, A.S. & Voit, B.** 2015. Reduced percolation concentration in polypropylene/expanded graphite composites: Effect of viscosity and polypyrrole. *Journal of Applied Polymer Science* 132: 41994.

**Sefadi, J.S., Luyt, A.S., Pionteck, J., Piana, F. & Gohs, U.** 2015. Effect of surfactant and electron treatment on the electrical and thermal conductivity as well as thermal and mechanical properties of EVA/EG composites. *Journal of Applied Polymer Science* 132: 42396.

**Sefadi, S.J., Luyt, A.S. & Pionteck, J.** 2015. Effect of surfactant on EG dispersion in EVA and thermal and mechanical properties of the system. *Journal of Applied Polymer Science* 132: 41352.

### Conference Contributions

**Tsotetsi, T.A., Luyt, A.S. & Van Sittert, C.G.C.E.** 2015. *Calculation of noncontact forces between titania nanospheres: Molecular dynamics study.* Poster presented at the 13<sup>th</sup> Annual UNESCO/IUPAC Workshop & Conference on Macromolecules & Materials, Port Elizabeth, South Africa. 7–12 September.

**Moji, R.G. & Holtzhausen, S.** 2015. *Is Chemistry difficult and abstract to first year students?* Oral presentation delivered at the 3<sup>rd</sup> SAERA Conference, Bloemfontein, South Africa. 24–27 June.

## Staff

**Professor:** Prof AS Luyt.

**Lecturers:** Drs NF Molefe, L Hlalele, SJ Sefadi, Messrs K Mpitso, TA Tsotetsi, and Ms MA Malimabe.

**Junior Lecturer:** Mr RG Moji.

**Research Associate:** Ms M Sibeko.

**Senior Officers: Professional Services:** Dr MJ Mochane and Mr MT Mosoabisane.

**Officers: Professional Services:** Dr PJ Mofokeng and Ms C Clarke.

## Contact Details

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## Qwaqwa Campus

# Department of Computer Science and Informatics

## Overview

The Department of Computer Science and Informatics at the Qwaqwa Campus started its new mobile development course in 2015. The mobile laboratory contains modern laptops and a teaching-friendly environment. The lab currently has wireless access and includes tablets and smartphones to support the mobile aspect of our new course.



Teaching with an iPad by Dr RD Wario.

## Achievements

Staff achievements for 2015 include the master's degree achieved by Mr Fani Radebe. Staff members Dr Wario and Mr Mase presented papers at the conferences of the Southern African Computer Lecturers' Association (SACLA) and Higher Education Learning and Teaching Association in Southern Africa (Heltasa) respectively. The department also initiated an iPad project where students have the opportunity to explore multiple education applications to enhance their learning. At the UFS' annual Teaching and Learning Awards ceremony, Messrs Ben Mase and Fani Radebe each received an Excellence Award.

## Activities

The department held a great open day for 2015. Students from different schools were informed about the importance of a knowledge-based industry to local communities with the benefits associated with it. The new mobility lab was designed and constructed on the department floor. It is a modern learning space that is perfectly suited for lecturing and group work. State-of-the-art laptops, wireless Internet access, and a high-resolution 3-D projector are included. The lab will be further enhanced with mobile devices in the year 2016 to serve as the department's flagship mobility laboratory.

## Community Service

RIS242 is a course offered as a service learning community service by the Department of Computer Science and Informatics: Qwaqwa Campus. It is a semester course with eight credits. The objective of the course is to uplift the lifestyle of elderly and young people in the Qwaqwa community by showing and teaching them how to use computers and work with basic MS Office applications. This course is optional for UFS students so we have seven to ten students every year for this course who purely take it out of choice as it is not obligated by their curriculum or programme. The UFS had a showcase day where there were many exhibits from different companies and parties. RIS242 students of the 2015 batch also participated in the event to exhibit the type of services we offer to the community.

## Research Specialisation Areas

Research in the department is broad; involving different activities focusing on the fields of Human-Computer Interaction (incorporating natural user interfaces), Data Warehousing, Educational Technologies, and Eye Tracking.

## Research Outputs

### Research Article

**Omole, D.C., Ndambuki, J.M., Musa, A.G., Longe, E.O., Badejo, A.A. & Kupolati, W.K.** 2015. A model selection procedure for stream re-aeration coefficient modelling. *Modern Applied Science Journal* 9(9): 138-160.

### Conference Contributions

**Dollman, G.J., De Wet, L. & Beelders, T.R.** 2015. Commercial brain computer interface: Potential as a natural user interface. In *Proceedings of the 2015 Annual Research Conference on South African Institute of Computer Scientists and Information Technologists* New York, USA. pp. 13:1-13:8.

**Mase, M.B.** 2015. Exploration of students learning through podcasts, vodcasts and online discussion forums in rural area. Paper delivered at the Higher Education Learning and Teaching Association in Southern Africa (HELTASA) Conference, North West University (NWU), South Africa. 17-20 November.

**Wario, R.D.** 2015. Using tablets to transform teaching and learning at a rural South African university. Paper delivered at the 9<sup>th</sup> Annual University of KwaZulu-Natal Teaching and Learning in Higher Education Conference, Elangeni Hotel, Durban, South Africa. 21-23 September.

**Wario, R.D. & Viljoen, M.C.** 2015. Attitudes towards computer usage as predictors of the classroom integration of ICT at a rural South African university. In *Proceedings of the 44<sup>th</sup> Annual Southern African Computer Lecturers Association (SACLA) 2015*, Johannesburg, South Africa. pp. 48-56.



Open day event 2015.

## Staff

**Lecturers:** Dr RD Wario, Messrs RM Alfonsi, GJ Dollman, MB Mase, and AG Musa.

**Junior Lecturers:** Messrs T Lesesa, FM Radebe, and B Sebastian.

**Assistant Officers:** Mss MP Mahakoe, PJ van der Merwe, and Mr MP Makhanya.

## Contact Details

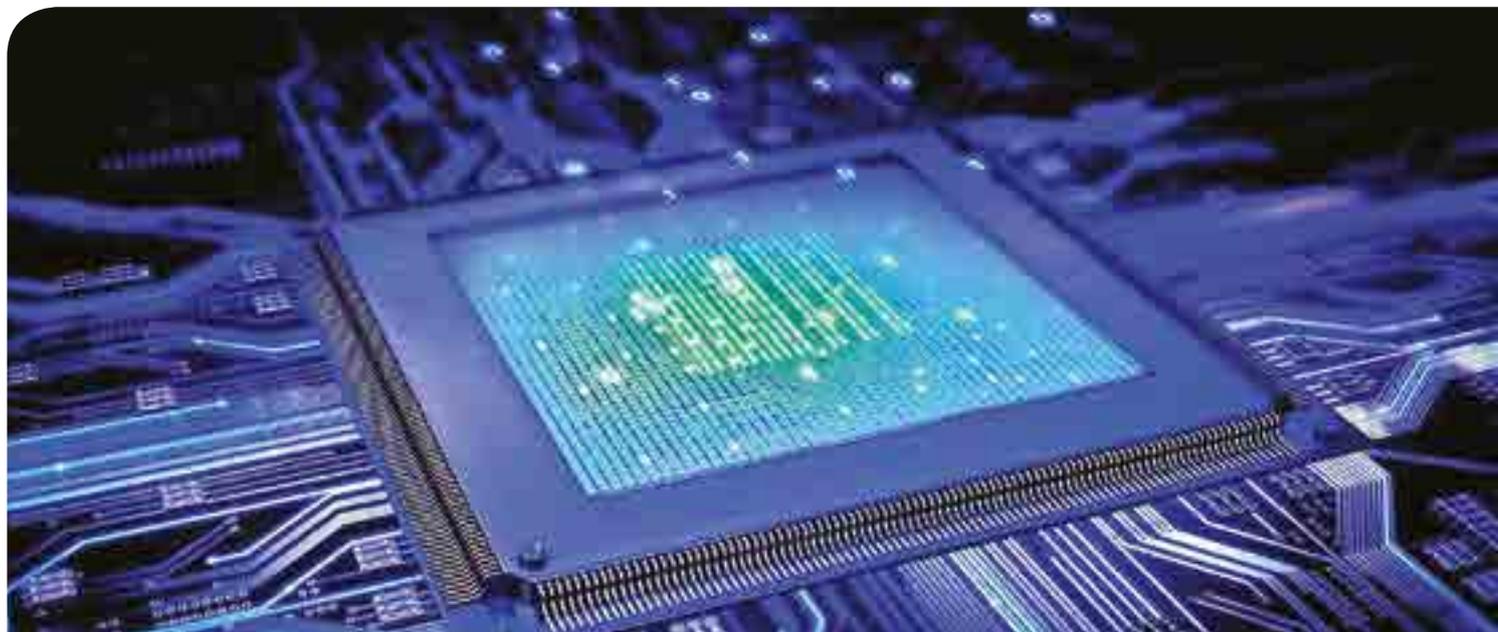
### Dr Ruth D Wario

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# Qwaqwa Campus

# Department of Geography

## Overview

The year 2015 was generally a successful year, which presented a number of opportunities and challenges to the Department of Geography at the Qwaqwa Campus. One important development was the diversity of research opportunities that were presented on the research front, through the launching of the Afromontane Research Unit (ARU) in the second half of the year. The department also managed to recruit two postdoctoral research fellows, namely Drs D Manatsa and LP Makaba, both of whom are doing research on climate change in the Eastern Free State Bioregion.



Geography students conducting fieldwork at a pothole site in Mpumalanga. The potholes seen in the foreground are an important geosite which receives thousands of tourists from all over the world every year. Apart from exploring the geomorphological features of the geosite, the students also interviewed some tourists at the site.

## Staff Changes

Following the interviews the department held early in 2015 when it had provision to hire two new staff members, the department managed to hire Dr T Okello to teach Tourism classes. Mr M Kuali is currently teaching on a temporary basis. Ms M Mbiriri and Mr S Zondo were identified as potential facilitators responsible for teaching students recruited for the Extended Programme. The Department of Geography will participate in the programme for the first time with effect from 2016.

### Success rates for 2015

Module	Students	% Pass	% Failure	Lecturer
GEOP1514	134	79.85	12.69	Mr P Mahasa
GEOH1624	100	79	20	Ms N Sekhele
GEOP2614	07	85.71	14.29	Ms N Sekhele
GEOH2614	57	91.23	7.02	Mr A Zondo
GEOH3714	57	84.21	15.79	Dr G Mukwada
GEOP3724	52	90.38	7.69	Dr G Mukwada
TURM2614	36	97.22	2.78	Prof W van Zyl
TURM2624	25	100	0	Prof W van Zyl
TURM3714	41	97.56	2.44	Mr A Adjei
TURM3724	35	88.57	5.71	Mr A Adjei
GEOF6816	03	100	0	Mr P Mahasa
GEOR6808	03	100	0	Dr S Adelabu, Prof W van Zyl
ENVG6826	03	100	0	Mr P Mahasa
ENVG6846	01	100	0	Mr P Mahasa
GGH626	02	100	0	Prof W van Zyl
GGH676	02	100	0	Prof W van Zyl

## Status of Postgraduate Enrolment

The number of postgraduate students increased by 43%, from eight in 2014 to 15 in 2015. The department currently has nine master's students, five PhD students, and six honours students.



## Current Challenges

We are still in need of remote sensing software for the analysis of satellite images. This is particularly important for the Montane research in which the department is involved.

New programmes have been introduced to strengthen the curriculum offered by the department and to make it more market-oriented and relevant to the needs of the community we serve. This is in light of the need to consolidate the marketing strategies of the UFS by devising other means to sell these new programmes to our clients. Financial resources are needed for such a marketing drive so that the department will be able to have face-to-face contact with its clients, for example schools.

## Highlights of 2015

- We moved to new premises; among others the new auditorium has made our department the centre of campus.
- The department organised a highly successful educational tour to the Kruger National Park in July. The trip took students through Gauteng, Mpumalanga and KwaZulu-Natal to Limpopo, thus exposing them to other parts of the country.
- This was followed by another successful educational trip to Durban for Geography and Tourism classes

## Research Outputs

### Research Articles

**Adelabu, S., Mutanga, O. & Adam, E.** 2015. Testing the reliability and stability of the internal accuracy assessment of Random Forest when compared with independent dataset. *Geocarto International* 30(7): 810-821.

**Dube, T., Mutanga, O., Cletah, S., Adelabu, S. & Tsitsi, B.** 2015. Satellite remote sensing of forest aboveground biomass: A review. *Tropical Ecology* 57(2): 125-132.

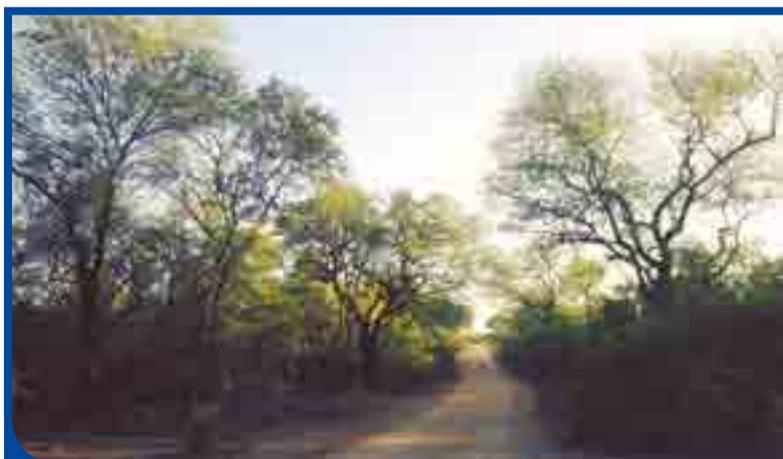
**Dube, T., Seutalal, K., Adelabu, S. & Shoko, C.** 2015. Water Quality Monitoring in Sub-Saharan Africa: A review of remote sensing methods. *African Journal of Aquatic Science* 70(1): 1-7.

**Mukwada, G. & Sekhele, N.** 2015. The potential of community-based geotourism in rural development in South Africa: The case of Witsie cave project. *Journal of Asian and African Studies* DOI: 10.1177/0021909615595991

**Mukwada, G., Chingombe, W. & Taru, P.** 2015. Strifes of the frontier: An assessment of *Acacia mearnsii* related park-community conflicts in the Golden Gate Highlands National Park, South Africa. *Journal of Integrative Environmental Sciences* 13(1): 37-54.

**Pululu, M.S., Lobina, P.G. & Tabukeli, R.M.** 2015. The Upper Orange River Water Resources affected by human interventions and climate change. *Hydrology: Current Research* 6(3): 2157-7587.

**Pululu, M.S., Lobina, P.G. & Tabukeli, R.M.** 2015. Uncertainties in techniques used to determine areas under irrigation in the Upper Orange River Basin. *Hydrology: Current Research* 6(3): 2157-7587.



Part of the mopane woodland in the Kruger National Park, which is now part of the Great Limpopo Transfrontier Park, an amalgamation of three national parks negotiated between South Africa, Zimbabwe, and Mozambique. The woodland is dominated by the mopane tree (*Colophospermum mopane*).

**Shoko, C., Dube, T. & Adelabu, S.** 2015. Applying the Surface Energy Balance System (SEBS) remote sensing model to estimate spatial variations in evapotranspiration in Southern Zimbabwe. *Transactions of the Royal Society of South Africa* 70(1): 47-55.

**Sibandana, M., Seutalal, K., Dube, T. & Adelabu, S.** 2015. Operational applications of remote sensing in groundwater mapping across sub-Saharan Africa. *Transactions of the Royal Society of South Africa* 70(2): 173-179.

### Conference Contribution

**Mukwada, G.** 2015. *Losing ground: The environmental impacts of Acacia mearnsii invasion of the Maloti-Drakensberg mountains in South Africa.* Paper presented at the Perth III Conference: Mountains of our future earth, Centre for Mountain Studies, Perth, Scotland. 4-8 October 2015.



It all starts at a tender age. In this photograph, cultural heritage exhibited by young dancers is fused with education and entertainment – providing a glimpse into South African culture.



Staff: 2015.

## Staff

**Associate Professor:** Prof WF van Zyl.

**Senior Lecturer:** Dr G Mukwada.

**Lecturers:** Dr Adelabu, Messrs A Adjei, and P Mahasa.

**Junior Lecturer:** Ms N Sekhele.

**Officer: Professional Services:** Ms N Mokhethi.

## Contact Details

**Dr G Mukwada**

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## Overview

The department had a fairly good year. We even managed to appoint a new lecturer after many attempts. However, we sadly lost Prof Schroeder to retirement at the end of 2015.

## Activities

Ms Faber attended an article-writing workshop presented by Dr Christel Troskie in Bloemfontein.

The department participated in the Science Open Day that was held at the UFS' Qwaqwa Campus. Learners from different schools were motivated and informed about the importance of mathematics in our daily life.

Mr SP Mbambo attended the Satellite International Conference on Mathematical Methods and Models in Biosciences (Biomaths 2015 - S) held at the University of Pretoria from 12-17 July 2015 with Prof Acho, the potential supervisor for his PhD.

## Staff

**Lecturers:** Messrs SP Mbambo and S Nkosi.

**Junior Lecturer:** Ms HC Faber.

## Staff Matters

- Mr SP Mbambo was elected as the new subject head, effective from 1 April 2015.
- Mr Nkosi was appointed as a new lecturer from July 2015.
- Prof Schroeder retired at the end of 2015.

## Research Outputs

### Conference Contributions

**Faber, H.C.** 2015. *The impact of online engagement on the performance of students in Rural Southern Africa*. Paper delivered at the Higher Education, Learning and Teaching Association of Southern Africa (Heltasa2015) Conference, North-West University, Potchefstroom, South Africa. 17-20 November.

**Mpono, Z. & Nkosi, S.** 2015. *A survey on blocks of characters in finite abelian groups*. Paper delivered at the Topology, Algebra, Analysis and Geometry Conference (TAAG 2015), North-West University, Potchefstroom, South Africa. 8-11 September 2015.

## Contact Details

### Mr SP Mbambo

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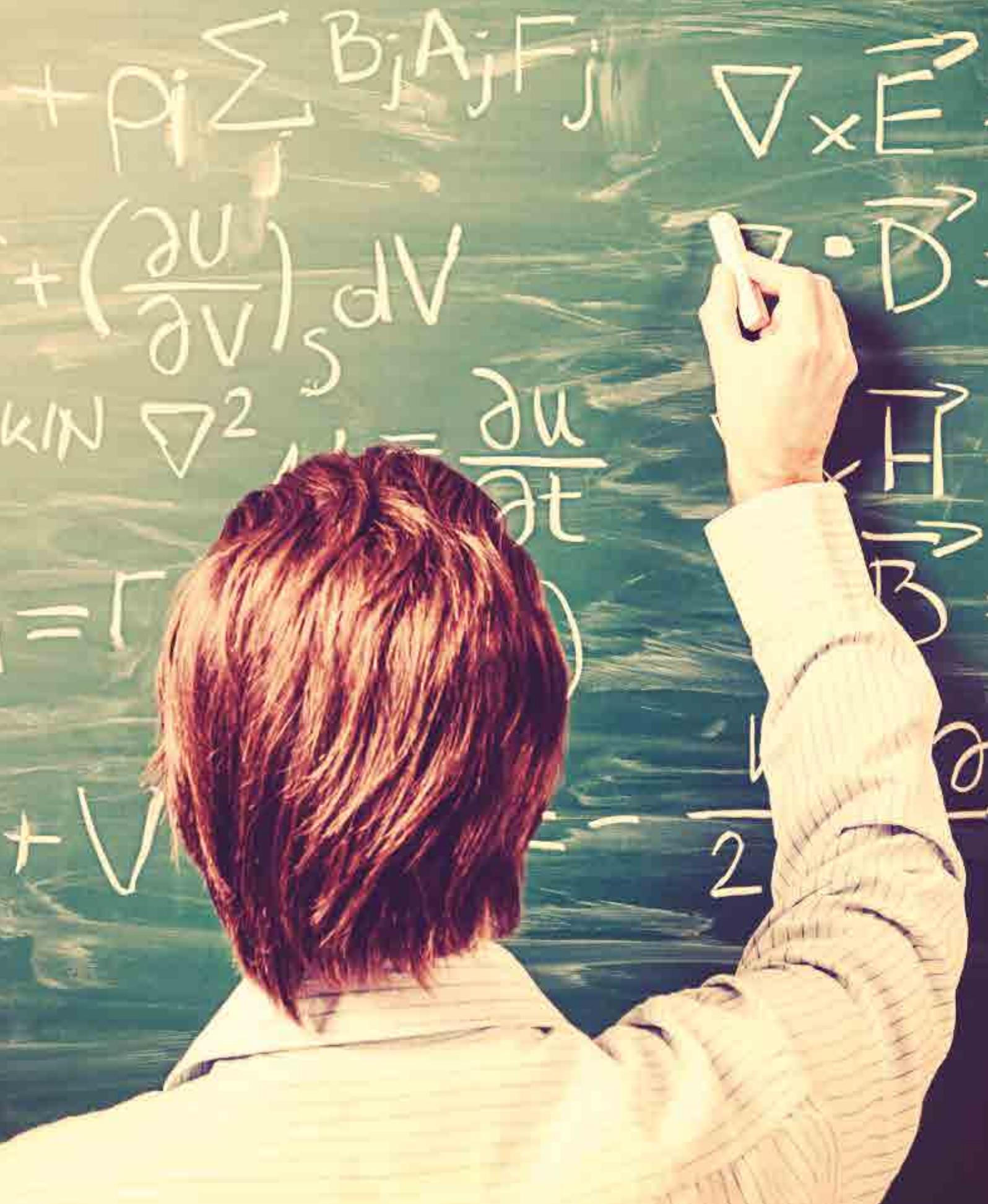
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$$+ \rho_i \sum_j B_j A_j F_j \quad \nabla \times \vec{E}$$

$$+ \left( \frac{\partial u}{\partial v} \right)_s dV \quad \nabla \cdot \vec{D}$$

$$\text{KIN } \nabla^2 u = \frac{\partial u}{\partial t} \quad \vec{H}$$

$$= \Gamma \quad \vec{B}$$

$$+ V = \frac{1}{2} \quad \partial$$

# Qwaqwa Campus

# Department of Physics

## Overview

The Department of Physics has continued to demonstrate high standards on both academic and human projects. In line with maintaining highly qualified academics within the department to deliver more efficiently on these projects, two academics, Drs SV Motloung and KG Tshabalala, were awarded doctorates at the May and June graduations respectively. The department is also pleased to congratulate Prof Dejene for successfully supervising two MSc students; Dr Koao, also with two MSc students; and Mr Ocaya with one MSc student. For honours degree supervision, Dr SV Motloung, with two honours students, is congratulated; and Dr KG Tshabalala is also thanked for supervising three honours students.

The Department of Physics has a dynamic team that focuses strongly on offering strong, futuristic, and lasting solutions for the most pressing of the country's problems, while improving the perceptions of the wider community of Physics through recurring contact with local schools, institutions, and the government. The Department of Physics at Qwaqwa has seen consistent growth and development as a result of careful planning over the 12-year period of 2003–2015 that culminated in the erection of a new Geography/Physics building.



Dr SV (Setumo) Motloung's PhD graduation day in 2015.

## Community Service

The department is involved with a local high school, Kgula Thuto, with the Astronomy Fair for a Grade 11 learners' project.

## Staff Achievements

- Dr LF Koao was successfully nominated to join the Prestige Scholars Programme (PSP).
- The department is very delighted about the achievement of both Drs Motloung and Tshabalala for obtaining their PhD degrees. Almost 80% of our C1 staff have now obtained their PhD's.
- Mr SJ (Joel) Motloung, who is employed as a senior technical officer, has successfully secured Thuthuka funding from the NRF in order to conduct his PhD research.

## Student Achievements

The department awarded five MSc degrees and five honours degrees.

## Research

The main research interests in the department are in the following niche areas:

- Phosphors and Luminescent materials
- New Energy materials – for use in new batteries
- Solar energy and new sensor materials
- Electronics – instrumentation and new semiconductor materials
- Computation and modelling

## National and International Collaboration

The Department of Physics supports collaborations with various renowned universities within the country and globally in countries such as South Korea, the USA, Saudi Arabia, Turkey, Egypt, Mauritius, Namibia, Botswana, Lesotho, Kenya, and Tunisia, to mention a few.

## Postgraduate Students

The department has the following postgraduate students enrolled:

- One honours student
- Five master's students
- Eight PhD students
- Two postdoctoral fellows

Dr KE Foka, a former PhD student under the supervision of Prof Dejene, passed away on 14 December 2015.

## Staff Matters

- Dr LF Koao was promoted to senior lecturer.
- Dr SV Motlounig resigned with immediate effect on 28 September 2015.

## Research Outputs

### Research Articles

**Dejene, F.B.** 2015. Structural, compositional and PL properties of  $\text{Cu}(\text{In}_{1-x}\text{Ga}_x)\text{Se}_2$  solar cell absorbers dependence on the stacking order of the precursor. *International Journal of Materials Engineering and Technology* 14(1): 45-58.

**Koao, L.F., Dejene, B.F., Swart, H.C. & Motaung, T.E.** 2015. Dependent of reaction time on Cu-doped ZnO nanostructures prepared by chemical bath method. *International Journal of Luminescence and Applications* 5(1): 54-61.

**Malevu, T.D. & Ocaya, R.O.** 2015. An investigation of nanostructure morphology in the Zinc-air cell method as a function of electrolyte concentration. *International Journal of Electrochemical Science* 10: 4097-4104.

**Malevu, T.D. & Ocaya, R.O.** 2015. Effect of annealing temperature on structural, morphology and optical properties of ZnO nano-needles prepared by Zinc-air cell system method. *International Journal of Electrochemical Science* 10: 1752-1761.

**Molefe, F.V., Koao, L.F., Dejene, B.F. & Swart, H.C.** 2015. Phase formation of hexagonal wurtzite ZnO through decomposition of  $\text{Zn}(\text{OH})_2$  at various growth temperatures using CBD method. *Optical Materials* 46: 292-298.

**Motlounig, S.V., Dejene, F.B., Kroon, R.E., Swart, H.C. & Ntwaeaborwa, O.M.** 2015. Radiative energy transfer in  $\text{ZnAl}_2\text{O}_4:0.1\% \text{Ce}^{3+}, x\% \text{Eu}^{3+}$  nanophosphor synthesized by sol-gel process. *Physica B* 468-469: 11-20.

**Motlounig, S.V., Dejene, F.B., Swart, H.C. & Ntwaeaborwa, O.M.** 2015. Effects of  $\text{Cr}^{3+}$  mol% on the structure and optical properties of the  $\text{ZnAl}_2\text{O}_4:\text{Cr}^{3+}$  nanocrystals synthesized using sol-gel process. *Ceramics International* 41: 6776-6783.

**Motlounig, S.V., Dejene, F.B., Swart, H.C. & Ntwaeaborwa, O.M.** 2015. Effects of Zn/citric acid mole fraction on the structure and luminescence properties of the un-doped and 1.5%  $\text{Pb}^{2+}$  doped  $\text{ZnAl}_2\text{O}_4$  powders synthesized by citrate sol-gel method. *Journal of Luminescence* 163: 8-16.

**Ocaya, R.O.** 2015. A linear CCD spectrometer based on FPGA for light-source characterization. *Applied Mechanics and Materials* 763: 120-125.

**Ocaya, R.O., Dere, A., Tuncer, H., Al-Ghandi, A.A., Sari, D.C. & Yakuphanoglu, F.** 2015. Graphene-oxide doped 2.9.16.23-tetrakis-4- $\{4-[(2\text{E})-3-(\text{naphthalene-1-yl})\text{prop-2-enoyl}]\text{phenoxy}\}$ -phthalocyaninato cobalt(II)/Au photodiodes. *Synthetic Metals* 209: 164-172.

**Tsega, M., Dejene, F.B. & Kuo, D.H.** 2015. Morphological evolution and structural properties of  $\text{Cu}_2\text{ZnSn}(\text{S},\text{Se})_4$  thin films deposited from single ceramic target by a one-step sputtering process and selenization without  $\text{H}_2\text{Se}$ . *Journal of Alloys and Compounds* 642: 140-147.

**Tsega, M., Kuo, D.H. & Dejene, F.B.** 2015.  $\text{Cu}_2\text{ZnSnSb}(\text{S},\text{Se},\text{Te})_4$  film formation from selenization of sputtered self-prepared single ceramic target. *Thin Solid Films* 589: 712-171.

**Tsega, M., Kuo, D.H. & Dejene, F.B.** 2015. Growth and green defect emission of ZnPbO nanorods by a catalyst-assisted thermal evaporation-oxidation method. *Journal of Crystal Growth* 415: 106-110.



Dr KG (George) Tshabalala's PhD graduation day in 2015.



Postgraduate students of the Department of Physics, Qwaqwa Campus.

### Conference Contributions

**Foka, K.E., Dejene, B.F. & Swart, H.C.** 2015. *Combustion synthesis of  $\text{Dy}^{3+}$ -doped  $\text{YVO}_4$  phosphor*. Proceedings of the 59<sup>th</sup> Annual Conference of the

South African Institute of Physics (SAIP2014), University of Johannesburg, South Africa. 7-11 July. pp. 34-40.

**Malevu, T., Ocaya, R.O. & Tshabalala, K.G.** 2015. *Effect of post-melt annealing on phase transformations in high-purity  $Bi_2$  nanoparticles from lead-acid accumulator anodes.* Proceedings of the 11<sup>th</sup> International Energy Technologies Conference (ENTECH '15), Istanbul, Turkey. 21-23 December. pp. 159-166.

**Molefe, F.V., Koao, L.F., Dejene, B.F. & Swart, H.C.** 2015. *Influence of zinc acetate concentration in the preparation of ZnO nanoparticles via chemical bath deposition.* Proceedings of the 59<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP2014), University of Johannesburg, South Africa. 7-11 July. pp. 79-84.

**Tebele, A.S., Motloung, S.V. & Dejene, F.B.** 2015. *Effects of catalyst:Ba*

*molar ratio on the structure and luminescence properties of  $BaCO_3:1\% Eu^{3+}, 2\% Dy^{3+}$  phosphors synthesized using sol-gel process.* Proceedings of the 59<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP2014), University of Johannesburg, South Africa. 7-11 July. pp. 138-143.

**Wako, A.H., Dejene, F.B. & Swart, H.C.** 2015. *Characterization of cerium doped yttrium gadolinium aluminate garnet ( $Y-Gd)_3Al_5O_{12}:Ce^{3+}$  phosphor thin films fabricated by pulsed laser deposition.* Proceedings of the 59<sup>th</sup> Annual Conference of the South African Institute of Physics (SAIP2014), University of Johannesburg, South Africa. 7-11 July. pp. 150-155.

## Staff

**Professor:** Prof FB Dejene.

**Senior Lecturer:** Dr LF Koao.

**Lecturers:** Dr KG Tshabalala and Mr RO Ocaya.

**Senior Technical Officer:** Mr SJ Motloung.

**Assistant Officer:** Ms MK Lebeko.

## Contact Details

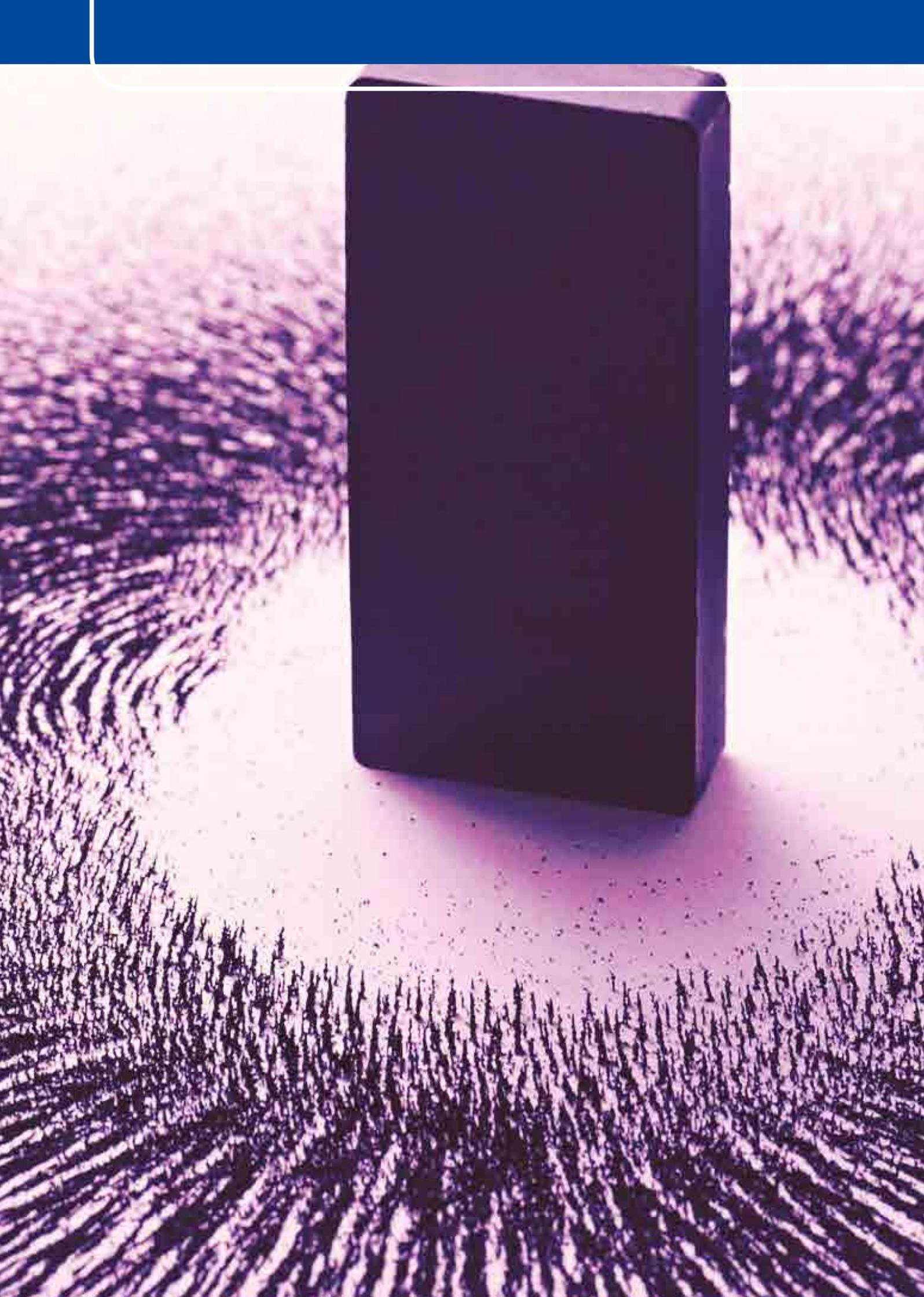
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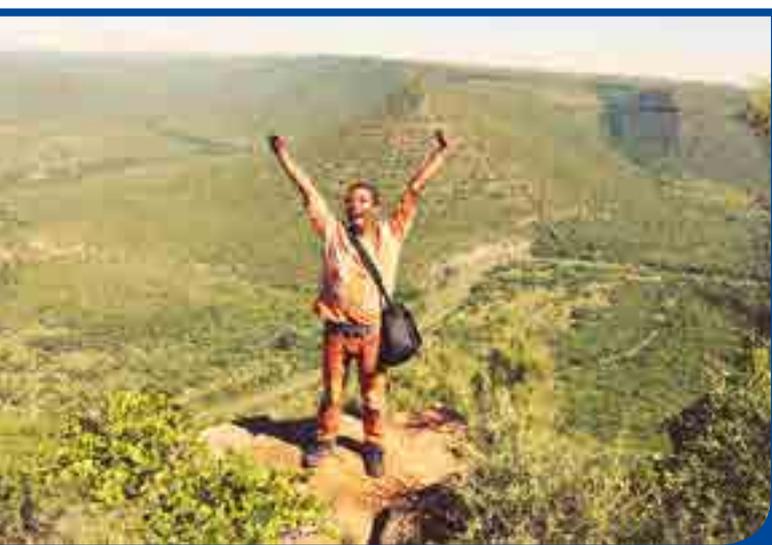
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## Overview

The Department of Plant Sciences: Qwaqwa Campus has five academic staff members and two professional officers. It offers undergraduate and postgraduate training up to doctoral level. The department has research programmes in Ethnobotany/Phytomedicine, Phytopharmacology, Vegetation and Functional Ecology, and Plant Biotechnology/Proteomics, in which a growing postgraduate student cohort is actively involved. In 2015, a total of nine honours, 12 master's, and five PhD students, and two postdoctoral fellows were hosted in the department.



Mr Thokozane Ngcongwane, a third-year Vegetation Ecology student, on a field trip to Weenen Game Reserve with Dr Sieben.

## Activities

Dr Erwin Sieben took his students on field excursions to Didima, Weenen Game Reserve, and Mont-Aux-Sources. Dr Ashafa also took his third-year Ethnobotany students on an "Ethnogeography of the Basotho" excursion to the historical Wetsi's Café in Monontsha.

## Staff Achievements

Dr Lisa Komoreng was awarded a Thuthuka NRF Rating Tract research grant (2015–2017).

Dr Rudo Ngara was awarded an NRF Competitive Support for Unrated Researchers (CSUR) research grant (2015–2017) and an NRF United Kingdom/South Africa travel grant for a visiting UK researchers (2015–2016).

## Student Achievements

Ms Makhosazana Xaba, a master's student of Dr Lisa Komoreng, received a bursary from AECL Limited, and Ms Elelwani Ramulipho, a master's student of Dr Rudo Ngara, received Agricultural Research Council (ARC) and NRF bursaries.

A number of Dr Tom Ashafa's postgraduate students received bursaries from various organisations:

- Ms Nosipho Sibiya, an honours student, received a bursary from the Department of Environmental Affairs.
- Mss Nobuhle Mbele and Fikile Makhubu, both master's students, received NRF bursaries.
- Mr Siphamandla Lamula, a master's student, received ARC and NRF bursaries.
- Mr Mayowa Agunbiade, a PhD student, received a Department of Science and Technology (DST)-NRF bursary.

## Research

Dr Sieben and his research team conducted a study to characterise the functional traits of vascular plants along transects, including on the summit of the Drakensberg. This team stands out as the first team to actually conduct research on the summit plateau. With his master's student, Ms Seadi Mofutsanyana, Dr Sieben also initiated a project on the characterisation of functional traits of wetland plants across an aridity gradient of the Highveld plateau.

Dr Rudo Ngara began her research project on the proteomic mapping of sorghum cell culture secreted proteins and characterising their responses towards a range of abiotic stress factors. This work serves to provide fundamental knowledge on the composition of extracellular matrix proteins in sorghum and their physiological roles in abiotic stress tolerance.

Dr Ashafa continued with his research work on medicinal plants used in the management of various diseases, particularly those used for diabetes and associated complications, with the ultimate goal of developing either ameliorative or curative remedies for these diseases. The research group is also working on parasitic (zoonotic) infections, biological materials for wastewater treatment, and antibiotics from plant sources.

Dr Komoreng continued with her research on traditional medicinal plants used in the treatment and management of lymphatic filariasis and tuberculosis in South Africa. This research study brings together a range of scientific fields such as microbiology, parasitology, and toxicology. It is aimed at providing knowledge to the South African community about lymphatic filariasis; its symptoms, causes, transmission, and management.

## Community Service

Dr Sieben began the digitisation of the herbarium so that in the future people will be able to access our departmental herbarium online.

## National and International Collaboration

- Dr Komoreng is collaborating with Profs MMO Thekiso and R Pieters, both from the North-West University, as well as Dr B Mayekiso from the University of Fort Hare.
- Dr Ngara is collaborating with Dr S Chivasa, Durham University, UK, and Dr TJ Tsilo from the ARC-Small Grain Institute (SGI) in Bethlehem.
- Dr Ashafa is collaborating with Profs G Fouché from the Council for Scientific and Industrial Research (CSIR); FB Lewu from the Cape Peninsula University of Technology (CPUT); MT Yakubu from the University of Ilorin (UNILORIN), Nigeria; TO Sunmonu from Al-Hikma University, Nigeria; D Akinpelu from Obafemi Awolowo University (OAU), Nigeria; Drs OA Aiyegoro from ARC-Animal Production Institute (API); TJ Tsilo from the ARC-SGI; and HA Abdelgadir and AR Ndhlala, both from the ARC Vegetable and Ornamental Plants Institute (VOPI).

## Research Outputs

### Research Articles

**Ashafa, A.O.T. & Pitso, T.R.** 2015. Effects of microwave drying on the yield and chemical composition of essential oils of *Artemisia afra* Jacq. Ex wild from the Eastern Free State South Africa. *Journal of Essential Oils Bearing Plants* 17: 1087-1093.

**Ashafa, O.A.T. & Kazeem, M.I.** 2015. In vitro antioxidant and antidiabetic potentials of *Dianthus basuticus* Burtt Davy whole plant extracts. *Journal of Herbal Medicine* 5: 158-164.

**Ashafa, O.A.T. & Kazeem, M.I.** 2015. Safety evaluation of aqueous root extract of *Hermannia geniculata* Eckl. & Zeyh. (Streculiaceae) in Wistar rats. *European Journal of Integrative Medicine* 7(5): 508-516.

**Ashafa, O.A.T. & Kazeem, M.I.** 2015. Toxicopathological evaluation of hydroethanol extract of *Dianthus basuticus* in Wistar rats. *Evidence-Based Complementary and Alternative Medicine*: 348519-1-10.

**Kazeem, M.I., Akanji, M.A., Yakubu, M.T. & Ashafa, A.O.T.** 2015. Antiglycation and hypolipidemic Effects of Polyphenols from *Zingiber officinale* Roscoe (Zingiberaceae) in streptozotocin-induced diabetic rats. *Tropical Journal of Pharmaceutical Research* 14: 55-61.

**Kazeem, M.I., Ashafa, A.O.T. & Nafu, M.** 2015. Biological activities of three Nigerian spices- *Laurus nobilis* Linn, *Murraya koenigii* (L) Spreng. and *Thymus vulgaris* Linn. *Tropical Journal of Pharmaceutical Research* 14: 1319-1326.

**Kazeem, M.I., Musbau, A., Musa, Y. & Ashafa, A.O.T.** 2015. Effect of *Sena alata* (L) Roxb (Fabaceae) leaf extracts on alpha amylase, alpha glucosidase and post prandial hyperglycaemia in rats. *Tropical Journal of Pharmaceutical Research* 14: 1843-1848.

**Mbhele, N., Balogun, F.O., Kazeem, M.I. & Ashafa, T.** 2015. In vitro studies on the antimicrobial, antioxidant and antidiabetic potential of *Cephalaria gigantea*. *Bangladesh Journal of Pharmacology* 10: 214-21.

**Musa, Y., Sunmonu, T.O., Lewu, F.B., Ashafa, A.O.T., Olorunniji, F.J. & Eddouks, M.** 2015. Medicinal plants used in the management of diabetes mellitus. *Evidence based Complementary and Alternative Medicine* 2015: 1-2.

**Ojuromi, T.O., Duan, L., Izquierdo, F., Fenoy, S.M., Oyibo, W.A., Del Auila, C., Ashafa, A.O.T., Feng, Y. & Xiao, L.** 2015. Genotypes of *Cryptosporidium* spp. and *Enterocytozoon bieneusi* in Human Immunodeficiency Virus-infected patients in Lagos, Nigeria. *Journal of Eukaryotic microbiology*: 10.1111/jeu.12285.

**Ollis, D.J., Ewart-Smith, J.L., Day, J.A., Job, N.M., Macfarlane, D.M., Snaddon, C.D., Sieben, E.J.J., Dini, J.A. & Mbona, N.** 2015. The development of a classification system for inland aquatic ecosystems in South Africa. *Water SA* 41: 727-745.



Dr Sieben with his third-year students on a savannah vegetation excursion.

**Pitso, T.R. & Ashafa, A.O.T.** 2015. Influence of different drying methods on the composition and antimicrobial activities of essential oil from *Leucosidea sericea* Eckl. & Zeyh. *Journal of Essential Oils Bearing Plants* 18: 146-153.

**Sieben, E.J.J.** 2015. The influence of flow regime on the vegetation zonation along mountain streams in the Western Cape, South Africa. *Journal of Mountain Science*: 10.1007/s11629-014-3420-7.

**Sieben, E.J.J., Ellery, W.N., Dullo, B.W. & Grootjans, A.P.** 2015. Impact of marine inundation after a period of drought on the lakeshore vegetation of Lake St. Lucia, South Africa: resilience of estuarine vegetation. *African Journal of Aquatic Sciences* 40: 175-185.

**Sobiyyi, O.K. & Ashafa, A.O.T.** 2015. In vitro anthelmintic activity of *Heliotropium indicum*, *Senna fistula* and *Spigelia anthelmia* used as worm expeller in South West Nigeria. *Bangladesh Journal of Pharmacology* 10: 417-422.



Third-year Ethnobotany students on “Ethnogeography of the Basotho” excursion to the historical Wetsi’s Café in Monontsha with Dr Ashafa.



Dr Ashafa with postgraduate students assisting with the 2015 Open Day at Qwaqwa Campus.



Third-year Vegetation Ecology students on a mountain grassland excursion with Dr Sieben.

### Conference Contributions

**Balogun, F.O. & Ashafa, A.O.T.** 2015. *Comparative study on the antioxidant activity of Dicoma anomala and Gazania krebsiana used in Basotho traditional medicine.* Paper delivered at the 41<sup>st</sup> South African Association of Botanist Conference (SAAB 2015): Sustaining biodiversity, University of Venda, Limpopo, South Africa. 11-15 January.

**Kazeem, M.I. & Ashafa, A.O.T.** 2015. *Inhibitory effect of Alstonia boonei (Apocynaceae) leaf extracts on key enzymes linked to diabetes mellitus.* Paper delivered at the 41<sup>st</sup> South African Association of Botanist Conference (SAAB 2015): Sustaining biodiversity, University of Venda, Limpopo, South Africa. 11-15 January.

**Lamula, S.Q.N. & Ashafa, A.O.T.** 2015. *Uptake of heavy metals by plants growing in four dumpsites of Thabo Mofutsanyane district in the Eastern Free State.* Paper delivered at the 41<sup>st</sup> South African Association of Botanist Conference (SAAB 2015): Sustaining biodiversity, University of Venda, Limpopo, South Africa. 11-15 January.

**Mbhele, N. & Ashafa, A.O.T.** 2015. *Comparative antimicrobial potential of different extracts and fractions of Morella serrata (Lam.) Killick (Myricaceae).* Paper delivered at the 41<sup>st</sup> South African Association of Botanist Conference (SAAB 2015): Sustaining biodiversity, University of Venda, Limpopo, South Africa. 11-15 January.

**Mofutsanyana, S.S. & Sieben, E.J.J.** 2015. *Plant functional composition along an aridity gradient of the Highveld in South Africa.* Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba: Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20-23 October.

**Pitso, T.R. & Ashafa, A.O.T.** 2015. *Impact of collection practices on availability and conservation of six medicinal plants commonly used to treat diabetes in the eastern Free State Province, South Africa.* Paper delivered at the 41<sup>st</sup> South African Association of Botanist Conference (SAAB 2015): Sustaining biodiversity, University of Venda, Limpopo, South Africa. 11-15 January.

**Sieben, E.J.J., Glen, R.F. & Mbona, N.** 2015. *The importance of Wetlands for the conservation of plant diversity.* Paper delivered at the 20<sup>th</sup> Annual National Wetlands Indaba: Education and capacity building, Goudini Spa, Rawsonville, Worcester, South Africa. 20-23 October.

**Sieben, E.J.J., Mtshali, H. & Janks, M.** 2015. *Distribution of wetland vegetation types, their conservation importance and their ecological drivers in South Africa.* Paper delivered at the 12<sup>th</sup> Biodiversity Planning Forum, Salt Rock Hotel and Beach Resort, KwaZulu-Natal, South Africa. 23-26 June.



## Staff

**Senior Lecturers:** Drs AOT Ashafa, EJJ Sieben, and LV Komoreng.  
**Lecturers:** Dr R Ngara and Mr TR Pitso.

**Research Associates:** Profs R Moffett, D Akinpelu, and Dr OA Aiyegoro.  
**Officers: Professional Services:** Messrs PJ Mojau and NP Mzizi.

## Contact Details

**Dr Rudo Ngara**

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# Department of Zoology and Entomology

## Overview

The Department of Zoology and Entomology continued its positive trajectory in terms of research, as well as teaching and learning activities in 2015. Several Zoology and Entomology staff members attracted outside funding through the National Research Foundation (NRF) in particular, and cemented local and international collaborations. Active at several locations in South Africa, as well as the Afromontane Research Unit, the Department of Zoology and Entomology is making a name for itself in terms of parasitological, entomological, and ecological research. Despite having only five lecturing staff members in 2015, the department boasted 16 postgraduate students. Many of these students are outstanding in their own right, having been awarded NRF bursaries for MSc and PhD studies.



Mr Mabena collecting data on livestock and helping in the community.

## Activities

Much of the department's activities remained centred on Teaching and Learning, with Dr Bredenhand again winning prizes for his Teaching and Learning research. The year 2015 was the second year in which the new curriculum for Qwaqwa was active, and staff members continued to improve the delivery of the novel BSc programme.

## Staff Achievements

- The best veteran poster presenter prize was awarded to Dr AM Tsotetsi, Ms ES Seipati, Dr S Njiro, and Prof OMM Thekisoie by the Parasitological Society of Southern Africa (PARSA) for the poster "Polymerase chain reaction as a tool to confirm identification of *Taenia saginata* and *T. solium* metacestodes made during meat inspection at abattoirs".
- Two staff members received Thuthuka grants from the NRF: Drs Emile Bredenhand and Johann van As.
- At the annual Qwaqwa Teaching and Learning Awards ceremony, Dr Bredenhand won the prize for Excellence in Teaching and Innovation: Teaching and Learning Research Article.
- Dr Aliza le Roux was selected to represent the NRF as "Future Leader" at the prestigious Science and Technology Forum in Kyoto, Japan.

## Student Achievements

A number of students successfully obtained, or continued to receive, NRF funding for their postgraduate studies in 2015. This includes Messrs R de Bruin, S Mofokeng, PJ Jacobs, Mss K Jumbam, A Seetsi, A Mkotywa, and S Renda.

## Research

The Department of Zoology and Entomology remains research-strong, with all staff members engaged in further studies or research projects that are training postgraduate students. Members of the department are also actively taking part in the Afromontane Research Unit, which supported the acquisition of a thermal camera for Dr Van As' research on reptilian blood parasites. Dr Le Roux's research into bat-eared fox behaviour attracted two international postdoctoral fellows, who spent the largest part of 2015 in the field, highlighting the complexities of this small carnivore's social and ecological environments. Dr Bredenhand continues to build his research programme on aquatic bioindicators in the Golden Gate Highlands National Park, while Ms Van As made great strides towards the completion of her PhD degree, which is focused on the impact of distinct management practices on leopard health. Other research in the department includes parasitological and immunological studies by Mr Mabena and Dr Leeto.

## Community Service

During field activities, several members of the department actively seek to engage the community affected by their research. For example, Mr Mabena informs farmers about best practices to reduce parasitological infections in livestock, while Ms and Dr Van As engage local students in field schools during their field visits to Ndumo Game Reserve. Dr Le Roux co-lead a field school at her field site (the Kuruman River Reserve in the Kalahari) with the University of Zurich, bringing together select BSc honours students from Qwaqwa with students from Switzerland in an intensive two-week course on field research methods.

## National and International Collaboration

### National Collaboration

Collaborators in the parasitology research group, working with Drs Tsotetsi, Mtshali, and Van As:

- Prof OMM Thekiso, North-West University (Potchefstroom Campus).
- Prof D Luseba, Tshwane University of Technology.
- Dr L Bekker, Tshwane University of Technology.
- Ms K Mtshali, Tshwane University of Technology.
- Prof S Mukaratirwa, University of KwaZulu-Natal.

Collaborators in the mammalian cognition research group, working with Dr Le Roux:

- Prof A Ganswindt, University of Pretoria.
- The Endangered Wildlife Trust.
- Dr F Dalerum, University of Pretoria and University of Oviedo, Spain.

Finally, we have several collaborators at the Agricultural Research Council's Small Grain Institute in Bethlehem, who conduct research with Dr Bredenhand, in the entomology research lab.

### International Collaboration

- Collaborating with Dr Tsotetsi on parasitological research: Dr LJS Harrison, University of Edinburgh, UK.
- Collaborating with Dr Le Roux in the field of behavioural ecology: Dr RA Hill, Durham University, UK.

## Staff Matters

In 2015, Prof Oriel Thekiso's vacated position was successfully advertised, and a new candidate, Dr Patrick Voua Otomo, was selected. He will assume duties as senior lecturer in 2016.

## Research Outputs

### Research Articles

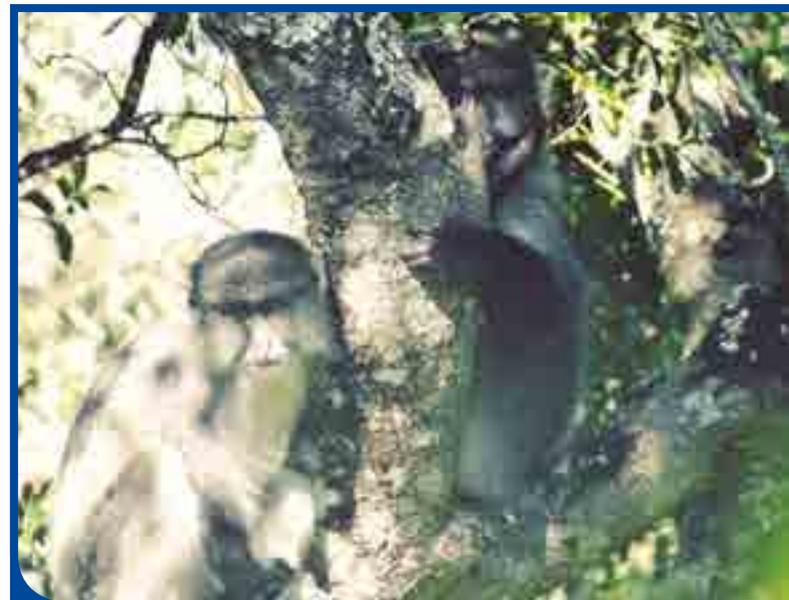
**Mtshali, K., Khumalo, Z.T.H., Nakao, R., Grab, D.J., Sugimoto, C. & Thekiso, O.M.M.** 2015. Molecular detection of zoonotic tick-borne pathogens from ticks collected from ruminants in four South African Provinces. *Journal of Veterinary Medical Science* 77(12): 1573-1579.

**Ngyen, T.-T., Motsiri, M.S., Taioe, M.O., Mtshali, M.S., Goto, Y., Schinichiro, K., Thekiso, O.M.M. & Inoue, N.** 2015. Application of crude and recombinant ELISAs and immunochromatographic test for serodiagnosis of animal trypanosomosis in the Umkhanyakude district of KwaZulu-Natal province, South Africa. *Journal of Veterinary Medical Science* 77(2): 217-220.

**Van As, J., Davies, A.J. & Smit, N.J.** 2015. Life cycle of *Hepatozoon affluomaloti* sp. n. (Apicomplexa: Haemogregarinidae) in crag lizards (Sauria: Cordylidae) and in culicine mosquitoes from South Africa. *Folia Parasitologica* 62: 008.

### Chapter in Book

**Epps, C.W., Nowak, K. & Mutayoba, B.** 2015. Unfenced reserves, unparalleled biodiversity and a rapidly changing landscape: Roadways and wildlife in East Africa. In *Handbook of Road Ecology* edited by R. Van der Ree, D.J. Smith and C. Grilo. Wiley-Blackwell, Oxford. pp. 448-454.



Samango monkeys in Lajuma (study subjects in Dr Le Roux's research group). Photo taken by Dr K Nowak, research associate.



Field work in the Golden Gate Highlands National Park. Photo taken by Mr Serero Modise, PhD student.

### Conference Contributions

**Le Roux, A.** 2015. *Shout when you're happy – at your own risk.* Talk delivered at the Primate Ecology and Genetics Group (PEGG) Meeting, University of Cape Town, South Africa. 10-11 July.

**Mathibane, N., Nowak, K. & Le Roux, A.** 2015. *Is the reaction of samango monkeys towards novel objects influenced by perceived variation in risk?* Poster presented at the Primate Ecology and Genetics Group (PEGG) Meeting, University of Cape Town, South Africa. 10-11 July.

**Motholo, L.F., Tsotetsi, A.M., Nkhebenyane, J.S., Mokoatsi, T.E. & Thekiso, O.M.M.** 2015. *Assessment of water quality and documentation of macro- and micro-invertebrates in dams and rivers of Qwaqwa, South Africa.* Proceedings of the 7<sup>th</sup> International Toxicology Symposium in Africa, University of Johannesburg, Johannesburg, South Africa. 30-31 August. pp: 22-23.

**Seipati, E.S., Tsotetsi, A.M. & Thekiso, O.M.M.** 2015. *Development of a real-time PCR for diagnosis of bovine cysticercosis.* Paper delivered at the 44<sup>th</sup> Annual Conference of the Parasitological Society of Southern Africa (PARSA), Pumula Beach Hotel, KwaZulu-Natal, South Africa. 20-23 September.

**Tsotetsi, A.M., Seipati, E.S., Njiro, S. & Thekiso, O.M.M.** 2015. *Polymerase chain reaction as a tool to confirm identification of Taenia saginata and T. solium metacestodes made during meat inspection at abattoirs.* Paper delivered at the 44<sup>th</sup> Annual Conference of the Parasitological Society of Southern Africa (PARSA), Pumula Beach Hotel, KwaZulu-Natal, South Africa. 20-23 September.

**Tsotetsi, A.M., Seipati, E.S., Njiro, S.M., Thekiso, M.M.O. & Harrison, L.J.S.** 2015. *Diagnosis of Taenia saginata and T. solium infections under South African conditions.* Paper delivered at the SA-UK Networks One Health Research Workshop: An integrated approach to one health research, Southern African Wildlife College, Limpopo Province, South Africa. 7-12 January.

## Staff

**Senior Lecturer:** Dr A le Roux.

**Lecturers:** Drs MP Leeto, J van As, E Bredenhend, and Ms M van As.

**Junior Lecturer:** Ms HM Matete.

**Research Associates:** Drs K Nowak, A Tsotetsi, S Mshali, and G Prinsloo.

**Senior Officer: Professional Services:** Ms M Sithole.

**Officer: Professional Services:** Mr J Mabena.

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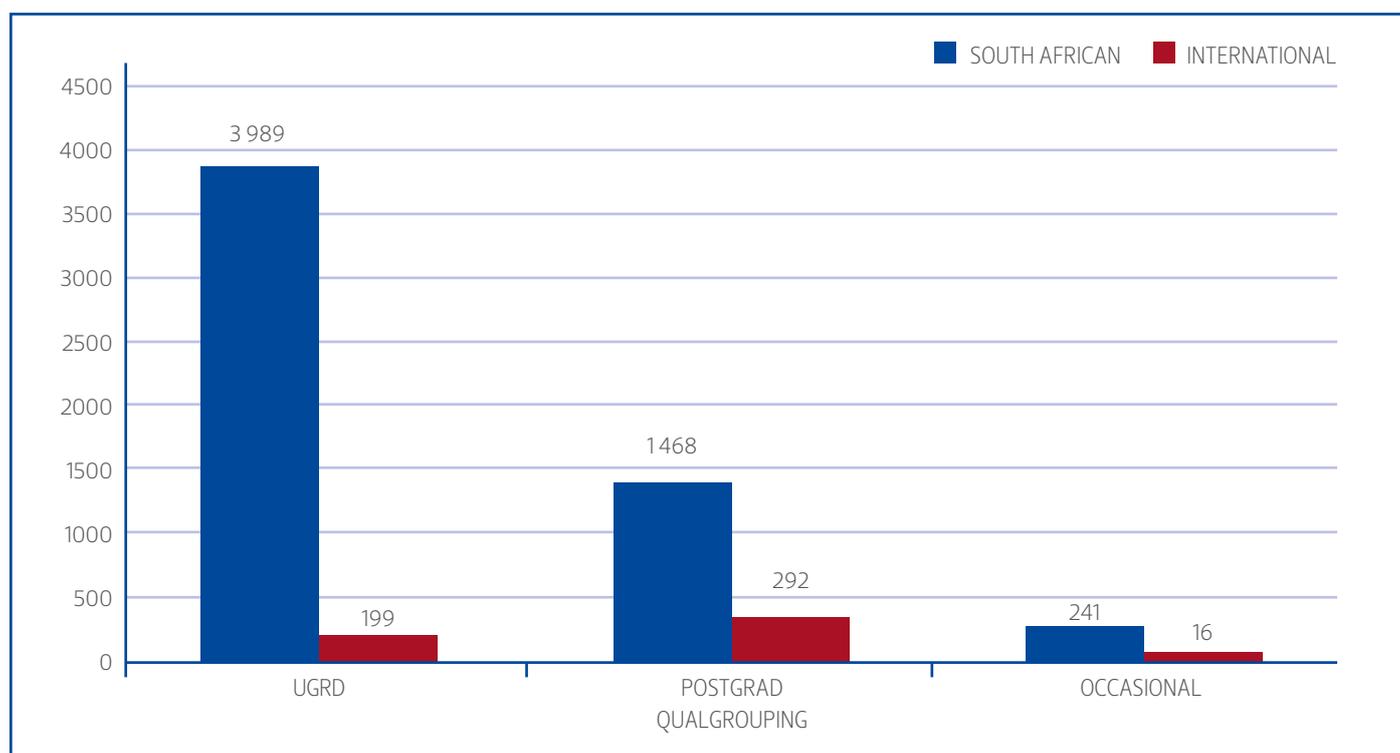
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# Statistical Data

## 2015 Registrations by Education Level

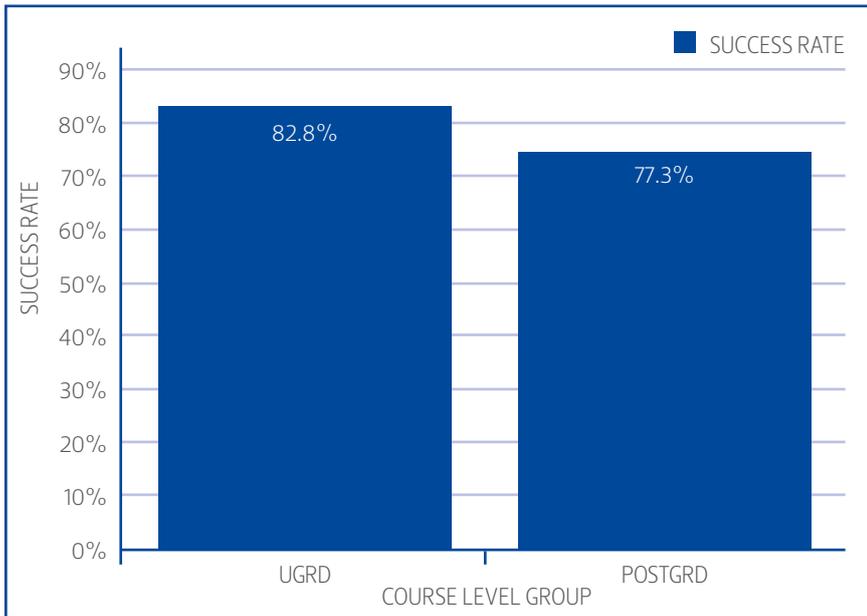


QUALGROUPING	SOUTH AFRICAN	INTERNATIONAL	TOTALS
	ENRL	ENRL	ENRL
UGRD	3 989	199	4 188
POSTGRAD	1 468	292	1 760
OCCASIONAL	241	16	257
<b>TOTAL</b>	<b>5 698</b>	<b>507</b>	<b>6 205</b>

## 2015 Registrations by Nationality

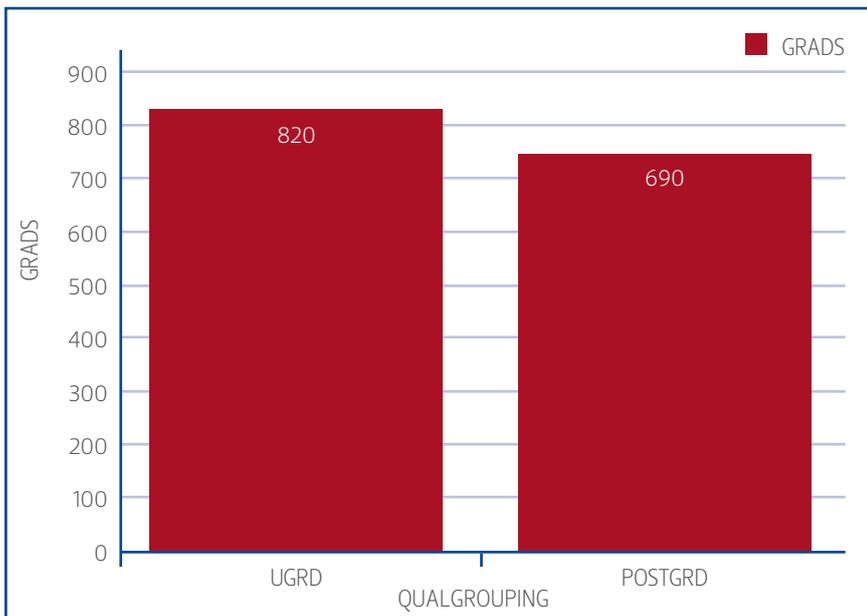
NATIONALITY > QUALGROUPING	ENRL
SOUTH AFRICAN	5 698
INTERNATIONAL	507
<b>TOTAL</b>	<b>6 205</b>

## 2015 Success Levels



QUALGROUPING	SUCCESS RATE
UGRD	82.8%
POSTGRD	77.3%

## 2015 Graduates by Education Level

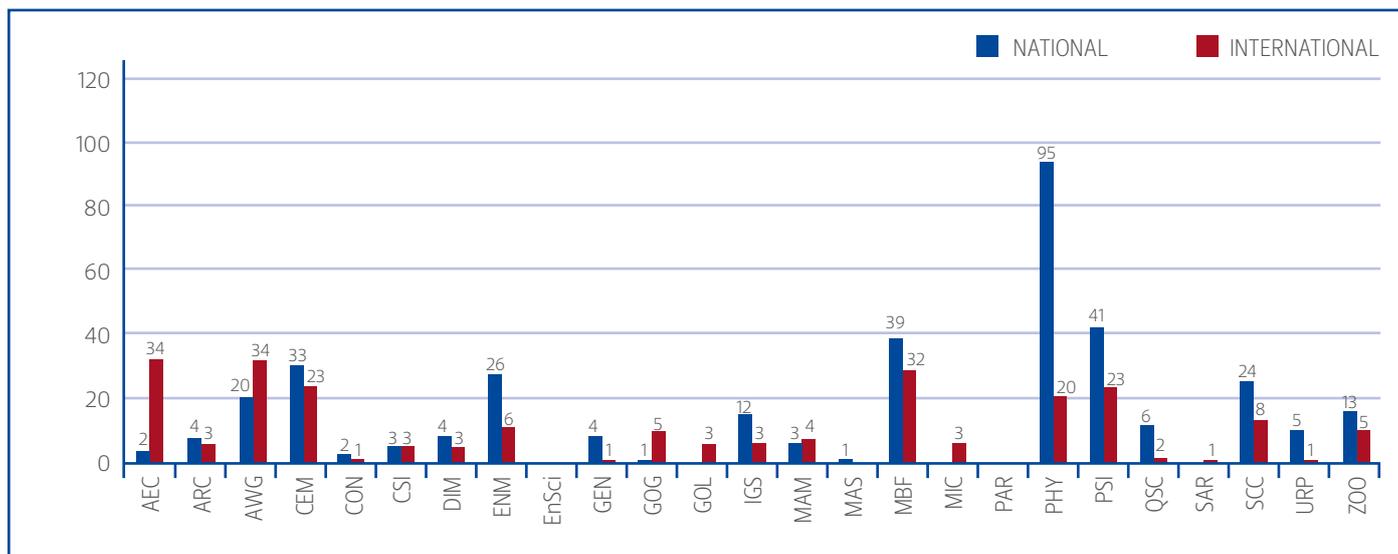


QUALGROUPING	GRADS
UGRD	820
POSTGRD	690
<b>Total</b>	<b>1510</b>

## 2015 Student Figures

QUALGROUPING > RACE	FEMALE	MALE	TOTALS
	ENRL	ENRL	ENRL
UGRD	2 046	2 142	4 188
POSTGRAD	749	1 011	1 760
OCCASIONAL	119	138	257
<b>TOTAL</b>	<b>2 914</b>	<b>3 291</b>	<b>6 205</b>

## 2015 Conferences



### Abbreviations

**AEC:** Agricultural Economics

**ARC:** Agricultural Research Council

**AWG:** Animal, Wildlife and Grassland Sciences

**CEM:** Centre for Environmental Management

**CON:** Consumer Science

**CSI:** Computer Sciences and Informatics

**DIM:** Dimtec

**ENM:** Environmental Management

**EnSci:** Engineering Sciences

**GEN:** Genetics

**GOG:** Geography

**GOL:** Geology

**IGS:** Institute for Groundwater Studies

**MAM:** Mathematics and Applied Mathematics

**MAS:** Mathematical Statistics

**MBF:** Microbial, Biochemical and Food Biotechnology

**MIC:** Center for Microscopy

**PAR:** Parady's Experimental Farm

**PHY:** Physics

**PSI:** Plant Sciences

**QSC:** Quantity Surveying and Construction

**SAR:** Sustainable Agriculture, Rural Development and Extension

**SCC:** Soil, Crop and Climate Sciences

**URP:** Urban and Regional Planning

**ZOO:** Zoology and Entomology



# Glossary

## A

**AAAS** – American Association for the Advancement of Science  
**ADF** – Amsterdam Density Functional Theory  
**AEASA** – Agricultural Economics Association of South Africa  
**AgMIP** – Agricultural Model Intercomparison and Improvement Project  
**AI** – Artificial Insemination  
**AMI** – Advanced Metals Initiative  
**AMWC** – Advanced Materials World Congress  
**AP** – Admission points  
**ARC** – Agricultural Research Council  
**ARC-CGI** – Agricultural Research Council Grain Crops Institute  
**ARC-SGI** – Agricultural Research Council Small Grain Institute  
**ARC-VOPI** – Agricultural Research Council Vegetable and Ornamental Plants Institute  
**ARS-USDA** – Agricultural Research Service – United States Department of Agriculture  
**ASSA** – Actuarial Society of South Africa  
**ASSA** – Astronomical Society of Southern Africa

## B

**BCI** – Brain-Computer Interface  
**BCIS** – Baccalaureus in Computer Information Systems

## C

**CC** – Collaborative Consortium  
**CDA** – Coega Development Agency  
**CDC** – Center for Disease Control  
**CEM** – Centre for Environmental Management  
**CENSARDE** – Centre for Sustainable Agriculture, Rural Development and Extension  
**CHPC** – Centre for High-Performance Computing  
**CIMA** – Chartered Institute of Management Accountants  
**CIMMYT** – International Centre for the Improvement of Wheat and Maize  
**CL** – Cathodoluminescence  
**CM** – Construction Management  
**CNC** – Computer Numerical Control  
**COLA** – Conference on Laser Ablation  
**CPUT** – Cape Peninsula University of Technology  
**CSAG** – Climate Systems Analysis Group  
**CSIR** – Council for Scientific and Industrial Research  
**CSUR** – Competitive Support for Unrated Researchers  
**CTL** – Centre for Teaching and Learning, UFS  
**CUT** – Central University of Technology

## D

**DAAD** – German Academic Exchange Service  
**DEA** – Department of Environmental Affairs  
**DESTEA** – Department for Economic and Small Business Development, Tourism and Environmental Affairs  
**DMISA** – Disaster Management Institute of Southern Africa  
**DNA** – Deoxyribonucleic Acid  
**DSA** – Digital Sky Academy  
**DSC** – Differential Scanning Calorimetry  
**DST** – Department of Science and Technology  
**DST-NRF** – Department of Science and Technology National Research Foundation  
**DUT** – Durban University of Technology

## E

**EAAP** – European Federation of Animal Science  
**ECA** – European Crystallographic Association  
**EMN** – Energy Materials Nanotechnology  
**EnSci** – Engineering Sciences  
**ESRC** – Economic and Social Research Council  
**EU** – European Union

## F

**FAO** – Food and Agricultural Organisation  
**FBIB** – Foundational Biodiversity Information Programme  
**FET** – Further Education and Training  
**FHB** – Fusarium head blight  
**FSIA** – Free State Institute of Architects  
**FSL** – Forensic Science Laboratory

## G

**GC** – Grassland Congress  
**GFAAS** – Graphite Furnace Atomic Absorption Spectroscopy  
**GFRAS** – Global Forum for Rural Advisory Services  
**GIS** – Geographical Information Systems  
**GPS** – Global Positioning System  
**GRF** – German Research Foundation  
**GSSA** – Grassland Society of South Africa

## H

**HCI** – Human-Computer Interaction  
**HEASA** – High-Energy Astrophysics in Southern Africa  
**HELTASA** – Higher Education Learning and Teaching Association in Southern Africa

**hERG-screen** – human Ether-à-go-go Related Gene

**HHT** – Hereditary Haemorrhagic Telangiectasia

**HOD** – Head of Department

**HPC** – High-Performance Computing

## I

**IAH** – International Association of Hydrogeologists

**ICARD-IMWA** – International Conference on Acid Rock Drainage and the International Mine Water Association

**ICASS** – International Conference on Applied Surface Science

**ICRPMC** – International Cereal Rusts and Powdery Mildews Conference

**IDC** – Industrial Development Corporation

**IFHE** – International Federation for Home Economics

**IGS** – Institute for Groundwater Studies

**IITA** – International Institute of Tropical Agriculture

**ILEARN** – Innovative Learning Environment and Research Network

**INRA** – National Institute for Agricultural Research

**IR** – Infrared

**IRAC** – International Research Action Committee

**IRSES** – International Research Staff Exchange Scheme

**IT** – Information Technology

## J

**JEOL** – Japan Electro-Optics Laboratory

## K

**KZANIA** – KwaZulu-Natal Institute for Architecture

## L

**LCAM** – Van Leeuwenhoek Centre for Advanced Microscopy

**LED** – Light Emitting Diode

## M

**MBDA** – Mandela Bay Development Agency

**MoA** – Memorandum of Agreement

**MOF** – Metal Organic Framework

**MRTM** – Mineral Resource Throughput Management

**MSA** – Master's in Sustainable Agriculture

**MS** – Mass Spectroscopy

**MURP** – Master of Urban and Regional Planning

**MUTHI** – Multidisciplinary University Traditional Health Initiative

## N

**NanoSAM** – Nano Scanning Auger Microscopy

**NASA** – National Aeronautics and Space Administration

**NECSA** – Nuclear Energy Corporation of South Africa

**NGO** – Non-Governmental Organisation

**NGS** – Next Generation Sequencing

**NHLS** – National Health Laboratory Service

**NMBU** – Nelson Mandela Bay University

**NMR** – Nuclear Magnetic Resonance

**NPS** – Non-point source

**NRF** – National Research Foundation

**NSF** – National Science Foundation

**NTeMBi** – Nuclear Technologies in Medicine and the Biosciences

**NUI** – Natural User Interface

**NUL** – National University of Lesotho

**NZG** – National Zoological Gardens

## O

**OAU** – Obafemi Awolowo University

**OCA** – Oracle Certified Associates

**ODI** – Overseas Development Initiative

**OES** – Optical Electronic and Mass Spectroscopy

## P

**PARSA** – Parasitological Society of Southern Africa

**PD** – Parkinson's disease

**PGE** – Platinum-Group Elements

**PI** – Principal Investigator

**PRT** – Protein Research Trust

**PSP** – Prestige Scholars Programme

## Q

**qPCR** – Quantitative polymerase chain reaction

**QS** – Quantity Surveying

## R

**rBST** – Recombinant bovine somatotropin

## S

**SAAFoST** – South African Association for Food Science & Technology

**SAAMIIP** – Southern Africa Agricultural Model Intercomparison and Improvement Project

**SAARC** – South Asian Association for Regional Cooperation

**SAASTA** – South African Agency for Science and Technology Advancement

**SAAWK** – Suid-Afrikaanse Akademie vir Wetenskap en Kuns

**SAB** – South African Breweries

**SACI** – South African Chemical Institute

**SACLA** – Southern African Computer Lecturers' Association

**SACPLAN** – South African Council for Planners

**SADC** – Southern African Development Communities

**SADC GMI** – Southern African Development Communities Groundwater Management Institute

**SADoCoL** – South African Doping Control Laboratory

**SAENSE** – Screening Applications and Novelty in Specialised Environments

**SAFEX** – South African Futures Exchange

**SAHS** – Southern African Society for Horticultural Science

**SAIP** – South African Institute of Physics  
**SALT** – Southern African Large Telescope  
**SAMO** – South African Mathematics Olympiad  
**SANBI** – South African National Biodiversity Institute  
**SAPPA** – South African Pecan Producers' Association  
**SAPS** – South African Police Service  
**SAPS-FSL** – South African Police Service Forensic Science Laboratory  
**SASA** – South African Statistical Association  
**SASAE** – South African Society of Agricultural Extensionists  
**SASAS** – South African Society for Animal Sciences  
**SASOL** – South Africa Synthetic Oil Liquid  
**SASPP** – South African Society for Plant Pathology  
**SASRI** – South African Sugarcane Research Institute  
**SAWSS** – Southern African Weed Science Society  
**SEA** – Strategic Environmental Assessment  
**SEM** – Scanning Electron Microscope  
**SEMDSA** – Society for Endocrinology, Metabolism and Diabetes of South Africa  
**SGI** – Small Grain Institute  
**SIMS-TOF** – Secondary Ion Mass Spectrometry – Time-of-Flight  
**SKA** – Square Kilometre Array  
**SSAG** – Society of South African Geographers  
**SSSSA** – Soil Science Society of South Africa  
**STIAS** – Stellenbosch Institute for Advanced Study  
**SU** – Stellenbosch University

## **T**

**TARM** – Transboundary Aquifer Resources Management  
**TEM** – Transmission Electron Microscopy  
**TGA** – Thermal Gravimetric Analysis  
**TWAS** – Third World Academy of Sciences

## **U**

**UAE** – United Arab Emirates  
**UCT** – University of Cape Town  
**UFS** – University of the Free State  
**UK** – United Kingdom  
**UM** – University of Minnesota  
**UNESCO** – United Nations Educational Scientific and Cultural Organization  
**UNILORIN** – University of Ilorin  
**UP** – University of Pretoria  
**UPP** – University Preparation Programme  
**US** – University of Sydney  
**USA** – United States of America  
**UV** – Ultraviolet

## **V**

**VOPI** – Vegetable and Ornamental Plants Institute

## **W**

**WCGALP** – World Congress on Genetics Applied to Livestock Production  
**WFRA** – Water Footprint Research Alliance  
**WGT** – Winter Grain Trust  
**WRC** – Water Research Commission

## **X**

**XRD** – X-Ray Diffraction  
**XRF** – X-Ray Fluorescence



