

Natural and Agricultural Sciences
Annual Report
2011



UNIVERSITY OF THE
FREE STATE
UNIVERSITEIT VAN DIE
VRYSTAAT
YUNIVESITHI YA
FREISTATA



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NATURAL AND
AGRICULTURAL SCIENCES
NATUUR- EN
LANDBOUWETENSKAPPE

Natural and Agricultural Sciences

Annual Report

2011

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Preface

Message from the Dean

Cutting edge research culminating in exciting prospects for new technologies, scholarly leadership in compelling national issues, exciting discoveries, prestigious international research awards and highly sophisticated new state-of-the-art equipment again characterized the achievements of our faculty in 2011.

The uncovering of new insights for drug development using nanotechnology made world headlines and opened up an exciting new area for scientific exploration while the discovery of a multi-cellular organism (a nematode worm) at the greatest depth below the earth's surface ever recorded was greeted with much excitement by the research community. The studying of seasonal movements, migration routes and behavioural patterns in giraffes using GPS equipped collars was also a world first. Significant new discoveries were made with regard to the identification of wheat and barley genotypes having genetic resistance to leaf and stem rust. And work on a model eukaryote showed that its epigenome was adjusted to reflect a general state of transcriptional repression during quiescence, a fundamentally important finding. While numerous prestigious awards were once again conferred on several staff members, a particularly special one was the African Union Kwame Nkrumah Scientific Award for research advancing socio-economic development on the continent which was won by one of our leading female researchers. We also have to extend a word of gratitude to our numerous collaborators, both nationally and internationally, whose involvement in our work makes it possible for staff and students to achieve more and also helps us to continually deepen our academic rigor. Our students also again excelled in various ways, winning awards for architectural creativity, being recognized for presenting outstanding papers on their research at international conferences, and winning prestigious bursaries to continue with their higher degrees. Special mention also has to be made of the outstanding successes achieved by our foundation programmes which offer students with potential the opportunity to perform themselves into our degree programmes. Finally, without state-of-the-art equipment research leadership is impossible which makes the acquisition of a multi-million



Prof. NJL Heideman

rand Time of Flight Secondary Ion Mass Spectrometer as an addition to our highly sophisticated nanotechnological research equipment, a further significant stride forward in this area of research.

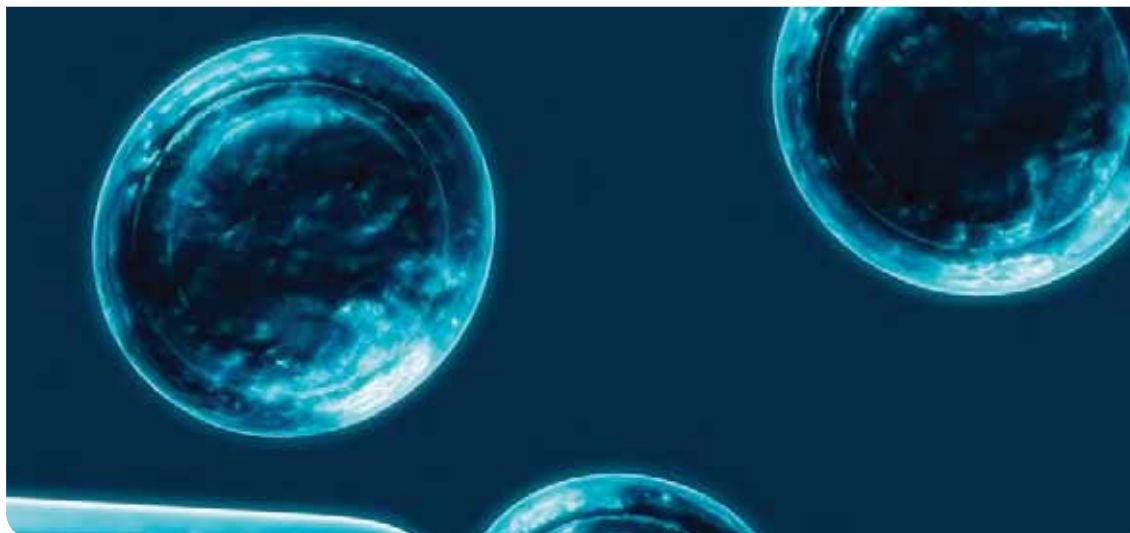
It is therefore once again my pleasure to present to you our 2011 Annual Report and extending my sincere gratitude to the staff and students for their selfless commitment to academic excellence and further raising the stature of our faculty and the university.

Prof. NJL Heideman
Dean, Faculty of Natural and Agricultural Sciences

Strategic Academic Clusters

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Strategic Academic Cluster: **Advanced Biomolecular Research**



The Advanced Biomolecular Research Cluster had a full and successful year in 2011. There was a significant increase in activity in all focus areas, with the High Throughput Biology and Bioinformatics focus areas experiencing a large growth in the number of projects. The inter-faculty multi-disciplinary philosophy was also expanded with the cluster participating in the annual Research Day of the Faculty of Health Sciences, with the identification of many possible collaborative activities.

The major achievements of the ABR cluster within the Faculty of Natural and Agricultural Sciences include the investigation of the post-translational modification of the core histones in the model eukaryote, *Saccharomyces cerevisiae*, where entry into stationary phase, mimicking a state of senescence of multi-cellular eukaryotes, was shown to be accompanied by quantitative deacetylation of histones H3 and H4. This finding showed that the epigenome of this eukaryote was adjusted to reflect a general state of transcriptional repression during quiescence. This study was published in *BMC Biochemistry* (Ngubo *et al.*, 2011).

The use of mass spectrometry (MS) in the structural elucidation of mega-Dalton multi-unit protein complexes was further expanded with the development of software for the analysis of MS/MS spectra for the identification of cross-linked amino acid residues in di-peptides. This approach allows identification of regions of proteins that are in close spatial proximity, and facilitates questions regarding complex structures at a resolution that lies between that of X-ray crystallography and cryo-electronmicroscopy. A review on this topic was published in the *impact 7 Briefing in Bioinformatics* (Mayne and Patterton, 2011). The mass

spectrometers and 2DGE apparatus in the Facility for Genomics and Proteomics were also heavily used by research groups from the campus and from other universities and industry for protein identification and quantitative proteomics. This included a project with the Water Research Commission making use of the MS instruments for a national reconnaissance study on the presence of emerging contaminants such as pesticides and pharmaceuticals in drinking water in South Africa.

The Bioinformatics focus area was also very active, with a project simulating the effect of post-translation modifications of the core histone N-terminal extensions on the secondary structures of these extensions being completed, which made use of the High Performance Computing centre at the UFS. Results from this study was presented by Prof. Patterton at the bi-annual FASEB conference on Epigenetics and Chromatin Structure in Colorado, US. This study provided a theoretical basis for further experiments on the location of the N-terminal tails in condensed chromatin, making use of chemical cross-linking and mass spectrometry.

In another major achievement, Prof. Derek Litthauer completed the sequencing of the *Thermus scotoductus* SA-01 genome, and showed that this species acquired many genes from other thermophilic micro-organisms. This study was published in the *impact 4 BMC Genomics* (Gounder *et al.*, 2011).

In the Advanced Cloning System focus area, Profs J. Albertyn and M. Smit registered two provisional patents related to novel plasmids that can be used for the expression of genes in a number of different yeasts. Profs A. Marston and J. van der Westhuizen were also very active in the Novel Drug Discovery focus area and published several papers on

pharmacologically active compounds isolated from South African plants. Prof. Marston also published a review on the isolation of protein kinase inhibitors and activators from natural products in *Current Topics in Medicinal Chemistry* (Marston, 2011). Protein kinases are involved in many signal transduction pathways, systems that allow cells to react to the environment, and which are involved in many cellular responses associated with diseased states in humans.

Cluster seed funding allowed several new projects to start, many of which generated preliminary data that was used in major funding applications. The ABR cluster continues to support multi-disciplinary projects in its focus areas, and facilitates the development of large multi-PI research projects and the development of major funding applications. We look forward to an even more active year in 2012 in pursuit of multi-disciplinary scientific excellence.

Participating staff

Prof. Hugh Patterson
 Dr Gabré Kemp
 Dr Dirk Opperman
 Prof. Koos Albertyn
 Prof. Martie Smit
 Prof. Derek Litthauer
 Dr Charlene Boucher
 Prof. Paul Grobler
 Dr Linda Spies
 Dr Botma Visser
 Prof. Felicity Burt
 Prof. Jan van der Westhuizen
 Prof. Andrew Marston
 Mr Du Toit Schabort
 Dr Anke Wilhelm-Mouton

Strategic Academic Cluster: Materials and Nanosciences



The main research focus of the MNS Cluster is divided into three sub-thrusts, i.e., Nano solid state materials, Petrochemicals and Polymers. A brief summary of the achievements for 2011 is given below.

Solid State Luminescent and Advanced Materials [H.C. Swart (leader), J.J. Terblans, O.M. Ntwaeaborwa, R.E. Kroon, and B.F. Dejene].

The research focuses on surface characterization, luminescent material, degradation mechanisms, luminescent mechanisms and 'up and down' conversion phosphors. For this, state-of-the-art equipment for surface characterization is

utilized, installed over the past 3 years, i.e., NanoSAM (5-10 nm resolution), XPS-Versaprobe, and a Nano TOF SIMS (< 100 nm resolution).

The outputs from the Swart group included 20 papers published in the international literature; 18 conference proceedings; 22 local conferences and 45 international conferences. There were 3 post doctoral associates in the group, 6 M.Sc. students finished their studies and 9 Ph.D. studies are in progress. Examples of outputs are given below.

In the **Petrochemicals** thrust, the focus is on *Homogeneous Catalysis and Reaction Mechanisms* [A. Roodt (Leader),

H.G. Visser, G. Steyl, and J.A. Venter] and *Heterogeneous Catalysis* [J.C. Swarts (Leader), J. Conradie, E. Erasmus, E. Fourie and E. Langner].

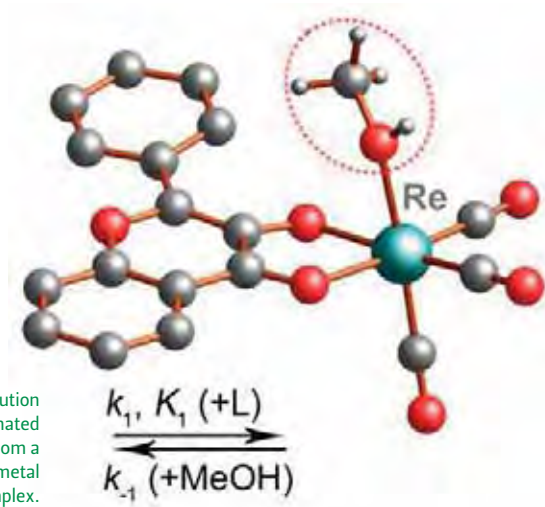
The Roodt group investigates the conversion of low-cost feedstocks to value added chemicals and aim to develop new catalysts which speeds up reactions (for example more than 10000 times: example shown to the right, for the substitution of coordinated methanol from a rhenium(I) metal complex). Another focus is on the nanomaterials as radiopharmaceuticals, and study of very fast (millisecond timescale), cryo, high-pressure and infrared kinetics, supplementing these with X-ray crystallography and Multi-Nuclear NMR.

The Swarts group explores oxidation catalysts from platinum, silver, palladium, rhodium and phthalocyanines (complex planar electron-rich groups) supported on two-dimensional materials and zeolites, and the surface action thereof as well as in solution utilising electrochemical, kinetic and thermal analysis. A highlight was the successful use of silver on a two dimensional support to oxidise alcohols.

There were eight students directly funded during 2011, but 15 were directly associated with the cluster. The two groups produced 20 publications in the international literature, and 23 conference presentations under the broad theme of the MNS Cluster. Examples of the best outputs are given below.

In the **Polymers** thrust, with A.S. Luyt (leader) & colleagues/postgraduate students (shown right; from left) Motshabi Sibeko, Sibusiso Ndlovu, Tshwafo Motaung, Teboho Mokhena, Thabang Mokhothu, Jonas Mochane, the focus is on the preparation and characterization of polymer-wax blends to be used as phase-change materials for energy storage, polymer-natural fibre composites and polymer nanocomposites. New materials are produced from the blending & mixing of polymeric; composite materials & fillers (especially natural fibres) inclusion of nano-sized particles into different matrices, modifying the physical properties of polymers & composites. The Luyt group produced 14 publications and 20 conference contributions during 2011.

The MNS Cluster produced in total 54 papers in the international literature and more than 60 presentations at conferences.



M.Sc. student Chris Joubert adjusting the reduction oven prior to measurements

Research outputs

Research articles

Conradie, J. & Swarts, J.C. 2011. Relationship between electrochemical potentials and substitution reaction rates of ferrocene-containing β -diketonatorhodium(I) complexes; Cytotoxicity of $[\text{Rh}(\text{FcCOCHCOPh})(\text{cod})]$. *Dalton Transactions* 40: 5844-5851.

Gusowski, M.A., Swart, H.C., Karlsson, L.S., Trzebiatowska-Gusowska, M. 2011. $\text{NaYF}_4:\text{Pr}^{3+}$ Nanocrystals Displaying Photon Cascade Emission. *Nanoscale* 4(2): 541-546.

Roodt, A., Visser, H.G. & Brink, A. 2011. Structure/reactivity relationships and mechanisms from X-ray data and spectroscopic kinetic analysis. *Crystallography Reviews* 17: 241-280.



A.S. Luyt (leader) & colleagues/ postgraduate students

Conference contributions

Roodt, A. 2011. *Crossing from the 3rd to the 4th Dimension: Relevance of Kinetic Studies*. Invited keynote lecture delivered at the 40th South African Chemical Institute (SACI) Convention and the 3rd Federation of African Societies of Chemistry (FASC) Congress, University of the Witwatersrand, Johannesburg, South Africa. 16–21 January.

Swart, H.C., Terblans, J.J., Nagpure, I.M., Pitale S.S. & Ntwaeaborwa, O.M. 2011. *Electron stimulated surface chemical reaction mechanism for phosphor degradation*. Invited lecture delivered at the 1st International Congress on Advanced Materials, Jinan City, Shandong, China. 13–16 May.

Swarts, J.C. 2011. *The Cytotoxicity of Ferrocene-Containing Complexes are Governed by Structural and Electrochemical Properties*. Invited lecture delivered at the BIT's 2nd Annual International Conference of Medicchem 2011: Master Drug Discovery Chemistry, Beijing International Convention Center, China. 9–11 August.

Participating staff

Interim Cluster Coordinator: Profs A. Roodt (Chemistry)

Focus area leaders: H.C. Swart (Physics), J.C. Swarts (Chemistry: Main Campus) and A.S. Luyt (Chemistry: QwaQwa Campus)

Strategic Academic Cluster: Technologies for Sustainable Crop Industries in Semi-Arid Regions



During 2011, projects funded by the cluster yielded a significant amount of new information and new technologies relevant to sustainable crop production in South Africa. Research conducted by investigators from various disciplines in the cluster is grouped into three Focus Areas (FA).

The majority of projects funded in 2011 resorted under **FA 1: Production Technologies for Managing Crop Environments**.

In this FA, researchers from various disciplines strive to gain a greater understanding of how plants are influenced by biological and physicochemical constraints in their environment and how these constraints can be managed and/or manipulated to the benefit of crops and the environment by means of traditional or new technologies. Within the context of entomology, Prof.Schalk Louw and Mr

Vaughn Swart, respectively, made significant breakthroughs in terms of understanding the dynamics involved in soil arthropod trophic structures and the insect-fungal ecology of nut crops in semi-arid regions.

The discipline of plant pathology, in general, was especially well served by the Cereal Rust Research programme of Prof. Zakkie Pretorius. His research yielded significant new discoveries with regard to the identification of wheat and barley genotypes having genetic resistance to leaf and stem rust. Molecular wheat research was also boosted by the valuable work of Dr Botma Visser who investigated various aspects of defence signalling in wheat.

Dr Visser, in collaboration with Prof.Wijnand Swart, also played a crucial role in establishing a new DNA-based

technique for studying microbial communities in soil. Prof. Neal McLaren made significant strides in determining the epidemiological value of resistance to principle soil-borne sorghum and soybean diseases in South Africa.

In terms of agronomy, Dr James Allemann conducted a valuable contribution in terms of understanding allelopathy and its significance to crop production. In the discipline of soil science, Prof. Chris du Preez made new discoveries relating to the effect of land use on soil and water quality while Dr Piet le Roux was successful in establishing digital soil mapping as a crucial technology for southern Africa.

In FA 2: Genetic Technologies for Crop Improvement, molecular and biotechnological applications are utilised for the genetic improvement of traditional crops. The main aim of this FA is to increase the nutritional quality of crops as well as to improve crop yield and increase tolerance to biotic and abiotic stress factors. In this regard, Dr A van Biljon made a valuable contribution to understanding the nutritional value of new South African sweet potato breeding lines developed for the needs of resource-poor farmers.

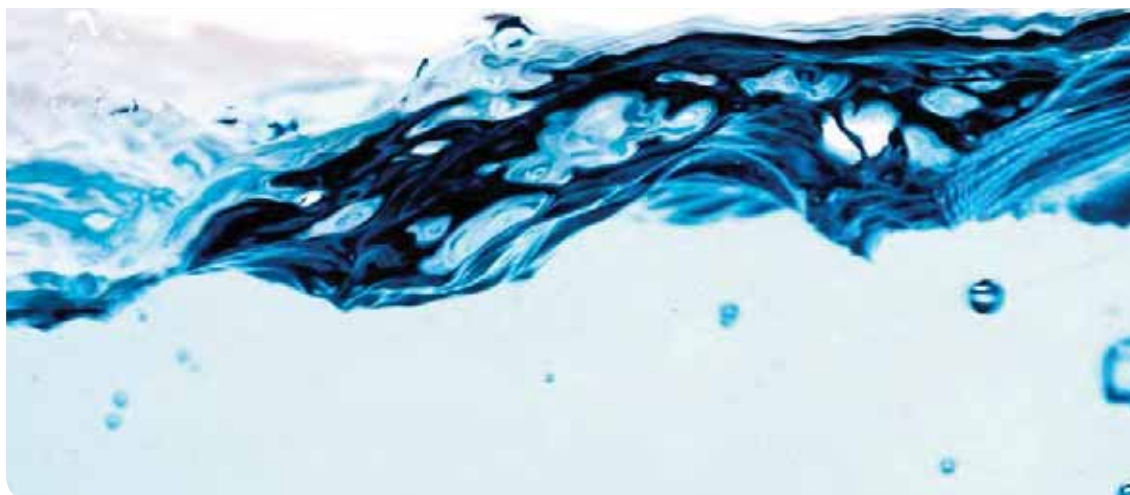
Prof. Maryke Labushagne made a significant contribution to the improvement of wheat quality by selecting appropriate polymeric and monomeric protein fractions in South African wheat cultivars using Size Exclusion High Performance Liquid Chromatography (SE-HPLC). **In FA 3: Technologies for Adding Value to and Improving Crop Product Quality,** research is directed towards increasing food and non-food product quality and safety, from the raw material to the consumer (including animal feed). Dr Maryna de Wit portrayed the food quality potential of cactus pear (*Opuntia ficus-indica*) in terms of carbohydrate, seed oil and anti-oxidant content. In the laboratory of Prof. Arno Hugo, a project to evaluate the effect of plant oils as feed additives to improve the health properties of animal products by increasing the use of high quality plant oils in animal feeds, yielded significant results.

Participating staff

Director: Prof. Wijnand Swart

Focus Area Leaders: Profs Z.A. Pretorius, M.T. Labuschagne and A. Hugo.

Strategic Academic Cluster: **Water Management in Water-Scarce Areas**



The Strategic Cluster *Water Management in Water-Scarce Areas* aims to carry out research and develop associated teaching in the management of the scarce water resource in its physical, ecological, social and economic aspects. In essence, the Cluster gives attention to the risks attendant on the availability of the water resource in its natural and utilisable states. Water management in water scarce areas

is essentially different from that where water is abundant. Unfortunately most of Southern Africa is a water-scarce area. Therefore, the Strategic Academic Water Cluster is structured to create a powerful intellectual cohesion among researchers with the potential to develop self-sustaining critical mass in key areas of national, regional or international relevance to water management in water-scarce areas.

The Third Orange River Basin Symposium was presented by the Water Cluster during June 2011, with the theme *The role of water in food security*. There was an excellent array of speakers, ranging from seasoned speakers to students delivering congress papers and addressed key issues such as the role of water in food security, microbial monitoring and implications, efficient use of water and the state of the Orange River and the impacts of climate change.

Research outputs for bursary holders in 2011

Rykie van der Westhuizen (Study leader: Prof. Leon van Rensburg, Department of Soil, Crop and Climate Sciences), Johan van Tol (Study leader: Dr Piet le Roux, Department of Soil, Crop and Climate Sciences), Sabelo Mavimbela (Study leader: Prof. Leon van Rensburg, Department of Soil, Crop and Climate Sciences), Mussie Zerizghy (Study leader: Prof. Leon van Rensburg, Department of Soil, Crop and Climate Sciences) and Abiodun Ogundeji (Study leader: Prof. Daan Louw, Department of Agriculture Economics) published articles in various scientific journals.

Abiodun Ogundeji received the Agricultural Economics Association of South Africa (AEASA) award for best presented paper at the 50th Annual Conference of the Agricultural Economics Association of South Africa held in Pretoria, South Africa – 2011 as well as the University of the Free State, Vice Chancellor Prestige Scholarship Award: 2011.

In addition, Water Cluster members made a significant contribution to the body of knowledge in the field.

Research topics for 2011

Botha, G. *A phytosociological study of the riparian and associated communities of the panhandle section of the Okavango River, Botswana.*

Fourie, H. *The influence of degree of water saturation on the growth of obligate hydrophytic vegetation.*

Kudinha, M. *Leaf Wetness Measuring techniques using the Energy Balance.*

Mavimbela, S. *Merging of infield rainwater harvesting (IRWH) with micro flood irrigation.*

Ogundeji, Abiodun *Quantification of the economic value of climate change impacts and the benefits and costs of adapting by the agriculture and water resource sector in Ceres, Western Cape, South Africa.*

Seiphethlo, L. *A phytosociological study of the Letsie wetland and catchment, south-eastern Lesotho.*

Van Rensburg, D. *A phytosociological study of the riparian and related catchment communities of the Groen River, Central Karoo, South Africa.*

Van Aardt, A. *A vegetation and environment analysis of the palaeo-Kimberley, palaeo-Modder Rivers and the surrounding area.*

Van der Westhuizen, R. *Quantification of the medium water supply rate and transpiration efficiencies of tomato and cucumbers grown hydroponically in coir.*

Van Tol, J. *Soil based characterization of hillslope hydrology.*

Zerizghy, M.G. *Influence of the in-field rain water harvesting (IRWH) surface structure on evaporation.*



Departments in the
Agricultural Sciences



“The purpose of the Department of Agricultural Economics is to provide students in Agricultural Economics with the theoretical training, linked to current agricultural economics and marketing issues in southern Africa and internationally.”

– Prof. Johan Willemse

Department of **Agricultural Economics**

Overview

The purpose of the Department of Agricultural Economics is to provide students in Agricultural Economics with the theoretical training, linked to current agricultural economics and marketing issues in Southern Africa and internationally. Emphasis is also placed on management, strategic planning and analysis of markets forging a strong relationship with the industry.

Special achievements

The 2011 annual conference of AEASA commemorated its 50th anniversary, with the conference theme: *AEASA 1961 – 2011 a foundation for the next 50 years*. Colleagues in the Department of Agricultural Economics won first prize for the best contributed paper, titled: *Impact of climate change on planning and dealing with flood disasters in South Africa: A case study of Soweto on Sea*. The authors were Abiodun Ogundeji and Giel Viljoen from the Department of Agricultural Economics, and Herman Booysen and Gawie Du Toit de Villiers, research associates from the Department of Geography.

Manfred Venter won the first prize for the best poster at the same conference. Riska de Klerk was voted the second best tutor by the Faculty of Natural and Agricultural Sciences.

Three students took part in the exchange programme with Virginia Tech in the USA and achieved very good marks.

The IFMA (International Farm Management Association) congress was also attended in New Zealand, where the Department delivered six peer reviewed papers.

A number of strategic market workshops were held with commercial farmers and agri businesses, while training for emerging farmers also took place.

Activities

The department had various interactions with bursary donors during 2011. Amongst the donors were GWK, OVK, Senwes, Suidwes-Landbou and VKB.

This is part of the Agri Bursary Project, introduced by the department to celebrate its 50th anniversary. The purpose is

01





Prof. Johan Willemse

Prof. Johan Willemse has extensive industry experience in commercial agriculture in southern Africa, in various senior positions, as well as in private consulting on strategic market and price analysis for agri business as well as extensive experience on the deregulation of agricultural markets (policy and farm level).

to assist our best students in creating opportunities to work and gain experience during the vacations, working at the agri-businesses, who are their donors.

The department received numerous bursary applications and were granted several bursaries by different agri businesses. Eleven students were appointed as assistant researchers and they assisted the lecturers, who acted as their mentors and study leaders, in various ways. They were involved in research work, tutoring of first year students and assisting with practical classes. The attendance of Friday seminars, presented by LEK Forum, is compulsory for all students/assistants; where they are granted the opportunity to do presentations and address the audience on different subjects of research regarding their own studies.

The 18th bi-annual (IFMA) International Farm Management Association conference was held in Methven, New Zealand from 20-25 March 2011. Five lecturers from the department attended the conference and 6 papers were presented.

Quarterly agricultural outlook workshops are held on campus by Prof. Johan Willemse and are well attended by farmers and agri businesses with sponsorship from Nedbank. Farmers from all over the country attend these workshops with lively interaction taking place. Safex workshops are presented by Mr Dirk Strydom and they have become a regular on the calendar. Prof. Johan Willemse was also invited to deliver a number of keynote addresses to industry forums and conferences and to assist in strategic planning for agribusiness.

Graduates from the Department of Agricultural Economics were 9 B.Sc. Agric Honours students, 5 B. Agric. Honours students, 19 M.Sc. Agric students, 1 (mini) M.Sc. Agric student, 1 M. Agric student, 4 Ph.D. Agricultural Economics students, 3 B.Com. Agricultural Economics Honours students and 5 M.Com. Agricultural Economic students in total.

Ongoing research projects for the Water Research Commission are also an important part of departmental research.

Community service

The South African Foundation for Economic and Financial Education (SAFEFE), the Faculty of Natural and Agricultural Sciences, supported by the Department of Agricultural Economics, completed two major projects for 2011.

SAFEFE together with the Mpumalanga Department of Education (sponsored by Absa) trained 137 153 learners for 2011.

Material was developed and approved by the National Department of Education and distributed to schools. It has four lessons for teachers. Each lesson consists of economic concepts, a mathematics component and a language component. SAFEFE facilitated a book donation of hundreds of books to the Free State schools from Mississippi State University- USA, a partner school of the UFS.

Ms Lize Morris, lecturer in Agricultural Economics facilitated a practical visit to the Arlington Farmer's Organisation and



Prof. Johan Willemse (Chairperson of the Department of Agricultural Economics), Ms Roxanne Porter (John Deere), Assistant Researcher Karabo Takadi, Ms Carol de Pol (John Deere) and Mr Moses Maine (VKB) at the information day/brunch on 2 September 2011.



Delegates at the 18th International Farm Management Conference Gala Dinner in Methven, New Zealand. From left: Janus Henning, Frikkie Maré, Ms Linda Olsen and Prof. Kent Olsen Olsen, Ms Lize Morris and Prof. Johan Willemse

OVK for 30 students and 4 personnel members. Farmers explained the A to Z of farming, stud farming and crop farming. A dairy farm with 700 cows was visited and students were also introduced to precision farming with a GPS system. A sheep farm with a flock of 1 000 sheep where the farmer used an Anatolian sheep dog to herd the flock, was visited. The visit also included a chicken farm where 35 000 chickens are housed. This was part of an ongoing process to expose students to practical commercial farming.

The department is also involved with a number of research projects, in conjunction with industry organizations, ranging from the potato industry to the maize industry, as well as the livestock and dairy industries. Work was also done on Farmer Controlled Businesses and in assisting farmers in forming business groups.

Staff contributed approximately 80 popular scientific articles to a wide range of magazines and newspapers on agricultural economic issues. This includes regular columns in *Landbouweekblad*, *SA KOOP*, *SA Groenteboer*, *Veeplaas*, *Food & Beverage*, *SA Grain*, *Beeld*, *Die Burger* and *Volksblad*.



Lecturer Lize Morris and students from the Department of Agricultural Economics on their farm visit to Arlington in September 2011.

Staff matters

After a career of 34 years Prof. Klopper Oosthuizen retired at the end of 2011. A former student of Prof. Oosthuizen, Prof. Bennie Grové, is now a senior lecturer in the department. Dr Kit le Clus also retired at the end of 2011.

Research Outputs

Department of Agricultural Economics



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Research articles

Alemu, Z.G. & Worak, O.T. 2011. Price transmission and adjustment in the Ethiopian coffee market. *Agrekon* 50(2): 27-43.

Grové, B. 2011. Review of whole-farm economic modeling for irrigation farming. *Water SA* 37(5): 789-796.

Joubert, J., Jooste, A. & Lotriet, R. 2011. The cash cows, dogs, stars and problem children of the South African agricultural sector. *International Journal of Agricultural Management* 1(1): 18-23.

Maine, N., Nell, W.T., Alemu, Z.G. & Louwenberg-De Boer, J. 2011. Impact of variable-rate application of nitrogen on yield and profit: A case study from South Africa. *Precision Agriculture* 11(5): 448-463.

Mmbengwa, V.M., Ramukumba, T., Groenewald, J.A., Van Schalkwyk, H.D., Gundidza, M. & Maiwashe, A.N. 2011. Evaluation of essential capacities required for the performance of farming small, micro and medium enterprise (SMMEs) in South Africa. *African Journal of Agricultural Research* 6(6): 1500-1507.

Ogundeji, A.A., Jooste, A. & Oyewumi, O. 2011. An error correction approach to modeling beef supply response in South Africa. *Agrekon* 50(2): 44-58.

Worako, T., Jordaan, H. & Van Schalkwyk, H.D. 2011. Investigating volatility in coffee prices along the Ethiopian coffee value chain. *Agrekon* 50(3): 90-108.

Conference contributions

Baiphethi, M.N., Viljoen, M.F., Kundhlande, G. & Ralehlo, N.G. 2011. *Participation in land transfer markets and the adoption of rainwater harvesting for crop production among resource poor smallholder farmers in Thaba 'Nchu, Free State.* Paper presented at the 49th Annual Conference of the Agricultural Economics Association of South Africa (AEASA). AEASA 1961 – 2011: A foundation for the next 50 years, Diep-in-die-Berg, Pretoria, South Africa. 28-30 September.

Gorgens, A., Grové, B., Annandale, J., Lorentz, S., Jovanovich, N., Du Preez, C.C., Matthews, N., Van der Laan, M., Le Roux, J. & Lyons, S. 2011. *Agriculture non-point source pollution: modeling and economics.* Paper presented at the South African Water Research Commission (WRC) 40-Year Celebration Conference, Emperor's Palace, Johannesburg, South Africa. 31 August – 1 September.

Henning, J.I.F., Strydom, D.B. & Willemse, B.J. 2011. *Developing a financial ratio benchmarking system for GWK District farmers in South Africa.* Proceedings of the 18th International Farm Management Association Congress: Thriving in a Global Market: Innovation, Co-operation and Leadership, Canterbury, New Zealand. 20-25 March. pp. 366-379.

Hough, E., Nell, W.T., Maine, N. & Groenewald, J.A. 2011. *Winter grain response to phosphorus variation on different soil types under precision agriculture (PA).* Proceedings of the 18th International Farm Management Association Congress: Thriving in a Global Market: Innovation, Co-operation and Leadership, Canterbury, New Zealand. 20-25 March. pp. 347-356.

Joubert, J., Jooste, A. & Lotriet, R. 2011. *The cash cows, dogs, stars and problem children of the South African Agricultural sector.* Paper presented at the 18th International Farm Management Association Congress: Thriving in a Global Market: Innovation, Co-operation and Leadership, Canterbury, New Zealand. 20-25 March.

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“Sustainable livestock production is seen as a solution to uplifting the rural small scale communities.”

– Prof. Johan Greyling

Department of **Animal, Wildlife and Grassland Sciences**

Overview

The Department of Animal, Wildlife and Grassland Sciences was once again prominent and made its presence felt in the animal production and wildlife industry locally and nationally – whether it be regarding research or community service. By focussing on the different disciplines and the efficient use of the natural resources, the utilisation of alternative feed sources, the improvement of reproduction efficiency and the acceleration of genetic progress - the maintenance of sustainable quality animal production is ensured. With a continuing changing environment and individual preferences, the challenges facing the animal producer in South Africa are ever increasing.

To address these demands the Department of Animal, Wildlife and Grassland Sciences with its high level of expertise plays a pivotal role in the industry and the communities. The products (students) generated by this department are our pride and much emphasis is placed on academic excellence. So for example in 2011 a total of 18 B.Sc. Honours students, 2 M.Sc. Agric students and 1 Ph.D. attained their post graduate degrees in the respective disciplines. The contributions made nationally and internationally by several of the department's

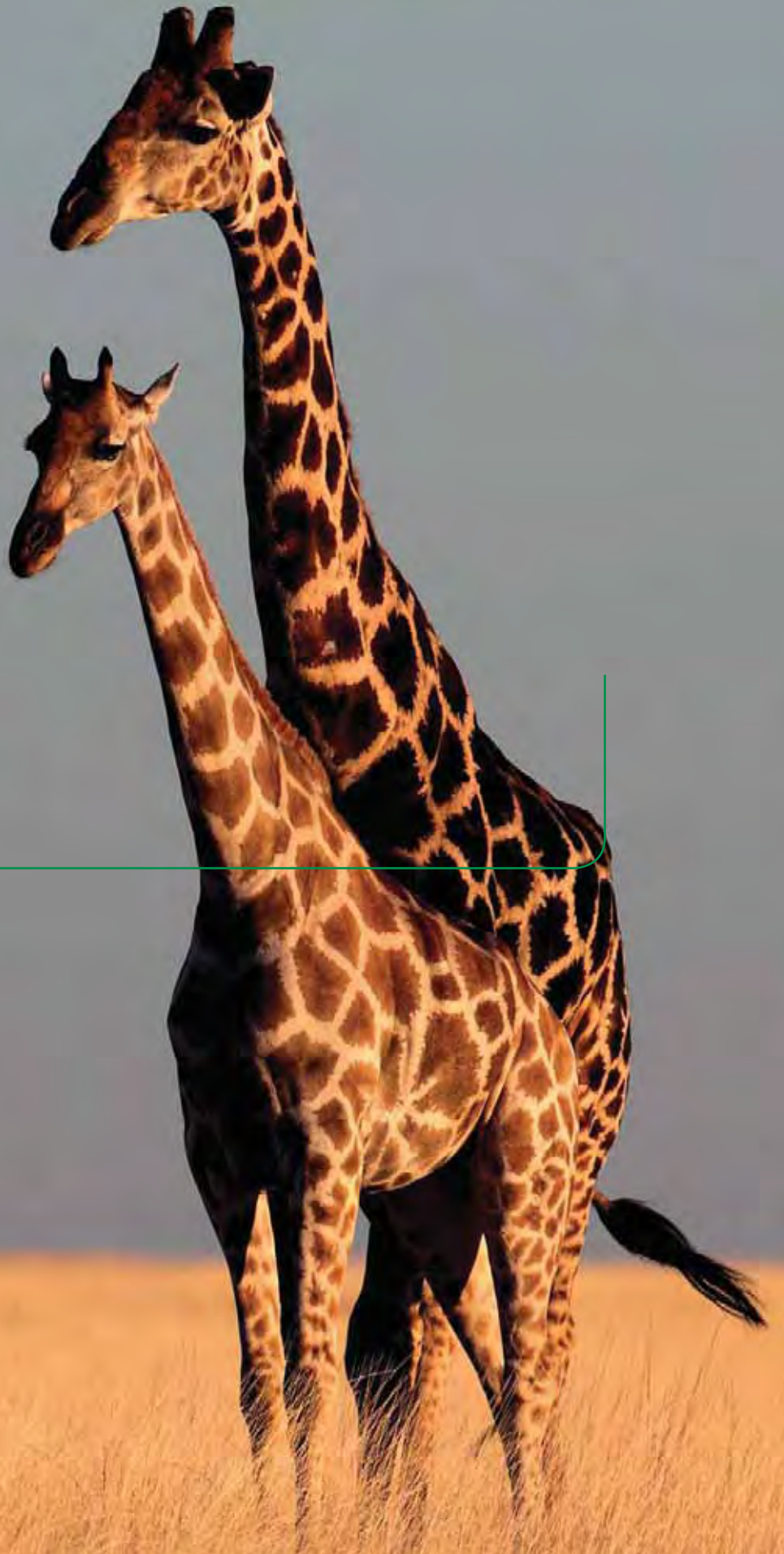
experts at farmers days, workshops and congresses, reflects the standing that the Department of Animal, Wildlife and Grassland Sciences enjoys.

Special achievements

Mr Francois Deacon is doing ground-breaking research on the giraffe – a species somewhat neglected in the past. With the aid of satellite technology and GPS (global positioning systems) equipped collars, seasonal movements, migration routes and behavioral patterns are monitored. This collaring of the giraffe is a first, worldwide.

A highlight in the Department was the attaining of a Ph.D. degree in Wildlife by a staff member, Dr. Beanérlri Janecke, and also the attainment of the award as the best post-graduate student in Grassland Science. Furthermore Prof. Nico Smit completed the BECVOL 3 tree quantification model. With this model it is possible, in addition to the leaf biomass, to also estimate the wood component of the woody plants. This model is being used to make an estimate of available bio-fuel on farms.

02





Prof. Johan Greyling

Prof. Johan Greyling is author and co-author of some 100 scientific and popular scientific publications in national and international journals, research reports and presentations. He is also a member of several scientific societies. His area of expertise lies in reproduction physiology and controlled breeding in sheep, goats and cattle.



Animal health stays an important aspect of animal production.

National and international collaboration

The collaboration and co-operation between the National Department of Agriculture, the IDC (Industrial Development Corporation) and the University of the Free State in the training of farmers in a Nguni project in the Northern Cape and Free State provinces, is an example of an ongoing project benefitting the rural small scale farmers. Millions of rand have been invested in this project to help uplift the rural poor small scale cattle farmers.

The National Research Foundation as such, still remains the main funder of livestock, wildlife and pasture research. Several other institutions have also contributed in the form of making data available, helping with research facilities and supplying products. These include institutions like the Agricultural Research Council (ARC) at Irene, Grootfontein and Elsenburg and the private sector, including the National Wool Grower's Association (NWGA), SA Studbook, Pfizer Pharmaceuticals, Meadow Feeds, Supreme Chickens, Afagri feeds, Nutrifeeds, Voermol Feeds, Hine Ruhr (Foss

instruments), Cape Mohair and Wool, the National Lucerne Organisation, Ramsem Artificial Insemination (AI) Small Stock Station, Taurus Cattle AI Station and several small and large stock breed societies. There are currently five Professors Extraordinary affiliated with the department, these include Prof. A. Van der Zijpp (Production Systems; The Netherlands), Prof. Amie Aucamp (Grassland Science; NWGA), Prof. Gert Erasmus (Animal Breeding), Prof. Michiel Scholtz (Animal Breeding, ARC, Irene) and Prof. Lucky Nedambale (Animal Physiology, ARC, Irene). This can be seen as an indication of the standing of the department in the industry and academia.

During 2011 several national and international congresses and symposia were attended by members in the department. So for example 4 of the Grassland Science group attended the IX International Rangeland Congress in Rosario, Argentina (April 2011) during which 13 congress presentations were made. Furthermore a student of Profs Chris du Preez and Hennie Snyman received an award at the 46th Annual Congress of the Grassland Society, held in Middelburg, Cape (July, 2011). Dr Beanétri Janecke and Mr Francois Deacon attended an International Wildlife Ranching Symposium in Kimberley (October, 2011), together with 12 post graduate Wildlife students. At the International Giraffe Congress at Etosha in Namibia (June, 2011) Mr Francois Deacon was elected a research associate of the Giraffe Conservation Foundation. Regarding the discipline of Animal Science, 9 lecturers had presentations at the annual South African Society for Animal Science in Stellenbosch. Two lecturers (Profs Frikkie Nesor and Japie van Wyk) also made presentations at the International Congress of Animal Breeding in Stavanger, Norway (September, 2011). Invited guest lectures were presented at the Northern Cape NWGA at their annual general meeting in Grootfontein. (Prof. Johan Greyling) and the Free State Government (Prof. HO de Waal) on subjects relating to predator control and the training of extension officers.

Research

The research highlights in the Department of Animal, Wildlife and Grassland Sciences for 2011 included the following:



A giraffe with a GPS collar for the project of Mr Deacon.



A giraffe being immobilised for the project of Mr Deacon.

In the **Wildlife** discipline, a formal memorandum of understanding was undertaken with the Northern Cape Department of Environment and Nature Conservation regarding a joint research project in 2011. The title of the research project being “An ecological planning of the Doornkloof Nature Reserve, Northern Cape” (Prof. Nico Smit).

The Centre of Environmental Management at the University of the Free State was approached by the Sishen Iron Ore Company, a subsidiary of Kumba Resources, to conduct an ecological survey on the newly developed Kolomela mine near Postmasburg in the Northern Cape. Problem areas that arise from the open-cast mining include soil removal, dust and the de-watering of the underground water reservoirs. As part of this larger project, Grassland Scientists of the Department of Animal, Wildlife and Grassland Sciences were involved with the main component of the vegetation survey. Survey plots were identified and marked and the actual surveys were conducted from March 2011. A final report was submitted during November 2011. Based on the quality of this report the contract was extended for another 4 years, to conduct the bio-monitoring on the survey plots.

Furthermore Dr Beanélrí Janecke is currently doing research in determining the nitrogen content in the faeces of the giraffe and impala in an area where evergreen trees are available as a source of nutrition. This is then compared to areas where deciduous trees are the main source of nutrition. Prof. Hennie Snyman of Grassland Science is involved with research regarding the “slangbos” (*Seriphium phemosum*) plant, which is encroaching the productive natural pastures. His latest observations have identified a rust fungus (*Endophyllum elytropappi*) that kills the bushes on a large scale. Chemical or physical eradication is also effective in destroying the bush. Farmers are kept informed regarding the cheapest and most effective methods of controlling this epidemic.

When it comes to Animal Science and more specifically the discipline of **Animal Nutrition**, research linked to using sun-dried cactus pear (*Opuntia ficus-indica*) cladodes as an

alternative feed (drought) source, in both sheep and cattle diets is gaining more and more momentum. Under the leadership of Prof. HO de Waal this unique source of feed is being evaluated in terms of intake, palatability, digestibility and growth performance in the animals. As an introduction it can be said that the arid and semi-arid conditions in South Africa present great potential for cactus pear production, especially as a livestock feed. The demands on scarce water resources for human consumption and the effects of climate change have necessitated this development of alternative animal feed sources, specifically crops that are more efficient consumers of water. It applies especially to the southern African subcontinent. Although cactus pears are present in these areas, varieties of spineless *Opuntia ficus-indica* have a large production potential for further development. Several studies have been completed at the University of the Free State and the programme has now entered a phase where the results are being commercialized. Three provincial



Slangbos encroachment.



Students busy with a poultry project.



Fruit producing cactus pear (*Opuntia ficus-indica*) orchard in the Free State Province of South Africa.

research and developmental activities are underway and in different stages of planning and implementation, in the Free State, Limpopo and Northern Cape Provinces of South Africa.

Still in the field of Animal Nutrition, Messrs Foch de Witt and Ockert Einkamerer have evaluated nutritional supplementation on the performance of broilers and layers. Current research on poultry nitrogen utilization focuses on the eventual product (egg and broiler meat) development, by utilizing dietary lipid sources with omega-3-6 and -9 characteristics. This use of fatty acids has been expanded to spermatogenesis, hatchability of the eggs and the possible transfer of certain aspects to the offspring.

A spin-off of fatty acid supplementation is being directed at the sheep feedlot industry (Mr Ockert Einkamerer). He is investigating the effects of the dietary inclusion of a bioflavonoid antioxidant and fat sources differing in fatty acid saturation levels on fatty acid composition and the oxidative characteristics of the lamb carcass. Dr Gerrie Scholtz is actively involved in investigating the accuracy and reliability of different lucerne hay sampling apparatus – all part of a grading system to be introduced for lucerne (based on quality, especially protein content) in the near future.

In the discipline of **Animal Breeding**, the focus has remained on the establishment of breeding value estimations (EBVs), while also determining the correlations between certain traits and the performance of farm animals. Profs Frikkie Nesor and Japie van Wyk are also involved in assessing the genotype x environment (GXE) interactions and performance testing in sheep and cattle. Much of the work is done in co-operation with the stud breeder societies. In this discipline, Mr Mike Fair

has concluded a unique study in which the environmental modeling of female ostriches was investigated.

Lastly in **Animal Physiology**, the technique of in vitro embryo production (IVEP) has been addressed in both sheep and cattle (Mr Benedict Raito). Here the quest is to perfect various in vitro techniques involved – from oocyte inspiration, in vitro maturation (IVM), in vitro fertilization (IVF) to in vitro culture (IVC) and eventually embryo transfer. A study was done on the synchronization of beef cattle (Prof. Johan Greyling), using different doses of progestagen in heifers and cows, while monitoring the progesterone blood profiles. This was done in an effort to increase the efficiency of synchronization and ultimately conception rate, following fixed-time artificial insemination (AI). Semen was also evaluated in indigenous rams (Prof. Johan Greyling, Dr Luis Schwalbach and Mr Benedict Raito) using the computer assisted sperm analysis (CASA) system. The characterization of cockerel semen, with the aim of cryopreservation is also being evaluated, especially following the inclusion of different dietary fatty acids in their diets.

Community service

In general members of the department have been involved in the presentation of short courses (students and industry) and workshops (Animal Breeding). Some of the staff have also been involved in the judging of national livestock competitions, in co-operation with the livestock industry. So for example Prof. Frikkie Nesor has been involved with the National Black and White Stud Farmer of the year and Profs Johan Greyling and Hennie Snyman in the Voermol Sheep

and Cattle Farmer of the year competitions. Several of the academic staff also serve on the editorial boards of scientific journals (local and abroad), whilst also being actively involved in the reviewing of scientific manuscripts for the journals.

The BECVOL 3-model has since been used to do an estimate of the available bio-fuel on farms surrounding the Ulco cement mine in the Northern Cape. The Ulco cement mine is reliant on coal as a fuel source for its cement manufacturing process. In recent times this has become a concern due to the cost of transporting of the coal (mainly by road from Mpumalanga), and also due to environmental considerations (high emission of CO₂ to the atmosphere and the issue of carbon credits). At the same time many farms in the savanna areas of the Northern Cape suffer from bush encroachment, especially by *Acacia mellifera* (black-thorn). A proposal was subsequently formulated to utilize the wood of these problem woody species (mainly *A. mellifera*), harvested on farms within a 20 km radius of the Ulco mine - to be used in the form of wood chips as partial replacement of the coal as a fuel source. The rationale of this operation is three fold: (i) the wood chips represent a bio-fuel that will reduce carbon emissions during combustion, compared to coal (ii) it is potentially more cost effective due to the close proximity

of the source, and (iii) the bush encroachment problem on the farms can be reduced by selectively harvesting the surplus problem woody plants and in doing so increase grass production and potential animal production.

A community service flagship in the department remains the Nguni project (Northern Cape and Free State) led by Prof. HO de Waal and his team (Mr Willie Combrinck and Dr Luis Schwalbach). They have made drastic strides in the training and empowerment of black cattle farmers. The impact of this project (100 farmers), more than 400 head of Nguni cattle in the Northern Cape), cannot be underestimated. This project is a combined effort of the UFS, the Industrial Development Corporation (IDC) and Provincial Department of Agriculture.

Staff matters

It was with a sense of disbelief that the department had to bid farewell to a beloved colleague and friend, Dr Luis Schwalbach, when he and his wife Cristina were tragically killed in a car accident on the 9th October 2011. His spontaneous nature, insight and innovative way of thinking will be missed by the students, the department and the UFS. His death is a great loss to all.

Research Outputs

Department of Animal, Wildlife and Grassland Sciences



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Research articles

Deacon, F. & Smit, G.N. 2011. The diet selection, habitat preferences and spatial ecology of relocated giraffe (*Giraffa camelopardalis*) in the Kgalagadi Transfrontier Park. *Giraffa* 5(1): 14-15.

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Snyman, H.A. 2011. Root studies in a semi-arid climate. *Grassroots* 11(1): 24-27.

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Snyman, H.A. 2011. Slangbos. *Veeploas* 2(5): 25-29.

Snyman, H.A. 2011. Spring aspects. *Veeploas* 2(8): 29.

Snyman, H.A. 2011. Veld management. *Veeploas* 2(3): 63-64.

Snyman, H.A. & Van der Westhuizen, H. 2011. Knowledge of the king of grasses. *Veeploas* 2(3): 66-67.

Snyman, H.A. & Van der Westhuizen, H. 2011. Recovering of veld after rain. *OVK Nuus* 13(2): 22-23.

Research reports

Smit, G.N., Janse van Rensburg, G. & Deacon, F. 2011. *Ecological planning of the Mushavi Game Ranch; district Douglas*. Report commissioned by S. Booysen, Mushavi Game Ranch, Douglas, South Africa.

Smit, G.N., Janse van Rensburg, G. & Deacon, F. 2011. *Estimation of the above ground biomass of woody plants on representative sites in the vicinity of the Ulco Mine, Northern Cape*. Report commissioned by MBB Consulting Services South (Pty) Ltd, Stellenbosch, South Africa.

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Chapters in books

Neser, F.W.C. 2011. Cattle breeds. In *Top Class Agricultural Science: Grade 10 Learners' Handbook*, edited by W. Moffet. South Africa, Pietermaritzburg: Shuter & Shooter Publishers. pp. 145-149.

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Neser, F.W.C. 2011. Goat breeds. In *Top Class Agricultural Science: Grade 10 Learners' Handbook*, edited by W. Moffet. South Africa, Pietermaritzburg: Shuter & Shooter Publishers. pp. 157-162.

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Neser, F.W.C. 2011. Sheep breeds. In *Top Class Agricultural Science: Grade 10 Learners' Handbook*, edited by W. Moffet. South Africa, Pietermaritzburg: Shuter & Shooter Publishers. pp. 150-156.

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Conference contributions

Booyens, K.E., Einkamerer, O.B., Hugo, A., Van der Merwe, H.J., Slippers, S.C. & Fair, M.D. 2011. *The effects of dietary inclusion of a bioflavonoid antioxidant and fat sources differing in fatty acid saturation level on fatty acid composition and oxidative stability of lamb*. Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Butler, V.P., Smit, G.N., Janecke, B.B. & Pienaar, F.C. 2011. *Habitat utilisation, activity patterns and management of buffalo (Syncerus caffer caffer, Sparrman 1779) in the Doornkloof Nature Reserve*. Paper delivered at the 8th Kimberley Biodiversity Research Symposium, Mokala Nature Reserve, Kimberley, South Africa. 6 September.

De Waal, H.O., Van Niekerk, H., Saffy, Q. & Avenant, N.L. 2011. *Advances towards a system of coordinated predation management in South Africa*. Paper delivered at the 7th International Wildlife Ranching Symposium (IWRWS): The Business of Conservation – Science, Livelihoods and Values, Kimberley, South Africa. 10-14 October.

De Witt, F., Hugo, A., King, E.J., Els, S.P., Van der Merwe, H.J. & Fair, M.D. 2011. *An evaluation of conventional and high oleic sunflower oil in poultry diets*. Paper presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Deacon, F. & Smit, G.N. 2011. *The diet selection, habitat preferences and spatial ecology of relocated giraffe (Giraffa camelopardalis) in the Kgalagadi Transfrontier Park*. Poster presented at the 8th Kimberley Biodiversity Research Symposium, Mokala Nature Reserve, Kimberley, South Africa. 6 September.

Deacon, F. & Smit, G.N. 2011. *The diet selection, habitat preferences and spatial ecology of relocated giraffe (Giraffa camelopardalis) in the Kgalagadi Transfrontier Park*. Poster presented at the Southern African Wildlife Management Association (SAWMA) Symposium: The Human-Natural Resource Interface – Reconciling Conflicting Trade-offs? ATKV Holiday Resort, Hartenbos, South Africa. 18-21 September.

Deacon, F. & Smit, G.N. 2011. *The diet selection, habitat preferences and spatial ecology of relocated giraffe (Giraffa camelopardalis) in the Kgalagadi Transfrontier Park*. Poster presented at the 1st 'Wild' Giraffe Indaba: Giraffe, the Forgotten Megafauna, Etosha Safari Lodge, Namibia. 4-8 July.

Deacon, F. & Smit, G.N. 2011. *The diet selection, habitat preferences and spatial ecology of relocated giraffe (Giraffa camelopardalis) in the Kgalagadi Transfrontier Park*. Poster presented at the 8th

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Du Plessis, J., Avenant, N. & De Waal, H.O. 2011. *Predator-prey interactions involving small mammals, black-backed jackal and caracal: implications for human-wildlife conflict management.* Paper delivered at the 11th African Small Mammal Symposium (ASMS): Africa's Small Mammal Biologists Tackling Africa's Big Problems, Department of Biological Sciences, University of Swaziland, Kwaluseni, Swaziland. 3-8 August.

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Du Toit, G.V.N., Malan, P.J. & Snyman, H.A. 2011. *Physical impact of sheep grazing on the arid Nama Karoo rangeland in South Africa.* Poster presented at the IX International Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

Du Toit, J., Van Wyk, J.B. & Maiwashe, A. 2011. *Assessment of inbreeding depression for functional herd life in the South African Jersey breed based on inbreeding level and rate of inbreeding.* Paper delivered at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Engelbrecht, A., Cloete, S., Bunter, K. & Van Wyk, J.B. 2011. *Genetic variation and heritability of ostrich weight traits.* Paper delivered at the 19th Conference of the Association for the Advancement of Animal Breeding and Genetics (AAABG), University of Western Australia, Perth, Australia. 19-21 July.

Engelbrecht, A., Cloete, S., Van Wyk, J.B. & Bunter, K. 2011. *Using additive genetic variation to improve ostrich leather and meat production.* Paper delivered at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Grobler, S., Scholtz, M.M., Schwalbach, L.M.J. & Greyling, J.P.C. 2011. *Effect of synchronisation followed by natural mating on calving data of beef cattle.* Paper delivered at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Hugo, A., Els, S.P., Bothma, C., De Witt, F. & Van der Merwe, H.J. 2011. *Effect of different dietary fat sources on fatty acid composition, fat stability and sensory acceptability of chicken breast meat.* Poster presented at the 57th International Congress of Meat Science and Technology (iCoMST): Global Challenges to Production, Processing and Consumption of Meat, Ghent, Belgium. 7-12 August.

Janecke, B.B. & Smit, G.N. 2011. *Faecal nitrogen of browsing game species as indicator of nutritional status.* Poster presented at the Southern African Wildlife Management Association (SAWMA) Symposium: The Human-Natural Resource Interface – Reconciling Conflicting Trade-offs? ATKV Holiday Resort, Hartenbos, South Africa. 18-21 September.

Janecke, B.B., Smit, G.N. & Hayter, D. 2011. *Status of game species on private and provincial game reserves in the Free State with special reference to exotic and TOPS species.* Poster presented at the Southern African Wildlife Management Association (SAWMA) Symposium: The Human-Natural Resource Interface – Reconciling Conflicting Trade-offs? ATKV Holiday Resort, Hartenbos, South Africa. 18-21 September.

Janse van Rensburg, G. & Snyman, H.A. 2011. *Soil degradation and seed bank stability.* Poster presented at the IX International

Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

Janse van Rensburg, G. & Snyman, H.A. 2011. *The effect of localized game concentration on soil organic matter in a semi-arid South Africa.* Poster presented at the IX International Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

King, E.J., De Witt, F., Hugo, A., Van der Merwe, H.J. & Fair, M.D. 2011. *Effect of dietary lipid saturation on production performances of layers.* Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

King, E.J., Hugo, A., De Witt, F., Van der Merwe, H.J. & Fair, M.D. 2011. *Effect of dietary fat source on fatty acid profile and lipid oxidation of eggs.* Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Lehloeny, K., Mahoete, N., Greyling, J.P.C. & Nedambale, T. 2011. *Effect of breed and frozen-thawed ram semen on in vitro fertilization and ovine embryonic development.* Poster presented at the 37th Annual Conference of the International Embryo Transfer Society (IETS): Reproductive Biotechnology at the Interface between Animal Agriculture and Biomedical Research, Wyndham Orlando Resort, Orlando, Florida, USA. 8-12 January.

Mahoete, N., Lehloeny, K., Schwalbach, L.M.J., Greyling, J.P.C. & Nedambale, T. 2011. *Factors affecting in vitro embryo production in sheep.* Paper delivered at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Makae, T., Greyling, J.P.C., Schwalbach, L.M.J. & Raito, M.B. 2011. *The effect of exogenous anabolic steroids on the testicular and seminal characteristics of Boer goat bucks.* Paper delivered at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Makae, T., Greyling, J.P.C., Schwalbach, L.M.J. & Raito, M.B. 2011. *Growth performance and certain body parameters of Boer goat bucks following anabolic steroid treatment.* Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Malan, P.J. & Snyman, H.A. 2011. *Seed germination of the arid land shrub, Pentzia incana, along a water and defoliation gradient.* Poster presented at the IX International Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

Malan, P.J. & Snyman, H.A. 2011. *Stress adaptability of two shrub species in an arid rangeland of South Africa.* Poster presented at the IX International Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

Matebesi, P.A., Cloete, S., Van Wyk, J.B., Olivier, J. & Zishiri, O. 2011. *Genetic parameters for age specific lamb survival and early growth weights in Tygerhoek merino experimental farm.* Paper delivered at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Matebesi, P.A., Cloete, S., Van Wyk, J.B., Olivier, J. & Zishiri, O. 2011. *Genetic parameters for age specific lamb survival and early growth weights in Tygerhoek merino experimental farm.* Poster presented at the 62nd Annual Meeting of the European Federation of Animal Science (EAAP), Stavanger, Norway. 29 August - 2 September.

Matshaba, B., Schwalbach, L.M.J., Mphaphathi, M., Nemes, C., Ngwane, C., Greyling, J.P.C., Eva, V. & Nedambale, T. 2011. *General characterization and cryopreservation of South African unimproved indigenous goat semen.* Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Matshaba, B., Schwalbach, L.M.J., Mphaphathi, M., Nemes, C., Ngwane, C., Greyling, J.P.C., Eva, V. & Nedambale, T. 2011. *The efficiency of four different extenders for semen cryopreservation in the unimproved*

indigenous South African goat. Paper delivered at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Mosenene, M.T., Greyling, J.P.C., Raito, M.B. & Schwalbach, L.M.J. 2011. *Preliminary study on the use of cryopreserved cockerel semen for AI in chickens*. Paper delivered at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Mosenene, M.T., Greyling, J.P.C., Schwalbach, L.M.J. & Raito, M.B. 2011. *Semen characterization of different chicken breeds*. Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Munyai, P.H., Mphaphathi, M., Ramukhithi, F., Malusi, P., Schwalbach, L.M.J., Greyling, J.P.C. & Nedambale, T. 2011. *The effect of different glycerol concentrations on South African indigenous ram semen cryopreservation*. Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Neser, F.W.C., Van Wyk, J.B., Fair, M.D. & Lubout, P. 2011. *Genetic evaluation of growth traits in beef cattle using random regression models*. Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Neser, F.W.C., Van Wyk, J.B., Fair, M.D., Lubout, P. & Crook, B. 2011. *Variance component estimates for growth traits in South African Brangus cattle*. Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Neser, F.W.C., Van Wyk, J.B., Fair, M.D., Lubout, P. & Crook, B. 2011. *Variance component estimates for growth traits in South African Brangus cattle*. Poster presented at the 62nd Annual Meeting of the European Federation of Animal Science (EAAP), Stavanger, Norway. 29 August - 2 September.

Pienaar, G., Einkamerer, O.B., Van der Merwe, H.J., Hugo, A., Scholtz, G.D.J. & Fair, M.D. 2011. *The effects of a rumen specific live yeast in finishing diets of lambs*. Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Ramukhithi, F., Sutherland, B., Nedambale, T., Greyling, J.P.C. & Lehloeny, K. 2011. *Effect of breed and duration of progestagen treatment on oestrous synchronisation of South African indigenous goats*. Paper delivered at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Saffy, Q. & De Waal, H.O. 2011. *A method to analyse data on the control of damage-causing predators*. Paper delivered at the 7th International Wildlife Ranching Symposium (IWRS): The Business of Conservation – Science, Livelihoods and Values, Kimberley, South Africa. 10-14 October.

Scholtz, A., Cloete, S., Cloete, J., Kruger, A., Van Wyk, J.B. & Van der Linde, T.C.D.K. 2011. *Genetic parameters for breech strike indicator traits and yearling production traits in Merinos*. Paper delivered at the 19th Conference of the Association for the Advancement of Animal Breeding and Genetics (AAABG), University of Western Australia, Perth, Australia. 19-21 July.

Scholtz, G.D.J., Smith, P.S., Van der Merwe, H.J., Einkamerer, O.B. & Fair, M.D. 2011. *An evaluation of conventional and high oleic sunflower oil in poultry diets*. Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Smit, G.N. 2011. *Re-encroachment of Colophospermum mopane on plots thinned to different tree densities in a semi-arid savanna of southern Africa*. Poster presented at the IX International Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

Smit, G.N. & Janse van Rensburg, G. 2011. *Phytomass and ecological significance of *Chrysocoma ciliata* within the Lets'eng-la-Letsie catchment area of Lesotho, Southern Africa*. Poster presented at the IX International Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

Smit, G.N. & Taylor, J.M. 2011. *The population dynamics of *Acacia nilotica* in Northern KwaZulu-Natal, South Africa*. Poster presented at the 46th Annual Congress of the Grassland Society of Southern Africa (GSSA): Advancing Rangeland Ecology and Pasture Management in Africa, Grootfontein Agricultural Development Institute, Middelburg, South Africa. 11-15 July.

Smit, G.N., Joubert, D.F., Johannes, M. & Sikongo, I. 2011. *Do hares help to keep semi-arid savannas open? Preliminary evidence suggests they do*. Poster presented at the IX International Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

Smit, Z.M., Smit, G.N., Du Preez, P.J. & Pienaar, F.C. 2011. *Development of a suitability index for the re-introduction of game species on game ranches and conservation areas*. Paper delivered at the 8th Kimberley Biodiversity Research Symposium, Mokala Nature Reserve, Kimberley, South Africa. 6 September.

Snyman, H.A. 2011. *Dynamics of *Seriphium plumosum**. Paper delivered at the Farmers Forum Research Symposium, Arlington, South Africa. 5 March.

Snyman, H.A. 2011. *Ecohydrological and soil quality changes following rangeland degradation in semi-arid South Africa*. Poster presented at the IX International Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

Snyman, H.A. 2011. *Method to protect slangbos encroachment*. Paper delivered at the Heilbron Farmers' Union Workshop, Heilbron, South Africa. 22 November.

Snyman, H.A. 2011. *Seasonal root distribution and root/shoot ratios following rangeland degradation in semi-arid South Africa*. Poster presented at the IX International Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

Snyman, H.A. 2011. *Seedling establishment and soil seed bank evaluation following rangeland degradation in semi-arid South Africa*. Poster presented at the IX International Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

Snyman, H.A. 2011. **Seriphium plumosum*: the problem plant - its protection*. Paper delivered at the Redmeat Producers' Organization (RPO) Free State Congress, Bloemfontein, South Africa. 9 June.

Steyn, J., Neser, F.W.C., Hunlun, C. & Lubout, P. 2011. *Preliminary report: The breed structure of the Brangus in South Africa*. Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Strauss, A., De Waal, H.O. & Avenant, N.L. 2011. *The impact of predation on a sheep enterprise in the Free State Province, South Africa*. Paper delivered at the 7th International Wildlife Ranching Symposium (IWRS): The Business of Conservation – Science, Livelihoods and Values, Kimberley, South Africa. 10-14 October.

Swanepoel, P.A., Botha, P., Du Preez, C.C. & Snyman, H.A. 2011. *Soil quality of kikuyu-ryegrass pasture in the southern Cape*. Poster presented at the 46th Annual Congress of the Grassland Society of Southern Africa (GSSA): Advancing Rangeland Ecology and Pasture Management in Africa, Grootfontein Agricultural Development Institute, Middelburg, South Africa. 11-15 July.

Theunissen, A., Scholtz, M., Neser, F.W.C. & Macniel, M. 2011. *Crossbreeding heterosis in beef cattle in arid areas*. Poster presented at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.



Van der Westhuizen, H. & Snyman, H.A. 2011. *Assessing rangeland condition through a degradation gradient for a semi-arid South Africa*. Poster presented at the IX International Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

Van der Westhuizen, H. & Snyman, H.A. 2011. *Grazing capacity quantification in a semi-arid South Africa*. Poster presented at the IX

International Rangeland Congress (IRC2011): Diverse Rangelands for a Sustainable Society, Rosario, Argentina. 2-8 April.

Van Niekerk, H.N., Taljaard, P.R., Grové, B. & De Waal, H.O. 2011. *The extent and impact of predation on small livestock in South Africa*. Paper delivered at the 7th International Wildlife Ranching Symposium (IWRs): The Business of Conservation – Science, Livelihoods and Values, Kimberley, South Africa. 10-14 October.

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Professors Extraordinary: Profs Amie Aucamp, Gert Erasmus, James Hayes, Lucky Nedambale, Michiel Scholtz

Associate Professor: Prof. H.O. de Waal

Senior Lecturers: Dr Luis Schwalbach, Mr Wikus Vorster (contract)

Lecturers: Dr Gerrie Scholtz, Messrs Foch de Witt, Mike Fair, Paul Malan, Ockert Einkamerer

Junior Lecturer: Mr Benedict Raito

Researcher: Dr Beanélrí Janecke

“The Department of Plant Sciences had a productive year which can be ascribed to the dedication and hard work by this department’s staff. A significant contribution was made by the staff on the QwaQwa campus.”

– Prof. Johann du Preez

Department of Plant Sciences

Overview

The Department of Plant Sciences consists of the disciplines of Botany, Plant Breeding and Plant Pathology.

Departmental activities and achievements

The Department of Plant Sciences had a productive year which can be ascribed to the dedication and hard work by this department’s staff. A significant contribution was made by the staff on the QwaQwa campus.

Prof. Johan Grobbelaar received the highest award from the International Society for Applied Phycology at the triennial congress. The inscription on the plaque reads “The International Society for Applied Phycology honours Prof. Johan U. Grobbelaar as “Distinguished Applied Phycologist” for his continued and outstanding contributions to this field of Science, Halifax, Canada 24th June 2011. He was invited to deliver a keynote paper at the congress in Canada. He was also invited to deliver a keynote paper at the National Science and Technology Foundation’s workshop on aquaculture, Port Elizabeth, in November.

Prof. Johan Grobbelaar was also a runner-up in the National Science and Technology (NSTF) award category “Research over a life-time”.

Prof. Louis Scott was also honoured with a Fellowship of the Royal Society.

Dr Marieka Gryzenhout received the International Mycological Association’s Young Mycologist Award for Africa for 2010. Dr Gryzenhout was also elected as Secretary elect of the International Society for Fungal Conservation.

National and international collaboration

Several staff members attended international conferences or visited institutes to build links with fellow researchers.

Prof. Sakkie Pretorius and **Ms Cornel Bender** attended the 3rd BGRI Technical Workshop in St. Paul, Minnesota. **Prof. Sakkie Pretorius** was invited to present an oral paper. A poster was also presented at the workshop. **Prof. Sakkie Pretorius** also paid a visit to India. **Prof. Liezel Herselman** visited America

03





Prof. Johann du Preez

Prof. Johann du Preez teaches Phytosociology on B.Sc. Hons. level. He has several Master's degree students under his supervision who have obtained their degrees with distinction. His area of expertise lies in vegetation ecology – his research concentrates on regional studies with emphasis on the synecology and syntaxonomy of South African grasslands and semi-arid vegetation.

to attend a workshop on some of the latest molecular techniques such as SNIPS. **Prof. Maryke Labuschagne** visited international research institutes in South America and Africa. **Prof. Amie** and **Dr Marieta Cawood** visited Prof. Bruno Moerschbacher in the Department of Plant Biochemistry and Technology, at the Westphalian Wilhelm's University (WWU), Muenster, Germany. They also met with other co-researchers in Germany. **Dr Botma Visser** visited Canada for a conference and attended a workshop at the University of Minnesota. Ms Lize Joubert attended an International Plant Botanical Conference in Melbourne, Australia.

Prof. Bruno Moerschbacher (Department of Plant Biochemistry and Technology, WWU), visited our department as part of the SA/Germany Science, Research and Technology Cooperation agreement.

Prof. Johann du Preez was invited to give a talk on *Global warming and its impact on vegetation distribution* during the Free State Climate Change Summit presented by the Department of Economic, Tourism and Environmental affairs. He also gave several popular lectures to among others BirdLife Free State on the birds of the Okavango, and the Botanical Society of the Free State on plant evolution.

The year also saw a number of staff changes. After long and fruitful academic careers, **Profs. Johan Grobbelaar** and **Amie van der Westhuizen** retired. **Dr Joyce Moloi** (QwaQwa campus) resigned to accept a postdoctorate fellowship. The department was fortunate to appoint three new staff members. **Dr Marieta Cawood** was appointed as senior lecturer in the Botany section while **Dr Rouxlene van der Merwe** and **Ms Chrisna Steyn** were appointed as lecturer and technical officer in the Plant Breeding Section respectively.



Ms Lineo Mohale investigating algae under a microscope.



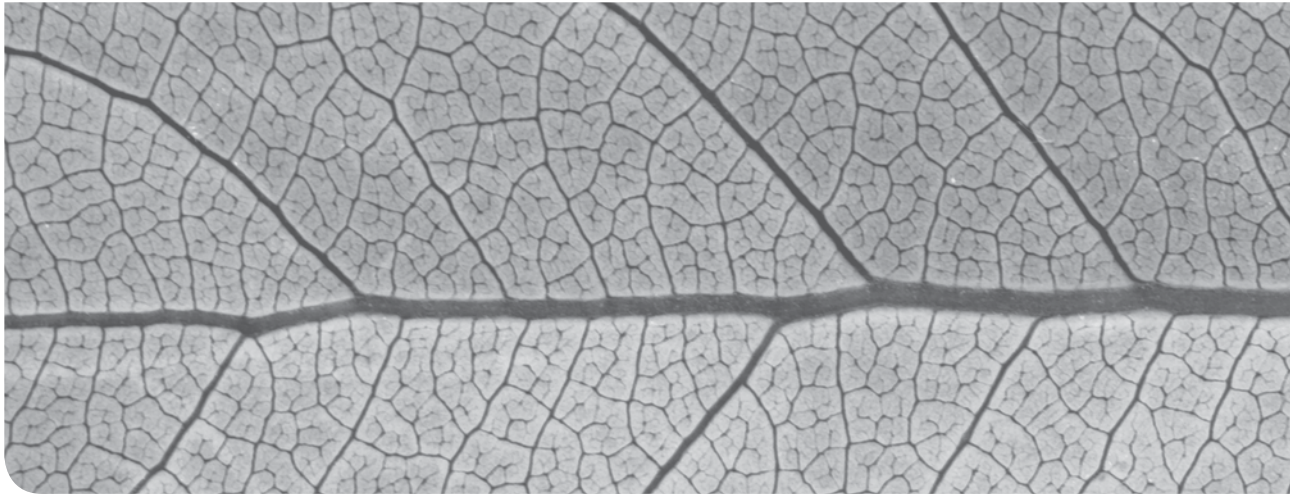
Mr Michael Austenfeldt, a visiting student from Germany, busy collecting material in the hothouse.



Students busy with a plant survey during a field excursion.

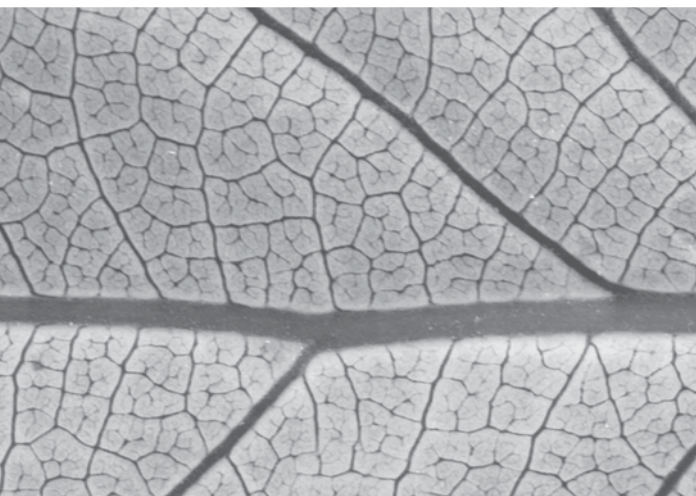
Research Outputs

Department of Plant Sciences



Research articles

- Ashafa, A.O.T.** 2011. Laxative potential of the ethanolic leaf extract of *Aloe vera* (L.) Burm.f. in Wistar rats with loperamide-induced constipation. *Journal of Natural Pharmaceuticals* 2(3): 158-162.
- Ashafa, A.O.T. & Olunu, O.** 2011. Toxicological evaluation of ethanolic root extract of *Morinda lucida* (L.) Benth. (Rubiaceae) in male Wistar rats. *Journal of Natural Pharmaceuticals* 2(210): 108-114.
- Ashafa, A.O.T., Sunmonu, T. & Afolayan, A.** 2011. Effects of leaf and berry extracts of *Phytolacca dioica* L. on haematological and weight parameters of Wistar rats. *African Journal of Pharmacy and Pharmacology* 5(2): 150-154.
- Ashafa, A.O.T., Sunmonu, T., Abass, A. & Ogbe, A.** 2011. Laxative potential of the ethanolic leaf extract of *Aloe vera* (L.) Burm. f. in Wistar rats with loperamide-induced constipation. *Journal of Natural Pharmaceuticals* 2(3): 158-162.
- Brand, R., Brown, L. & Du Preez, P.J.** 2011. The grassland vegetation of Platberg, eastern Free State, South Africa. *Koedoe: Research Journal of the South African National Parks*. 53(1): 1-13.
- Chase, B., Quick, L., Meadows, M., Scott, L., Thomas, D. & Reimer, P.** 2011. Late Glacial interhemispheric climate dynamics revealed in Southern Africa. *Geology* 39: 19-22.
- Chen, S., Gryzenhout, M., Roux, J., Xie, Y., Wingfield, M. & Zhou, X.** 2011. Novel species of *Celoportha* from *Eucalyptus* and *Syzygium* trees in China and Indonesia. *Mycologia* 103(6): 1384-1410.
- Fernandez-Jalvo, Y., Scott, L. & Andrews, P.** 2011. Taphonomy in palaeoecological interpretations. *Quaternary Science Reviews* 30: 1296-1302.
- Fischer, E., Venter, H.J.T., Killmann, D., Meve, U. & Venter, A.M.** 2011. *Epistemma neuerburgii* (Apocynaceae, Periplocoideae): A new epiphytic species from Nyungwe National Park, Rwanda, Africa. *South African Journal of Botany* 77: 680-684.
- Gissa, D.W., Labuschagne, M.T. & Vivek, B.** 2011. Protein quality and endosperm modification of quality protein maize (*Zea mays* L.) under two contrasting soil nitrogen environments. *Field Crops Research* 121: 408-415.
- Heyns, I., Pretorius, Z.A. & Marais, F.** 2011. Derivation and characterization of recombinants of the Lr54/Yr37 translocation in common wheat. *The Open Plant Science Journal* 5: 1-8.
- Janse van Rensburg, B., Flett, B., McLaren, N.W. & McDonald, A.** 2011. Sampling variation in the quantification of fumonisins in maize samples. *South African Journal of Plant and Soil* 28 (2): 90-98.
- Janse van Rensburg, B., McLaren, N.W., Viljoen, A. & Flett, B.** 2011. Aflatoxins and fumonisins on sorghum grain from commercial production areas of South Africa (Short Communications). *South African Journal of Plant and Soil* 28(4): 236 - 238.
- Kawuki, R., Ferguson, M., Labuschagne, M.T., Herselman, L., Orone, J., Ralimanana, I., Bidiaka, M., Lukombo, S., Kanyange, M., Gashaka, G., Mkamilo, G., Gethi, J. & Obiero, H.** 2011. Variation in qualitative and quantitative traits of cassava germplasm from selected national breeding programmes in sub-Saharan Africa. *Field Crops Research* 122: 151-156.
- Kawuki, R., Labuschagne, M.T., Nuamanya, E., Herselman, L. & Ferguson, M.** 2011. Segregation of selected agronomic traits in six S1 cassava families. *Journal of Plant Breeding and Crop Science* 3(8): 154-160.
- Kena, M. & Swart, W.J.** 2011. Effects of plant extracts on in vitro suppression of fungal pathogens and control of damping-off of vegetable seedlings in the greenhouse. *Botswana Journal of Agriculture and Applied Science* 7(2): 36-44.
- Liebenberg, M. & Pretorius, Z.A.** 2011. Pathogenic diversity in and sources of resistance to *Uromyces appendiculatus* in Southern Africa. *Journal of Phytopathology* 159: 287-297.
- Mago, R., Tabe, L., McIntosh, R., Pretorius, Z.A., Kota, R., Paux, E., Wicker, T., Breen, J., Lagudah, E., Ellis, J. & Spielmeier, W.** 2011. A multiple resistance locus on chromosome arm 3BS in wheat confers resistance to stem rust (Sr2), leaf rust (Lr27) and powdery mildew. *Theoretical and Applied Genetics* 123: 615-623.
- Mashope, B.K., Herselman, L. & Labuschagne, M.T.** 2011. Genetic diversity among South African cactus pear gene bank accessions using AFLP markers. *Bradleya* 29: 103-114.
- McIntosh, R. & Pretorius, Z.A.** 2011. Borlaug global rust initiative provides momentum for wheat rust research (Introduction). *Euphytica* 179: 1-2.
- Mohase, L., Van der Westhuizen, A.J. & Pretorius, Z.A.** 2011. Involvement of reactive oxygen species generating enzymes and hydrogen peroxide



in the rust resistance response of sunflower (*Helianthus annuus* L.). *South African Journal of Plant and Soil* 28(1): 64-68.

Muedi, H., Fourie, D. & McLaren, N.W. 2011. Characterization of bacterial brown spot pathogen from dry bean production areas of South Africa. *African Crop Science Journal* 19(4): 357-367.

Mukoyi, F., Soko, T., Mulima, E., Mutari, B., Hodson, D., Herselman, L., Visser, B. & Pretorius, Z.A. 2011. Detection of variants of wheat stem rust race Ug99 (*Puccinia graminis* f.sp. *tritici*) in Zimbabwe and Mozambique. *Plant Disease* 95(9): 1188-1188.

Mutegi, E., Sagnard, F., Semagn, K., Deu, M., Muraya, M., Kanyenji, B., De Villiers, S., Kiambi, D., Herselman, L. & Labuschagne, M.T. 2011. Genetic structure and relationships within and between cultivated and wild sorghum (*Sorghum bicolor* (L.) *moench*) in Kenya as revealed by microsatellite markers. *Theoretical and Applied Genetics* 122: 989-1004.

Mwenye, O., Labuschagne, M.T., Herselman, L. & Benesi, I. 2011. Mineral compositions of Malawian cocoyam genotypes. *Journal of Biological Sciences* 11(4): 331-335.

Mweta, D.E., Labuschagne, M.T., Bonnet, S.L., Swarts, J.C. & Saka, J. 2011. Effect of annealing, acid hydrolysis and acetylation on the physicochemical and thermal properties of Malawian cocoyam starches. *Trends in Carbohydrate Research* 3(2): 39-54.

Neumann, F., Scott, L. & Bamford, M. 2011. Climate change and human disturbance of fynbos vegetation during the late Holocene at Princess Vlei, Western Cape, South Africa. *Holocene* 21(7): 1137-1149.

Park, R., Fetch, T., Hodson, D., Jin, Y., Nazari, K., Prashar, M. & Pretorius, Z.A. 2011. International surveillance of wheat rust pathogens: progress and challenges. *Euphytica* 179:109-117.

Prins, R., Pretorius, Z.A., Bender, C.M. & Lehmensiek, A. 2011. QTL mapping of stripe, leaf and stem rust resistance genes in a Kariega 3 Avocet S doubled haploid wheat population. *Molecular Breeding* 27: 259-270.

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Wheat infested with pathogens.

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Agenbag, G.M., Pretorius, Z.A., Boyd, L., Bender, C.M. & Prins, R. 2011. *Dissecting adult plant stripe rust resistance in the wheat cultivar Cappell Desprez.* Poster presented at the 3rd Borlaug Global Rust Initiative (BGRI) Technical Workshop, St Paul Minnesota, USA. 13-16 June.

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Wheat infected by rust.

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Dr Andor Venter, Prof Teuns Verschoor and Mr Darius van Rensburg inspecting a cycad.

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Scott, L., Rossouw, L., Cordova, C., Risberg, J. & Fernandez-Jalvo, Y. 2011. *Plant microfossils' contents in two coprolites from Azokh Cave (Caucasus).* Paper delivered at the Hominid-Carnivore Interactions during the Pleistocene International Congress, Salou, Terragonna, Spain. 25–27 October.

Sieben, E.J.J. 2011. *Progress in the National Wetland Vegetation Database and a provisional wetland classification for South Africa.* Paper delivered at the National Wetland Indaba 2011: Wetlands – Back to the future 2020. Act today – for a better tomorrow, Didima Resort and Conference Centre, KwaZulu-Natal, South Africa. 17–19 October.

Smit, Z.M., Smit, G.N., Du Preez, P.J. & Pienaar, F.C. 2011. *Development of a suitability index for the re-introduction of game species on game ranches and conservation areas.* Poster presented at the 8th Kimberley Biodiversity Research Symposium, Mokala Nature Reserve, Kimberley, South Africa. 6 September.

Swart, W.J. 2011. *Food Security in water scarce regions: Agro-ecological perspectives.* Paper delivered at the Arid Zone Ecology Forum (ZEF) Conference: Interactions in the Arid Zone, Nieuwoudtville, Northern Cape, South Africa. 3–6 October.

Swart, W.J. 2011. *Innovative Technologies for Crop Production in water-scarce regions.* Paper delivered at the Annual Congress of Free State Agriculture Union, Kopana Nokeng, Bloemfontein, South Africa. 3–4 August.

Swart, W.J. 2011. *Understanding the role of plant-microbial-faunal interactions in Agriculture.* Paper delivered at the XVII Congress of the Entomological Society of Southern Africa (ESSA), University of the Free State, Bloemfontein, South Africa. 3–6 July.

Swart, W.J. 2011. *Water for food security: More crop, more drop.* Paper delivered at the 3rd Annual Orange River Basin Symposium, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 8–9 June.

Taiwe, B.M. & Mohase, L. 2011. *Aphid saliva induces defence responses in different wheat cultivars.* Paper delivered at the 37th Annual Conference of the South African Association of Botanists (SAAB): Plants in a changing world, Rhodes University, Grahamstown, South Africa. 17–19 January.

Taole, M., Burgess, T., Gryzenhout, M., Wingfield, M. & Wingfield, B. 2011. *Phylogenetic and morphological re-evaluation of Teratosphaeria epicoccoides causing disease in Eucalyptus.* Poster presented at the 47th Southern African Society for Plant Pathology (SASPP) Congress, Kruger National Park, South Africa. 23–26 January.

Van Aardt, A.C. & Du Preez, P.J. 2011. *A vegetation and environmental analysis of the Palaeo-Kimberley and Palaeo-Modder Rivers and surrounding areas.* Poster presented at the 8th Annual Inkaba yeAfrica (IyA) Workshop, Cape Town International Convention Centre, Cape Town, South Africa. 28 August – 2 September.

Van der Westhuizen, A.J. 2011. *Signaling events during the Russian wheat aphid resistance response in wheat.* Poster presented at the 47th Southern African Society for Plant Pathology (SASPP) Congress, Kruger National Park, South Africa. 23–26 January.

Van Rooyen, D. & Mclaren, N.W. 2011. *The suppression of sorghum root rot by Trichoderma spp..* Paper delivered at the 47th Southern African Society for Plant Pathology (SASPP) Congress, Kruger National Park, South Africa. 23–26 January.

Vermeulen, M., Chen, S., Zhou, X., Gryzenhout, M., Wingfield, M. & Roux, J. 2011. *Biogeography of species within the tree pathogen genus Celoportha (Cryphonectriaceae).* Paper delivered at the 4th Asian Congress on Plant Pathology, concurrent with the 18th Biennial Australasian Plant Pathology Society Conference (ACPP APPS 2011): New Frontiers in Plant Pathology for Asia and Oceania, Darwin, Australia. 26–29 April.

Vermeulen, M., Gryzenhout, M., Wingfield, M. & Roux, J. 2011. *Cryphonectriaceae: An unexplored group of tree pathogens in Africa.* Paper delivered at the 47th Southern African Society for Plant Pathology (SASPP) Congress, Kruger National Park, South Africa. 23–26 January.



A field of sunflowers.

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Associate Professors: Prof. Johann du Preez, Liezel Herselman

Affiliated Associate Professors: Profs Koos van Rensburg (ARC-GCI), Renée Prins (Cen Gen)

Lecturers: Drs Gert Marais, Lintle Mohase, Marieka Gryzenhout, Mariette Bezuidenhout, Gerhard Potgieter, Angie van Biljon, Botma Visser, Rouxlene van der Merwe, Adrie Minnaar-Ontong, Ms Lize Joubert

QwaQwa Campus

Lecturers: Dr Tom Ashafa, Dr Erwin Sieben, Dr Joyce Moloi, Mr Robert Lentsoane

Junior lecturer: Mr Raymond Pitso

“Over the past few years the department has shown growth, not only in the number of undergraduate students but also in the number of postgraduate students.”

– Prof. Chris du Preez

Department of **Soil, Crop and Climate Sciences**

Overview

The Department of Soil, Crop and Climate Sciences specialises in the disciplines of Agrometeorology, Agronomy, Horticulture and Soil Science, contributing to the agricultural programme of the Faculty of Natural and Agricultural Sciences of the University of the Free State (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 growth, not only in the number of undergraduate students but also in the number of postgraduate students. In 2011 an average of 23 master's and 18 doctoral students were enrolled. Approximately 40% of these students come from Botswana, Eritrea, Ethiopia, Germany, Kenya, Lesotho, Malawi, Mauritius, Swaziland, the United States of America, Zambia and Zimbabwe.

Research in the department is aimed at various aspects of the soil-crop-atmosphere system. Approximately R4 million was spent on research in 2011, 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), Protein Research Trust (PRT), Winter Grain Trust (WGT), Monsanto, McCain Foods (SA) (Pty) Ltd., Omnia Fertilizer Ltd., Syngenta and Agraforum. Research findings were published in research articles, chapters in books and presented at conferences. These are outlined in the research outputs later on.

Activities and achievements

In terms of the department's activities and achievements during 2011, one has to note the extent of national and international collaboration that is being pursued by the department. For example funding was again obtained



04



Prof. Chris du Preez

Prof. Chris du Preez's research has focused on such areas as the causes and control of soil compaction and ammonia volatilization of nitrogenous fertilizers. Recently, the focus was on agricultural land use and soil organic matter changes, soil fertility and fertilization, and agriculture water quality and usage.

for 13 postgraduate students under the Inkaba yeAfrika programme. These students and two staff members, Mr Stephan Steyn and Ms Elmarie Kotzé, attended the 8th Annual Inkaba yeAfrika Conference in Cape Town where they reported on their progress. The conference was attended by delegates from most South African universities as well as from research institutions in Germany.

Prof. Cornie van Huyssteen visited the St. Istvan University in Hungary. The visit is the result of a NRF research grant on the South Africa - Hungary exchange agreement. Prof. Van Huyssteen met with Profs Erika Micheli, Martha Fuchs, and Istvan Waltner to relate the Taxonomic Soil Classification System for South Africa with that of the World Reference Base (WRB). As a result recommendations could be made for the improvement of the South African classification

system as well as the WRB. Adoption of these proposals will hopefully lead to better correlation between the two systems, but also increase the interpretations that could be made after classification.

The research project entitled *Vulnerability and resilience of soils under different rangeland use*, financed by the Research Foundation of Germany is in its final phase. The leadership of Profs Wulf Amelung and Chris du Preez, with their team members from Germany and South Africa visited Kuruman for a month's field work. Ms Elmarie Kotzé of the South African team also visited the University of Bonn, Germany for seven weeks to gain insight into some specialised laboratory analyses.

Prof. Du Preez was successful to obtain funding from the NRF under the South Africa - Mozambique agreement. His collaborator is Dr Alfredo Nhantumbo from the Eduardo Mondlane University in Maputo. Their research for the next three years will focus on the sustainable management of fertility in agriculture soils.

The hydrogeology research group of Dr Pieter le Roux made progress by identifying indicators of hydrological processes in soils. The hydrological classification of soils was improved in the process. This brings the research closer to hydrological characterisation of hillslopes. The overarching aim is to facilitate an improved understanding of hydrology using soil indicators.

Three projects in rainwater harvesting for crop production in semi-arid to sub-humid climate zones were completed by doctoral students under the guidance of Prof. Leon van Rensburg. The first project was managed by Jestinos Mzezewa from the University of Venda. It focused on the reduction of soil water evaporation losses by introducing a



The description of a soil profile is explained to students.



Soil sampling in the savannah near Kuruman.

green mulch-sunflower intercropping system under in-field rainwater harvesting (IRWH). The second project was done by Sabelo Mvimbelo from Swaziland by combining integrated micro-flood irrigation with IRWH using maize as a test crop. A series of experiments were launched to characterise the soil hydraulic properties before designing a simple short-furrow irrigation system, using a modified basin area of IRWH as an irrigation furrow. The third project of Mussie Zerizghy from Eritrea focused on water conservation measures during a crop fallow period. This project's aim was to develop a soil water balance model to aid in the simulation of the complex hydrologic processes under IRWH. The last two projects were funded by the UFS's Water Cluster.

Agrometeorology achieved a wonderful milestone as three doctoral students graduated on one day. Their research projects complement each other as they stretch across the scope of Agrometeorology. Mokhele Moeletsi did a climate analysis of the Free State and constructed a computer model for the weather risk factors affecting the maize growing areas. Nhlonipho Nhlabatsi reported on a micrometeorology study of factors affecting soil surface evaporation which is a major loss in semi-arid environments, and Durton Nanja established an agrometeorological service with a community in the southern province of Zambia to disseminate useful climate information to help them grow crops more sustainably.

Agrometeorology has been part of a successful project funded by IDRC/CCAA run in Zambia and Zimbabwe entitled *Building Adaptive Capacity to Cope with the "Increasing*

Vulnerability due to Climate Change. The work in the Mujika Community in the southern province of Zambia included maize trials in farmers' fields; training and dissemination of relevant climate information via local radio and farmer study groups. The success was in integrating the community inputs and collaboration into CAPES which is a Community Agrometeorology Participatory Extension Service. Two useful popular booklets have been produced – one a *Handbook for CAPES*. The other *Mujika Personal Stories: Climate Learning Changing Livelihoods* which describes how some of the community members and small-scale farmers were able to utilize the climate information in seasonal forecasts to make better decisions about crops and cultivars to plant, thus improving their livelihoods. These are both available to be downloaded at www.agrometeorology.org.

Prof. Sue Walker was privileged to be hosted by FAO – Land and Water Division in Rome during the second semester of 2011. During this time she worked (with help from doctoral students) on calibrating the FAO-AquaCrop model for the locally important African crops amaranthus, pearl millet and taro. AquaCrop can be used to simulate the water use and yield of agronomic crops using climate, soil and crop data. Thus risk assessments of selected crops likely to be sustainable in certain agroclimatic zones can be made with the model.

In March 2011, Agrometeorology held a special seminar to commemorate the Annual World Meteorological Day. Presentations were given by UFS and ARC-ISCW staff, and



Sue Walker with FAO colleagues in Rome.

visitors from Japan who were part of a NRF-JSPS funded scientific exchange project on drought and grasslands across the Free State. One of our postgraduate students, Mr Pieter Snyman, won the prize for best oral presentation during his session at the 2011 student symposium of the “Suid-Afrikaanse Akademie vir Wetenskap en Kuns”.

Ms Linda de Wet and Stephan Steyn attended and presented at the CALMet IX International Conference which was held in Pretoria. The themes of the conference included innovative learning activities, learning and instructional theory, educational resources, collaborative projects and virtual teams, competency-based training, new instructional technologies and training programme management. This shows their continued efforts to improve the quality of teaching and willingness to explore new pedagogical techniques. Similarly, lecturers from other universities and national weather services were able to draw from their experiences using innovated teaching methods. Stephan Steyn led a workshop on *A Practical Approach to Instructing Dynamic Meteorology*. Linda de Wet presented a paper titled *Learning through problem-based classes: How do students feel?*

As a result of the collaboration with Mr Francois van Heerden of St. Michaels Secondary School in Bloemfontein and Ms Carla Ramsdell of the Department of Physics and Astronomy at the Appalachian State University a Climate Club was established at the school. The aims of this interaction are to further the education of learners in geography by allowing postgraduate students in our department to present regular talks at the club meetings and to mobilise these learners to do meteorological observations at the school. These observations will be used by

researchers at the Appalachian State University and be shared with other learners across the world.

The weather station terrain was also upgraded this past year and now boasts additional office space and a 15 m-high observation tower equipped with meteorological instrumentation. This will facilitate practical training wherein students are expected to calculate vertical profiles of wind and temperature as well as heat and moisture fluxes within the boundary layer.

In Agronomy and Horticulture one master's and three doctoral students completed their studies under the supervision of Drs James Allemann, Gert Ceronio and Gesine Engelbrecht. From this research a number of papers were delivered at both national and international conferences. A study into the effect of various nutrients on hydroponically cultivated rose geranium has been completed, while a number of research programmes are ongoing. Research into chloroacetanilide herbicide damage to crops, *A. cruentus* allelopathy, and temperature effects on sunflower germination are still underway in the Agronomy section. Horticultural studies presently underway are investigations into various aspects of onion production, together with an investigation into the effect of nitrogen concentrations and types on beet yield and quality, as well as temperature and drought stress effects on the germination of amaranth seeds and early seedling growth.

The crop and stress physiology research team of Prof. Seef Pretorius completed the screening of more than 3 500 crude plant extracts for antibacterial and antifungal properties. From this two plants with exceptionally high antifungal

properties have been identified. Extracts of these two plants have been successfully formulated into a liquid prototype product that shows excellent *in vitro* control of a series of economically important plant fungal pathogens. Two *in vivo* field trials confirmed the potential. Currently a series of *in vivo* trials are undertaken in order to obtain sufficient data for registration as a natural fungicide. The active ingredients have been identified previously and elucidation of its mechanism of action revealed disintegration of hyphal cell walls leading to inhibition of mycelium growth. Further, expression of the PR2, PR3 and PR9 genes in *Arabidopsis thaliana* following treatment with the product indicated that the PR-protein defence system of crops can be activated as a secondary control measure against fungal disease. A commercial product is envisaged in three years.

Mr Johan Barnard was appointed as a lecturer in Agronomy. His research focuses on managing salinity associated with irrigation in selected areas of South Africa.



Students preparing plots for a field trial.

Research **Outputs**

Department of Soil, Crop and Climate Sciences



Annual Report 2011

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Research articles

Du Preez, C.C., Van Huyssteen, C.W. & Mnkeni, P. 2011. Land use and soil organic matter in South Africa. 1. A review on spatial variability and the influence of rangeland stock production. *South African Journal of Science* 107: 27-34.

Du Preez, C.C., Van Huyssteen, C.W. & Mnkeni, P. 2011. Land use and soil organic matter in South Africa. 2. A review on the influence of arable crop production. *South African Journal of Science* 107: 35-42.

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Technical assistants preparing pots for a greenhouse trial.



A sunflower trial evaluating herbicide damage.

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Mzezewa, J. & Van Rensburg, L.D. 2011. Effects of tillage on runoff from a bare clayey soil on a semi-arid ecotone in the Limpopo Province of South Africa. *Water SA* 37: 1-8.

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Seyoum, T., Osthoff, G., Steyn, M.S., Engelbrecht, G.M. & Pretorius, J.C. 2011. The effect of preharvest treatment, disinfection and storage environment on quality of carrots. *Journal of Food Processing and Preservation* 35: 331-341.

Van der Laan, M., Miles, N., Annandale, J. & Du Preez, C.C. 2011. Identification of opportunities for improved nitrogen management in sugarcane cropping systems using the newly developed Canegro-N model. *Nutrient Cycling in Agroecosystems* 90: 391-404.

Van der Laan, M., Stirzaker, R.J., Annandale, J.G., Bristow, K.L. & Du Preez, C.C. 2011. Interpretation of electrical conductivity measurements from ceramic suction cups, wetting front detectors and ECH2O-TE sensors. *South African Journal of Plant and Soil* 28: 244-247.

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Van Jaarsveld, C.M., Du Preez, C.C., Zharare, G. & Smit, M. 2011. *Soil rehabilitation of the Hillendale mine: Effect of filtercake application on properties of a reconstituted soil and resulting sugarcane growth thereon*. Report commissioned by Exxaro KZN Sands, Richards Bay, South Africa.

Van Jaarsveld, C.M., Du Preez, C.C., Zharare, G. & Smit, M. 2011. *Soil rehabilitation of the Hillendale mine: Effect of phosphorus application on properties of a reconstituted soil and resulting sugarcane growth thereon*. Report commissioned by Exxaro KZN Sands, Richards Bay, South Africa.

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Conference contributions

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Kotze, E. & Du Preez, C.C. 2011. *Effect of grassland condition on selected soil fertility properties*. Paper delivered at the 8th Annual Inkaba yeAfrica (IyA) Workshop, Cape Town International Convention Centre, Cape Town, South Africa. 28 August – 2 September.

Kotze, E., Du Preez, C.C. & Akhosi, M.C. 2011. *Effect of land use on soil humic substances in different semi-arid agro-ecosystems in the Free State Province, South Africa*. Paper delivered at the Conference on Ecology of Soil Micro-organisms: Microbes as important drivers of soil processes, Prague, Czech Republic. 27 April – 1 May.

Le Roux, P.A.L., Van Tol, J.J., Hensley, M. & Lorentz, S. 2011. *Soil indicators of hillslope hydrology*. Paper delivered at the General Assembly of European Geosciences Union (EGU), Vienna, Austria. 4-8 April.

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Nape, K.M., Steyn, A.S. & Ceronio, G.M. 2011. *Validation of APSIM using various management practices in the Modder River catchment, South Africa*. Paper delivered at the 27th Annual Conference of South African Society for Atmospheric Sciences, Hartbeespoort, Pretoria, South Africa. 22-23 September.

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Snyman, P. & Steyn, A.S. 2011. *Die Bloemfontein stedelike hitte-eiland gedurende winter*. Paper delivered at the Student Symposium on Natural Science, Pretoria, South Africa. 27-28 October.

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Steyn, A.S. 2011. *Temperature projections for the 21st century over the Free State gold fields region*. Paper delivered at the 8th Annual Inkaba yeAfrica (IyA) Workshop, Cape Town International Convention Centre, Cape Town, South Africa. 28 August – 2 September.

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Tharaga, P.C. & Steyn, A.S. 2011. *Downscaling climate change scenarios to daily maximum temperatures over Kimberley, South Africa*. Paper delivered at the 8th Annual Inkaba yeAfrica (IyA) Workshop, Cape Town International Convention Centre, Cape Town, South Africa. 28 August – 2 September.

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Van Heerden, P. & Walker, S. 2011. *Testing crop coefficient correctness with SAPWAT3 version 2*. Paper delivered at the SABI Congress 2011: Sustainable Irrigation for 2011 for People, the Planet and Prosperity, Protea Hotel Kruger Gate, Hazyview, Mpumalanga, South Africa. 2-5 Augustus.

Van Rensburg, L.D., De Clercq, W., Barnard, J.H. & Du Preez, C.C. 2011. *Management guidelines for salinisation*. Paper delivered at the South African Water Research Commission (WRC) 40-Year Celebration Conference, Emperor's Palace, Johannesburg, South Africa. 31 August – 1 September.

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Departments in the
Building Sciences



“M.Arch.(Prof) Student Jurie Swart and his project :
Borderline – Mediated Landscape : A Water Research
Centre for the University of the Free State (QwaQwa
Campus) was announced as the Regional winner of the
Corobrik Student of the Year competition.”

– Ms Martie Bitzer

Department of **Architecture**

Overview

During 2011 the Department of Architecture experienced a number of highlights.

One such highlight was the 23rd Sophia Gray Memorial Lecture and Exhibition, presented by Mr Peter Rich, entitled *Learnt in Translation*. Peter Rich was the winner of the 2009 World Building of the Year Award for the Mapungubwe Interpretation Centre.

The mini congress concurrent with the Sophia Gray Memorial Lecture featured local architect Mr Mokena Makeka of Cape Town and Mr Tom Kundig of Seattle USA, who both presented their work and gave insights into their design processes and implementations especially in terms of environmental sustainability.

The 5th South African Journal of Art History conference was hosted by the Department on 8 and 9 July. Mr Rudolf Bitzer, Mr Kobus du Preez, Prof. Walter Peters and Dr Diaan van der Westhuizen served as the organizers and Mr Rudolf Bitzer served as guest editor of the associated issue. The conference was entitled *Ruin as Metaphor and Process:*

Ideals, Damage and the Passing of Time. The conference was attended by several national colleagues and researchers. Staff, who also presented papers, included Prof. Walter Peters, Dr Diaan van der Westhuizen, Mr Kobus du Preez, Mr Rudolf Bitzer and Ms Wanda Verster.

B.Arch.Stud.(Hons). students Victor Salzmann, Rohann Wessels, Johan du Preez, Darius Coertse, André Krige and Erick Ouko participated in the Cement and Concrete Institute's Short Film Competition with their film *Umbrella Man*. The competition, titled *Science Friction*, asked how one can offer a vision of the future South African city - either utopian or dystopian. The film went on to win at national level and as a result was screened at the Prague Architecture Week Film Festival held 10 – 23 October 2011.

M.Arch.(Prof) student Jurie Swart and his project: *Borderline – Mediated Landscape: A Water Research Centre for the University of the Free State (QwaQwa Campus)* was announced as the Regional winner of the Corobrik Student of the Year competition. He, as well as runners-up Marko



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Ms Martie Bitzer

Ms Martie Bitzer is convinced that 'sustainability is the new normal'. Sitting on 7 committees, she also chairs the UFS Sustainable Committee as she views the role of her profession as a leading one in the sustainable drive. Her research focus on the influence that the visual object-building has on the student's design approach.

Pretorius and Ian Cox and Martin Potgieter (winner of the prize for best use of clay masonry), demonstrated that future architects were embracing the sustainability agenda.

The M.Arch. (prof) class performed well: 14 candidates received distinctions in the technical component of their dissertations and 8 in the design component, of these students 8 are to receive their degrees *cum laude*.

Activities and achievements

The annual study tours undertaken by students in the various year groups were once again informative and enjoyable. First year students toured to Philippolis and later to Clarens, the second years travelled to Durban, the third years to Johannesburg and the honours students to Maputo.

On 8 March 2011, Lira, well known Jazz singer, judged of the third year design projects inspired by her lyrics and music. The projects were an investigation into the adaptability of structure and space.

Staff member Henry Pretorius was responsible for the expansion and remodelling of the Architecture building. Construction started in 2010 and was completed a year later. The building was officially re-opened on 17 October 2011 with a screening of the student film *Umbrella Man*. Guests at the events included the rector, Prof. Jonathan Jansen and the Dean of the Faculty of Natural and Agricultural Sciences, Prof. Neil Heideman.

To his surprise, the KwaZulu-Natal Institute for Architecture conferred upon Prof. Walter Peters, an illuminated scroll



Pictured at the award ceremony are from left: Gary Westwood FS Manager Corobrik, first runner-up Marko Pretorius, second runner-up Ian Cox, the winner of the regional finals of the 2011 Corobrik Architectural Student of the Year Jurie Swart, with Departmental Chairperson Ms Martie Bitzer, and Martin Potgieter who received an award for the best use of clay masonry.



UMBRELLAMAN



From left: Rohann Wessels, Erick Ouko, Darius Coertse, Johan du Preez, Victor Salzmann, André Krige.

marking three decades of editorship of the *Journal of the KZ-NIA*.

Mr Jan Ras attended the 2011 UIA (Union of International Architects) conference in Tokyo, Design 2050 – Beyond Disaster – in September. He is part of the UIA/SAIA Organisation Committee to host the next UIA congress in Durban in 2014.

Mr Jan Ras was also part of the UIA/SAIA/COP 17 activities in Durban. These were also attended by Mr Zack Wessels and Mr J.T. Erasmus from 28 November – 9 December and a special lecture was presented by Mr Wessels to the students on what was learned at this event.

Mr Jako Olivier attended the KZ-NIA master class event in Durban from 16–19 June, with internationally acclaimed studio masters, architect Angelo Bucci (Prof. of Design UIC at Barcelona); Elena Rocchi of Spain, and Claudio Vekstein of Argentina.

Mr Rudolf Bitzer presented a lecture on alternative construction methods at an UVPersu Wellness event in August. He also presented a lecture at the ESKOM energy efficiency discussion held at Black Mountain outside Bloemfontein in December 2011.

Community service

The Winter School took place on the 13th and 14th of July in order to provide high school learners who are considering a career in architecture with some understanding on this profession.

Ms Martie Bitzer was the speaker at the annual Staff Health and Wellness Women's Breakfast on 12 Augustus 2011 with the theme, *Architecture – A stage for life, creating ambience*. Attended by some 250 women, this took place at the Centenary complex.

As part of the F1 first year group of 2011, Ms Martie Bitzer accompanied 11 students as mentor to the Vrije University in Amsterdam in January 2012.

Weekly research seminars

As of 2011, the staff agreed to re-arrange the timetable to release them from teaching duties during the first two



Lira is pictured here with Theo Gutter third-year student.



SEEN at the function are from left: Nina Saunders, KZ-NIA-President, Prof. Walter Peters and past-KZ-NIA-President Rodney Harber.

periods on Friday mornings to enable participation in weekly research seminars. These seminars consisted of a combination of information sessions delivered by Prof. Walter Peters and Dr Diaan van der Westhuizen and presentations by registered higher degree candidates. Visitors also attended, themselves presenting and participating in seminars, including UFS Affiliate Professor of Architecture Ora Joubert, UFS Sustainable Development Cluster Director Prof. Doreen Atkinson, UFS Post-Graduate School Head Prof. Neil Roos, and UFS Extraordinary Professor Maresi Nerad. A total of 17

seminars were offered. The seminars also provide a tracking system to ensure that all candidates obtain regular support, supervision and feedback.

These seminars have borne some fruit: lecturer Kobus du Preez has submitted his M.Arch. dissertation, student Colleen Steenkamp should follow suit in April 2012, and research assistant Wanda Verster at the end of 2012. Once this group has graduated, the supervisory capacity of the department should be considerably enhanced.

Dr Diaan van der Westhuizen received the Thuthuka NRF grant for 2011 for his proposal entitled: *The Influence of the Built Environment on Quality of Life in Low Income Communities*. This is a significant achievement in the career of any academic.

Staff matters

Ms Ansue Schulz retired in August of 2011 after serving as administrative clerk in the Department from January 1992.

Dr Diaan van der Westhuizen left the Department at the end of 2011 after accepting a position at the University of the Witwatersrand. He made invaluable contributions to both Design and Theory lectures as well as improving the research culture in the department.

Ms Wanda Verster, a recent graduate of the Department, was appointed as full time research assistant.

Research Outputs

Department of Architecture



Research articles

Peters, W. 2011. Durban's Beachfront Upgrade in Perspective. *Architecture SA*: 22-23.

Peters, W. 2011. Men are as great as the monuments they leave behind: Wilhelm O. Meyer and the University of Johannesburg, Kingsway Campus. *SA Journal of Art History* 26(2): 69-80.

Peters, W. 2011. University of Johannesburg, Kingsway Campus. Part 1: A Framework for Development. *Architecture SA*: 42-51.

Peters, W. 2011. University of Johannesburg, Kingsway Campus. Part 2: Realisation. *Architecture SA*: 57-70.

Van der Vyver, Y. 2011. Geology and ruin as settlement generators in Provence-Alpes-Côte d'Azur. *SA Journal of Art History* 26(2): 126-162.

Verster, W. 2011. The role of photography, place and memory in gallery and museum design. *SA Journal of Art History* 26(2): 143-156.

Conference contributions

Bitzer, R. 2011. *Ruins, ruination and response ideas about minding what is lost to interpret what is left.* Paper presented at the 5th Annual Conference of the South African Journal of Art History: Ruination as Metaphor and Process: Ideals, Damage, and the Passing of Time, University of the Free State, Bloemfontein, South Africa. 8-9 July.

Du Preez, K. & Kotze, P. 2011. *President Brandt Cemetery in Bloemfontein.* Paper presented at the 5th Annual Conference of the South African Journal of Art History: Ruination as Metaphor and Process: Ideals, Damage, and the Passing of Time, University of the Free State, Bloemfontein, South Africa. 8-9 July.

Olivier, J., Raman, P. & Perold, R. 2011. *International relevance through local significance.* Paper presented at the South African Visual Arts Historians (SAVAH) and the Comité International d'Histoire de l'Art (CIHA) Colloquium: Art History in (South) Africa and the Global South, University of the Witwatersrand, Johannesburg, South Africa. 12-15 January.

Peters, W. 2011. *Aspects of Townships and Conservation.* Paper presented at the UKZN-KZNIA Education in a Changing Built Environment Conference, Durban, South Africa. 16-17 September.

Peters, W. 2011. *Men are as great as the monuments they leave behind: Wilhelm O. Meyer and the University of Johannesburg, Kingsway Campus.* Paper presented at the 5th Annual Conference of the South African Journal of Art History: Ruination as Metaphor and

Process: Ideals, Damage, and the Passing of Time, University of the Free State, Bloemfontein, South Africa. 8-9 July.

Van der Vyver, Y. 2011. *Geology and ruin as settlement generators in Provence-Alpes-Côte d'Azur.* Paper presented at the 5th Annual Conference of the South African Journal of Art History: Ruination as Metaphor and Process: Ideals, Damage, and the Passing of Time, University of the Free State, Bloemfontein, South Africa. 8-9 July.

Van der Westhuizen, D. 2011. *Ruin of the colonial conception of space in the evolution of a city: evidence for the city of Bloemfontein, 1848-2010.* Paper presented at the 5th Annual Conference of the South African Journal of Art History: Ruination as Metaphor and Process: Ideals, Damage, and the Passing of Time, University of the Free State, Bloemfontein, South Africa. 8-9 July.

Verster, W. 2011. *The role of photography, place and memory in gallery and museum design.* Paper presented at the 5th Annual Conference of the South African Journal of Art History: Ruination as Metaphor and Process: Ideals, Damage, and the Passing of Time, University of the Free State, Bloemfontein, South Africa. 8-9 July.

Creative outputs

Pretorius, H. Extension and Remodelling of Department of Architecture Building, UFS main campus

Contact details

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Staff

Departmental Chair: Ms Martie Bitzer

Professor: Prof. Walter Peters

Affiliate Professor: Prof. Ora Joubert

Senior Lecturers: Ms Martie Bitzer, Dr Diaan van der Westhuizen

Lecturers: Mr Gerhard Bosman, Mr Kobus du Preez and Mr Jan Ras

Junior Lecturers: Mr Henry Pretorius, Mr Jako Olivier, Mr Rudolf Bitzer, Mr JT Erasmus, Mr Jan Nel and Mr Hein Raubenheimer

Contract Lecturers: Mr Charl-Pierre Cilliers, Ms Carmen Dickens, Ms Madelein Markram, Ms Katie Salzmänn, Mr Jacobus Smit, Mr Zack Wessels and Ms Helena Jordaan-Olivier

Departmental Clerical Assistant: Ms Zelda Bronkhorst

Departmental Secretary: Ms Yolanda Pretorius

Computer Laboratory Assistant: Mr Lindelo Keswa

Messenger: Ms Joyce Mohatlane

Research Assistant: Ms Wanda Verster

“Once again a Kovsie (UFS) student was awarded the Gold Medal of the Association of South African Quantity Surveyors.”

– Prof. Basie Verster

Department of Quantity Surveying and Construction Management

Overview

During 2011, the Department of Quantity Surveying and Construction Management was involved in various activities, events and developments and experienced a number of highlights.

The University of the Free State's (UFS) accreditation by the South African Council for the Property Valuation Profession (SACVP) was again confirmed in 2011 after a visit by the council to the university.

Some outstanding students of the department once again were awarded prestigious national awards: Ms F. Samuel is to receive the national gold medal from the Association of South African Quantity Surveyors for her outstanding performance in 2010. Ms E. Malherbe was awarded the national Bell John Prize for her outstanding academic achievements in 2010.

The department took part in continuous research projects with the Council for Scientific and Industrial Research (CSIR) and the Construction Industry Development Board (CIDB) and comprehensive results were published. Departmental lecturers and students also presented fourteen successful

papers at international congresses in Amsterdam, Bristol, Manchester and Helsinki. In total 11,75 official research outputs were achieved by the department.

In the field of education, students are offered lectures through the medium of residential and open learning programmes. In 2011, the department served a total of 252 undergraduate students; 150 honours students, 36 students on master's level and 7 Ph.D. students.

The department also presents various registered short programmes and courses as an additional training action. In 2011, 79 students were registered for the QCP open learning programme; 153 students completed the Facilities Management Programme (FMP) supported by the South African Property Owners Association (SAPOA) and 28 students completed the Intensive Project Management Programme (IPMP), also supported by SAPOA.

Over the past few years, the department has delivered significant contributions to the various professions and to the construction industry as a whole. The Department has

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Prof. Basie Verster

Prof. Basie Verster is very active in the professional community. He was President of the Association of South African Quantity Surveyors (ASAQS) in 1997, Chairman of the Alliance of Development Professions (S.A.) in 1998, and Chairman of the International Cost Engineering Council, 2004 – 2006. He is the Chairman of the Education Standards and Research (ESR) Committee of the South African Council for the Quantity Surveying Profession (SACQSP; 2004-2009).

also maintained statutory accreditation by the South African Council for the Quantity Surveying Profession (SACQSP), the South African Council for the Project and Construction Management Professions (SACPCMP), and the South African Council for the Property Valuers Profession (SACPVP). Internationally, the department is accredited by the Royal Institution of Chartered Surveyors (RICS) in the UK, and the Chartered Institute of Building (CIOB), also in the UK.

Prof. Basie Verster, Head of the Department is the Vice President (education) of the CIOB (Chartered Institute of Building) Southern Africa. Prof. Verster also served on the UFS Council in 2011. Prof. Basie Verster and Mr Carl van Zyl also serve on the CIOB council.

Dr Hendrik Marx and Mr Stephen Ramabodu are Council Members of the Association of Schools of Construction in Southern Africa (ASOCSA).

The *Acta Structilia* is a fully accredited scientific journal, endorsed by the South African Council for the Quantity Surveying Profession (SACQSP) and the Royal Institution of Chartered Surveyors (RICS). In 2011, the journal celebrated its 18th year. This journal offers publication opportunities for independent, peer-reviewed articles by local and overseas researchers in the fields of physical and development sciences. Since 1993, 86 research articles, 18 review articles, 12 international articles, 14 commentaries, 8 book reviews and eight introductions have been published.

In 2011, the 27th publication of the student journal, *Bouvaria*, was published.

Many students from the department visited various construction sites to see the practical implications of construction and students also attended the SACQSP National Congress in Port Elizabeth during September 2011 as well as the ASOCSA congress.



Some outstanding students of the department Quantity Surveying and Construction Management received prestigious awards: Back from the left :Mr Pierre Oosthuizen (lecturer) Mr J. Pieterse, Mr M. van der Merwe, Mr J .Furstenburg and Mr E Degenaar (recipients) Front from the left: Ms F. Samuel (Gold medal), Ms E. Malherbe(recipient) and Mr Carl van Zyl (lecturer).



Students of the Department of Quantity Surveying and Construction Management visited the site of the new Economics and Management Sciences building on campus.



Research **Outputs**

Department of Quantity Surveying and Construction Management

Conference contributions

Dlungwana, S. & Hauptfleisch, A.C. 2011. *A quantified emerging contractor development report: A case study in pursuance of best practice.* Paper presented at the 6th Built Environment Conference of the Association of Schools of Construction in Southern Africa (ASOCSA), Johannesburg, South Africa. 31 July – 2 August.

Du Preez, O.R.C. & Berry, F.H. 2011. *The additional project management knowledge areas: Practice and reception.* Paper presented at the Nelson Mandela Metropolitan University (NMMU) Construction Management 40 Conference, Marine Hotel, Port Elizabeth, South Africa. 27-29 November.

Du Preez, O.R.C. & Verster, J.J.P. 2011. *Education, training and mentorship in pursuit of maturity in quantity surveying.* Paper presented at the 6th Built Environment Conference of the Association of Schools of Construction in Southern Africa (ASOCSA), Johannesburg, South Africa. 31 July – 2 August.

Els, M. & Verster, J.J.P. 2011. *People skills as core competency of a construction project manager.* Paper presented at the Nelson Mandela Metropolitan University (NMMU) Construction Management 40 Conference, Marine Hotel, Port Elizabeth, South Africa. 27-29 November.

Greyling, C. & Verster, J.J.P. 2011. *Sustainable human settlement development – The cost of going green.* Paper presented at South African Council for the Quantity Surveying Profession (SACQSP) Research Conference: 2020 Revisited, Port Elizabeth, South Africa. 2 September. Endorsed by the International Cost Engineering Council (ICEC).

Hauptfleisch, A.C. & Du Preez, O.R.C. 2011. *The development of sustainable private retirement villages: Establishment of resident preferences and development directives.* Paper presented at the 6th Built Environment Conference of the Association of Schools of Construction in Southern Africa (ASOCSA), Johannesburg, South Africa. 31 July – 2 August.

Hauptfleisch, A.C. & Marx, H.J. 2011. *A case study regarding the potential impact on socio-economic and property development resulting from road transport corridors in Africa.* Paper presented at the SB11 Helsinki World Sustainable Building Conference, Helsinki, Sweden. 18-21 October.

Hauptfleisch, A.C. & Marx, H.J. 2011. *The potential impact on property and socio-economic development resulting from road transport corridors in Africa: A case study.* Paper presented at the International



Conference on Management and Innovation for a Sustainable Built Environment (MISBE 2011), Delft University of Technology, Amsterdam, the Netherlands. 19-23 June.

Hauptfleisch, A.C. & Verster, J.J.P. 2011. *Facilities Management: Proposals for practice improvement and development support through educational programmes in South Africa.* Paper presented at the International Conference on Management and Innovation for a Sustainable Built Environment (MISBE 2011), Delft University of Technology, Amsterdam, the Netherlands. 19-23 June.

Jacobs, E. 2011. *Elements of going green.* Paper presented at South African Council for the Quantity Surveying Profession (SACQSP) Research Conference: 2020 Revisited, Port Elizabeth, South Africa. 2 September.

Jacobs, E. 2011. *Sustainable building awareness in the Free State Province, South Africa.* Paper presented at the 6th Built Environment Conference of the Association of Schools of Construction in Southern Africa (ASOCSA), Johannesburg, South Africa. 31 July – 2 August.

Marx, H.J. 2011. *Key construction performance indicators for employers and their agents.* Paper presented at the COBRA 2011: Construction and Building Research Conference of the Royal Institution of Chartered Surveyors (RICS), Manchester, United Kingdom. 12-13 September.





Marx, H.J. 2011. *Key construction performance indicators measuring contractor satisfaction*. Paper presented at the Association of Researchers in Construction Management (ARCOM), Congress, Bristol, United Kingdom. 5-7 September.

Marx, H.J. 2011. *Key performance indicators reflecting the condition of the construction industry*. Paper presented at the 6th Built Environment Conference of the Association of Schools of Construction in Southern Africa (ASOCSA), Johannesburg, South Africa. 31 July – 2 August.

Verster, J.J.P. & Weitsz, C. & Zimema, L. 2011. *Perceptions of risk associated with construction contracts: Consequences towards 2020*. Paper presented at South African Council for the Quantity Surveying Profession (SACQSP) Research Conference: 2020 Revisited, Port Elizabeth, South Africa. 2 September.

Zulch, B.G. & Verster, J.J.P. 2011. *Communication skills*. Paper presented at the COBRA 2011: Construction and Building Research Conference of the Royal Institution of Chartered Surveyors (RICS), Manchester, United Kingdom. 12-13 September.

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Lecturers: Mr Ben Swart, Mr Hendrik van Vuuren, Mr Stephan Ramabodu, Ms Benita Zulch

Contract Lecturers: Mr Carl van Zyl, Mr Pierre Oosthuizen, Mss Esti Jacobs, Mart-Marie Els, Olive du Preez

“The Spatial Development Framework is a spatial interpretation of the development vision and goals of the community.”

– Prof. Verna Nel

Department of **Urban and Regional Planning**

Overview

The department offers post graduate degrees (Master's and Honours) in urban and regional planning as well as a doctoral degree in Urban and Regional Planning.

During the 2011 May graduation ceremony 6 students graduated with a Master's in Urban and Regional Planning, 4 students graduated with a Baccalaureus in Land and Property Development Management (Housing) and 12 students graduated with a Baccalaureus in Spatial Planning Honours.

During the 2011 Spring graduation ceremony 7 students graduated with a Baccalaureus in Spatial Planning Honours, as well as one student with a Magister in Urban and Regional Planning, and another with a Baccalaureus in Land and Property Development Management (Housing).

Activities

At the Southern African Housing Foundation's annual National Housing Awards Ceremony on Tuesday 13 September Martin Abrahamse was awarded a R10, 000 cash prize provided by

the Chartered Institute of Housing (CIH) in the United Kingdom which was awarded in recognition for obtaining the highest marks, diligence, time management and excellent research capabilities in the Service Learning Housing Module (BEH752) as part of the Master's of Urban and Regional Planning Degree Programme at the University of the Free State.

Mr Danie Schoeman (alumnus, moderator, researcher and Spatial Planner at the Mangaung Metropolitan Municipality), Dr Maléne Campbell and Mr Wynand Myburgh (Master's graduate) each presented a paper at the World Planning Schools Congress in Perth, Western Australia (4-11 July 2011). Re-worked versions of the full papers were accepted for publication after a double blind peer review process.

Research

Mr Y. Mashalaba presented some of his Ph.D. research findings, at the South African Planners Institute AGM in Kimberley, for the celebration of World Planning Day, regarding the perceptions of people on open spaces.



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Prof. Verna Nel

Prof. Verna Nel is a member of the South African Council for Town and Regional Planners and a member of the South African Planning Institute. Until August 2008 she was responsible for the management of the City Planning function for the City of Tshwane. This included all the responsibilities associated with a senior management post.

Ms E. Barclay was involved in various research projects in indigenous knowledge based development, with funding from the African Association of Planning Schools and the UFS Cluster for Sustainable Development. Research projects by Ms E. Barclay also include the viability of sustainable campus transport, the development of a Forensic Research Hub and the viability of transforming Welkom into a 'Science City'.

An ongoing research project by Dr Campbell is determining the impact on property and socio-economic development resulting from the Maputo Development Corridor. Research is being conducted among businessmen, professional practitioners and planning officials on both the South African side and the Maputo side of the corridor.

Community service

The Department runs combined community service and community service learning projects in Greater Dealesville, part of Tokologo Local Municipality, where students from various modules are doing community based engagement and research in order to provide the municipality with a local economic development plan, tourism plan, transportation plan, rural development plan, and Spatial Development Framework and inputs into an Integrated Development Plan.

In addition to the BEH752 service learning module the Master's students have to develop a housing chapter of the Integrated Development Plan of a small town. It is a bottom-up process



From the left: Robert Keats, CIH South East Branch, Martin Abrahamse, Minister Bonginkosi Madikizela, MEC for Human Settlements & John Hopkins, CEO – SAHF.

where the students interact with the recipients of government subsidised houses for low-income families as well as partners in the Peoples' Housing Process. The housing chapter details identified housing needs and backlogs, identifying well-located land suitable for development as well as investigating and verifying alignment of identified land with the Spatial Development Framework. Outcomes for the students are that this service learning module allows students to gain hands-on



From the left: Mr Danie Schoeman, Dr Maléne Campbell and Mr Wynand Myburgh. Background: City of Perth on the banks of the Swan River.

experience on how to transform housing needs into spatial needs. The impact on the community is that the 'Housing Voice' of the community is heard.

Mr Y. Mashalaba took students on a tour of Batho Location in Mangaung, to give a perspective of the current urban renewal efforts with specific reference to the Grootspuit open space.

Staff

Prof. V.J. Nel, Head of the Department, is currently the chairperson of the Committee of Heads of Planning Schools and in that capacity also serves on the Education and Training Committee of the South African Council for Planners. She is also the Department's representative on the local South African Planning Institute's committee. In this capacity she facilitated the SAPI skills training workshops in Bloemfontein and Kimberley in July 2011.

The Department has a unique employee track record in that no one has yet resigned, only retired. At the end of 2011 Ms G.M.Steenkamp retired and will be fondly remembered as the environmental activist that taught Environmental Planning and encouraged those who were shy and unsure of themselves to grow in confidence.



A staff member and MURP students enjoying themselves after they circulated questionnaires at the Komatipoort Prawn Festival. From the left at the back: Etienne Terblanche and Antoinette Nel. From the left front: Donn  van der Merwe, Hendrik Ferreira and Tinus Galloway.

Research **Outputs**

Department of Urban and Regional Planning



Research articles

Campbell, M.M. & Meades, Z. 2011. Urban design principles for micro level planning in low-cost housing: The Case of Turflaagte. *The International Journal for the Constructed Environment* 1(2): 29-46.

Nel, V.J. 2011. Land use management system as a tool towards achieving low carbon cities in South Africa. *Town and Regional Planning* 58: 1-5.

Africa. Paper delivered at the World Planning Schools Congress 2011: Planning's Future-Futures Planning: Planning in an Era of Global (Un) Certainty and Transformation, Perth, Western Australia. 4-8 July.

Campbell, M.M., Abrahamse, M.A., Mdingi, Z. & Smit, R. 2011. *A proposed development axis framework: The case along the West Coast road (R27) between Cape Town and Saldanha Bay, South Africa*. Paper delivered at the World Planning Schools Congress 2011: Planning's Future-Futures Planning: Planning in an Era of Global (Un) Certainty and Transformation, Perth, Western Australia. 4-8 July.

Research reports

Venter, A., Campbell, M.M., De Gouveia, A., Myburgh, W. & Marais, J.G.L. 2011. *Clarens: Visitor and business survey*. Centre for Development Support (CDS) Research Report, LED and SMME Development (2), University of the Free State, Bloemfontein, South Africa.

Conference contributions

Campbell, M.M. & Myburgh, W.R. 2011. *The viability of a development axis between the cities of Bloemfontein and Kimberley, South*

Africa. Paper delivered at the World Planning Schools Congress 2011: Planning's Future-Futures Planning: Planning in an Era of Global (Un) Certainty and Transformation, Perth, Western Australia. 4-8 July.

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Departments in the
Natural Sciences



“The single most rewarding experience for 2011 was the inauguration of the newly renovated Chemistry building, which took place in November, ending five and a half years of frustration due to renovations, to create a competitive world-class research and teaching facility.”

– Prof. André Roodt

Department of **Chemistry**

Main campus

Overview

The single most rewarding experience for 2011 (International year of Chemistry; UNESCO) in Chemistry on the main campus was the inauguration of the newly renovated Chemistry building, which took place in November, ending five and a half years of frustration due to renovations, to create a competitive world-class research and teaching facility. Interruptions due to the renovation process still posed a range of unique problems in terms of practical classes, theory and research and placed significant stress on the department. In spite of this, the enthusiasm and commitment of the department's personnel were illustrated by the fact that most activities were continued without significant problems throughout the year. The support of senior UFS management as well as faculty colleagues who provided office and laboratory space and other support to Chemistry under- and postgraduate students during 2010 are gratefully acknowledged.

Having finally experienced the completion of the facilities, Chemistry is proud of the continued quality and excellence in pursuit of the strategic priorities of the UFS and the Faculty of Natural and Agricultural Sciences under difficult infrastructural circumstances. The postgraduate core of Chemistry consisted of twelve postdoctoral associates, 22 M.Sc. and 36 Ph.D. students in different sub-disciplines, of whom 4 Ph.D. and 12 M.Sc. students graduated during 2010. Accordingly, a significant and sustained research output for 2010 was produced, as manifested by 81 research articles published in international accredited journals and 85 presentations made at local and international conferences.

The collaboration between the UFS and Sasol, which supports the extended secondment of Prof. Ben Bezuidenhout to the department continued. An achievement under this agreement is the successful application of “Applied Process Chemistry” to the South African National Research Foundation's (NRF)

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Prof. André Roodt

Prof. André Roodt's areas of expertise lie in Reaction Mechanisms, Reaction Kinetics, Organometallic Chemistry, Coordination Chemistry, X-Ray Crystallography, Homogeneous Catalysis, Multi-Nuclear NMR, IR, UV/Vis Spectroscopy, High-Pressure in situ spectroscopy, Nuclear Medicine and Molecular Modelling.

Technology and Human Resources for Industry Programme (THRIP) from combined inputs of Inorganic, Physical and Organic Chemistry (Profs Roodt, Swarts and Bezuidenhoudt). This has sourced an additional R3.2 million for the upgrade of equipment and the development of extended capacity.

Teaching aspects at undergraduate level have again been a prime focus of the department. The continued teaching in parallel medium on the Main Campus was quite demanding on individuals and challenged the lecturers to improve constantly, also with respect to using more sophisticated teaching methods and computers during classes.

The South Campus saw the formal introduction of the new structure for the extended programme, which introduced four separate modules covering the theoretical fundamentals of the 1st year programme. Once students have successfully completed these, they are promoted to the Main Campus to complete their practical work and continue as main stream students.

The honours course again saw the further refinement of advanced topics by outside scholars in a number of courses in the B.Sc. honours programme, exposing the chemistry students to international teachers.

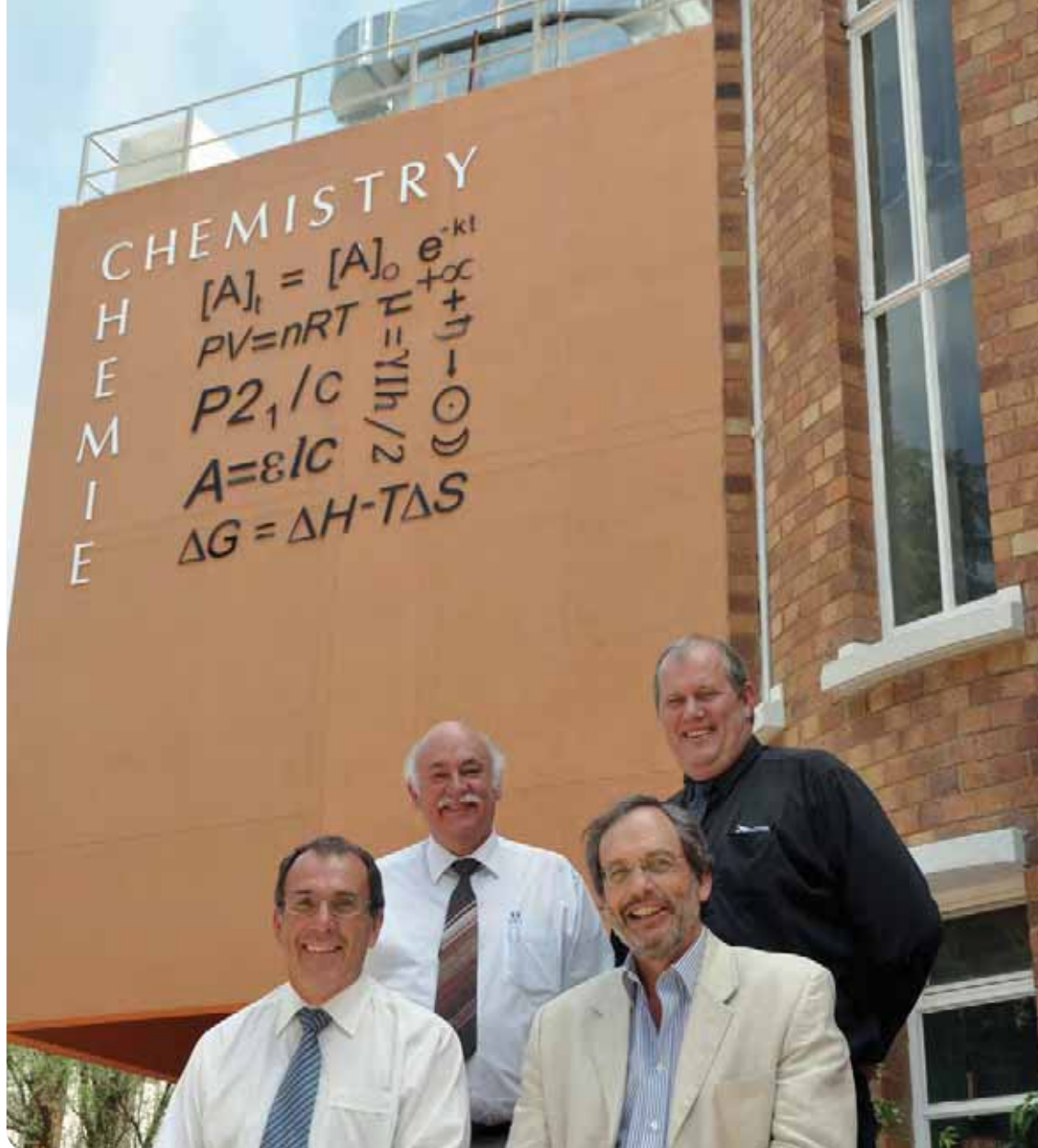
Departmental activities and achievements

The Chemistry Department consist of four divisions, i.e., Organic and Process Chemistry, Physical Chemistry, Analytical Chemistry and Inorganic Chemistry.

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

The **Organic and Process Chemistry** Division is headed by Profs Ben Bezuidenhoudt, Andrew Marston and Jan van der Westhuizen, with Dr Susan Bonnet as senior lecturer and Ms Anke Wilhelm-Mouton as lecturer. They were assisted during 2011 by Ms Anette Alleman as technical officer, Dr Charlene Marais as post-doctoral assistant and Ms Bernadette van Tonder as technical assistant. 19 M.Sc. and Ph.D. students were studying towards higher degrees, while 5 post-doctoral fellows were actively working in the division.

Prof. Marston contributed significantly to the activities of the division since his appointment in 2009. He obtained new research funding from the European Union [Seventh Framework Programme for Building Sustainable Research Capacity on Plants for Better Public Health in Africa (Euro 207 600)], the Norwegian Research Council bioprospecting [The isolation and structure determination of compounds from plants and algae (NOK 43 000)], and the South African Rooibos Tea Council (R 300 000). He also acted as reviewer for research proposals for the NRF's Revised Thuthuka Programme, the South Africa/Japan Society for the Promotion of Science Research Partnership Programme, and the European Research Council and became a member



The renovations to the Chemistry building have finally been completed. At the inauguration were from left: Dr Chris Reinecke, former Sasol Technology Research and Development Managing Director, Prof. Jannie Swarts (Physical Chemistry), Prof. Frederick Fourie (previous Rector), Prof. André Roodt (HOD, Chemistry). Photo: Stephen Collett

of the editorial boards of several international scientific journals, like *Scientia Pharmaceutica*, *Planta Medica*, *Journal of Biochemistry and Biotechnology*, and *Isan Journal of Pharmaceutical Science* (Thailand). He was also invited as a visiting professor to the University of Angers (France) and gave presentations at 3 workshops organized within the framework of the EU Muthi Project [at UWC, in Bamako (Mali) and in Kampala (Uganda)].

Prof. Jan van der Westhuizen continued his collaboration with Parexel as well as his efforts towards finding industrial applications for natural product research, which led to the filing of two more patents on the synthesis of flavonoids. He also collaborated on projects funded by the Medical Research Council, the Agricultural Research Council and the Bioprospecting Programme of the CSIR on the synthesis of bioactive natural products.

The **Process Chemistry** group strengthened ties with the catalysis research group of Prof. Manie Vosloo at NWU and visited them during the winter holiday. In a 'Chemistry Intersarsity' M.Sc. and Ph.D. students from both universities presented their results to their peers and it was agreed that this interaction should become an annual event. The visit to Potchefstroom was combined with a visit to a chemical production plant in Pretoria (the Chemical Process Technologies production facilities) where students obtained first-hand experience of typical working conditions in a chemical industry as well as the challenges faced by industry.

The division's research image was expanded by the participation and attendance of several international and national conferences. They attended the CATSA 2011 Conference, the International Organization for Chemical Sciences in Development Symposium, the 59th International



Visit of the Process Chemistry Group students to NWU in Potchefstroom; second from left, Prof. Ben Bezuidenhout, Sasol Professor in Organic Chemistry at UFS; Back; third from left; Prof. Manie Vosloo, Director, Centre for Beneficiation, NWU, and far right, Prof. Desmond Young, Sasol seconded professor to NWU.

Congress and Annual Meeting of the Society for Medicinal Plant and Natural Product Research, the 17th European Symposium on Organic Chemistry, and the Indigenous Plant Use Forum where 2 lectures (one plenary) and 15 posters were presented.

The outputs from the division were further complemented by the publishing of 13 papers and the graduation of 3 M.Sc. and Ph.D. students.

The **Physical Chemistry** division has two research groups headed by Profs Jannie Swarts and Jeanet Conradie, respectively. Dr Ernie Langner and Dr Lizette Erasmus are developing their own autonomous research topics. Dr Eleanor Fourie was appointed as the lab manager in Physical Chemistry and will develop her own research programme.

Prof. Swarts is currently C1-rated by the NRF and Prof. Conradie C3. Both held NRF research grants, while Dr Langner is the holder of a ThuThuka NRF grant. The Swarts group was also funded by THRIP and industrially by research grants from Sasol. Dr Erasmus obtained a young researcher grant from Sasol and was a recipient in the Prestigious Scholarship Programme of the rector.

The principle research question of the Swarts research group concerns synthetic and physical chemistry aspects of multi-nuclear metallocenes. The focus is on six projects, i.e., porphyrin and phthalocyanine compounds bearing metallocene substituents; titanocene, zirconocene, hafnocene, ferrocene, ruthenocene and osmocene derivatives, especially in associ-

ation with rhodium, iridium, silver, gold and copper; electrochemical, kinetic and thermal analyses of these complexes; medicinal aspects of these complexes; industrial studies on carboxylato complexes and heterogeneous catalysis of systems supported on two-dimensional supports in collaboration with Sasol.

The research in the Conradie group focuses on the characterisation of known and unknown transition metal complexes and intermediates by synthetic and computational chemistry. Transition metal porphyrin and related compounds, O,O'-chelated titanocene and titanium complexes, Beta-diketonato-carbonyl complexes of rhodium(I) and rhodium(III) and Dithizonato compounds of transition metal complexes are currently being investigated.

The Swarts and Conradie groups have international collaboration with Prof. Abhik Ghosh and Dr Katherine Hopman (Department of Chemistry and Centre for Theoretical and Computational Chemistry, University of Tromsø, Norway); Prof. Todd C. Harrop (Department of Chemistry, University of Georgia, Athens, Georgia, USA on computational chemistry); Prof. Mike Cook (University of East Anglia, Norwich, England on phthalocyanines); Prof. Manuel Aquino (Saint Francis Xavier University, Antigonish, Canada on metal carboxylates); Prof. Bill Geiger (University of Vermont, Vermont, America, on electrochemistry) and Prof. Henry Lang (Chemnitz Technical University, Chemnitz, Germany, on metal carboxylates and electrochemistry).

Dr Erasmus has collaboration with Prof. B. Gates of the University of California at Davis.

During research trips to Europe, Prof. Swarts visited Prof. Henry Lang at the Chemnitz Technical University, Germany (electrochemistry) and Prof. Hans Niemantsverdriet of the Schuit Institute of Catalyses at the Technical University, Eindhoven, the Netherlands. Dr Conradie paid two research visits to the Department of Physical Chemistry, University of Tromsø, Norway. Both staff members presented research lectures. Dr Erasmus had four months sabbatical leave and furthered her collaboration with Prof. Niemantsverdriet and established new research collaboration with Prof. Bruce Gates from the University of California at Davis. Both are heterogeneous catalysis experts.

Highlights from the Physical Chemistry Division include the lecture which Prof. Swarts gave at CATSA 2011 and he was also an invited speaker to BITS's Annual International Conference of Medicem - 2011 in Beijing, China. During 2011, the Swarts and Conradie group twice had cover page articles in high impact journals (*Dalton Transactions and European Journal of Inorganic Chemistry*). The Conradie group excelled with 11 oral contributions at international conferences and they attended the Accelrys Workshop for Materials Modelling at the Centre for High Performance Computing in Pretoria.

The **Analytical Chemistry** division consists of Prof. Walter Purcell (NRF C3-rated researcher), Dr Karel von Eschwege and Dr Rebotsamang Shago and is supported by one Ph.D. and six M.Sc. students.

The Analytical Chemistry group was involved in a number of analytical and inorganic projects which included 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 identify and quantify the different elements such as niobium, tantalum and rhodium therein. These are done in close cooperation with industrial partners such as NECSA [Advanced Metals Initiative (AMI) of the SA Government Department of Science and Technology (DST)]; funding four students to do research on the establishment of digestion methods and element quantification in plasma dissociated and natural zircon as well as tantalite minerals] and the Thuthuka Group Limited.

Microwave and acid dissolution procedures were employed while Inductively Coupled Plasma Optical Emission Spectroscopy (ICPOES), Atomic Absorption Spectroscopy (AAS) and Graphite Furnace AAS, Ultraviolet/visible and Infrared spectroscopy were used to identify and quantify the different elements, using ISO 17025 criteria as benchmark. Techniques such as X-ray diffraction and X-ray fluorescence (Department of Geology, UFS), Differential Scanning Calorimetry (DSC) and Thermal Gravimetric Analysis (TGA) were also used. A large number of samples were also analyzed for private people as well as local and national companies. The LECO micro-analyzer has been commissioned and tested and enabled the in-house analysis of C, H, N, O, and S on a number of organic and organometallic compounds.



Research visitors to UFS Chemistry: From left: Emeritus Prof. Gert Lamprecht, former head of Physical Chemistry, Prof. Jannie Swarts, current head of Physical Chemistry and Prof. Bill Geiger, a world-leading electrochemist from the University of Vermont, USA.

The group is also involved in different Inorganic Chemistry projects, i.e., kinetic and structural studies of organometallic complexes of Iridium (I) and Rhodium(I) oxidative addition reactions, kinetic and structural studies of Rhenium(V) and Osmium(VI) cyanido_complexes as well as some Cobalt and Chromium aqueous chemistry utilising the techniques described above. Other studies included 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 & Gaussian) and X-ray Crystallography are employed.

The Analytical Section is responsible for elemental analyses for the other sections in the Chemistry department as well Geology, Physics and Animal, Wildlife and Grassland Sciences.

Dr R. Shago undertook two research visits in October to Green-Diesel and Biodiesel centre companies both in Cape Town. During those visits crude glycerol from Biodiesel production was collected for purification in the economical use of glycerol research. She also received NRF (Thuthuka) funding on economical use of glycerol as part of renewable energy focus area. Tommy Theron received his M.Sc. (cum laude) and also the prize as the best M.Sc. student in the Department of Chemistry for 2010-2011.

The **Inorganic Chemistry** group focuses on Coordination Chemistry and the integrated investigation of reaction mechanisms through the use of crystallography, spectroscopy, computational chemistry and reaction kinetics. Three research sub-thrusts concentrate on the applications to medicine (radiopharmaceutical and chemotherapeutical agents), industrial reactions/homogeneous catalysis/applied process chemistry, and the development of separation technology. This research continued in the group of Prof. André Roodt (NRF B3 rated researcher), supported by Profs Deon Visser, Gideon Steyl (NRF Y2 rated; Computational Chemistry), Dr Johan Venter, 17 M.Sc. and Ph.D. students, and



Excursion on lake Luzern in Switzerland following a visit to Prof. Roger Alberto in Zurich, are Profs André Roodt (left) and Deon Visser.

four post-doctoral associates. Prof. Steyl also runs a separate research thrust related to the Institute for Ground Water Studies at the UFS, as indicated below.

The medical research focus in the Roodt group, in collaboration with the Universities of Missouri, USA (Dr Hendrik Engelbrecht), Lund, Sweden (Prof. Ola Wendt) and Zurich, Switzerland (Prof. Roger Alberto), as well as with CANSa (Prof. Connie Medlen, Pharmacology, University of Pretoria and affiliated Professor, UFS) and PETLabs Pharmaceuticals (Dr Gerdus Kemp) showed good progress. The project entitled *Development of Novel Nuclear Pharmaceuticals* from Profs Roodt and Medlen sourced another R1.3 million from PETLabs Pharmaceuticals and THRIP.

The homogeneous catalysis research in the Inorganic group is driven in close collaboration with Sasol and the Department of Science and Technology at the University of Cape Town's Centre for Excellence in Catalysis, c*change. The focus is on the conversion of simple feedstock molecules into value-added products and includes studies such as carbonylation, hydroformylation, olefin metathesis and oligomerisation. Collaboration with Sasol forms part of this thrust, and significant funding was sourced under the "Applied Process Chemistry" theme.

An industrially related project with the Nuclear Energy Corporation of South Africa (NECSA) under the Advanced Metal Initiative (AMI) for selected metal beneficiation of the South African Government's Department of Science and Technology's (DST) continued and sourced again R500 000.00 for bursaries and project expenses.

Two workshops were organised under the new initiative Nuclear Technologies in Medicine and the Biosciences (NTeMBI) from the DST and the Nuclear Energy Corporation of South Africa (NECSA). Under this programme, funding to the value of R900,000.00 was obtained to further collaboration with Prof. Roger Alberto at the University of Zurich, Switzerland. Ms Marietjie Schutte visited the group of Prof. Alberto during late 2011 under this project.

Profs. Deon Visser and André Roodt, and six students attended the XXII Congress and General Assembly of the International Union of Crystallography (IUCr) in Madrid, Spain, during August 2011. Prof. Roodt also gave a keynote lecture at the 40th Convention of the South African Chemical Institute in Johannesburg in January. Prof. Visser and four students attended ISRS2011, the 19th International Symposium on Radiopharmaceutical Sciences, Amsterdam, the Netherlands, during August/ September 2011. Dr Johan Venter attended the 19th EuCheMS International Conference on Organometallic Chemistry, Toulouse, France, 3-7 July 2011, and visited several research groups in the Netherlands. Prof. André Roodt gave an invited lecture at the African Materials Science Research conference at Victoria Falls, and he was elected chair of the Special Interest Group on Chemical Crystallography (SIG13) of the European Crystallographic Association. Prof. Deon Visser was elected as the South African representative on SIG13.

Prof. Gideon Steyl was project leader for the Water Research Commission's (WRC) 'State-of-the-Art Knowledge on Hydraulic Fracturing' which addressed the current state of knowledge on this subject as it pertains to South Africa. He collaborated with the Institute for Groundwater Studies and the Council of Geosciences of South Africa on this project. An additional research contract was awarded to him by the WRC to investigate the effect of surface water and groundwater interaction as it relates to chemical, isotopic and data gathering aspects to assist South Africa in setting up a standard in collecting vital information to manage climate change.

The research group of Prof. Steyl was expanded to include four students funded by the Inkaba yeAfrica foundation (a collaboration between South Africa and Germany) to investigate impacts related to chemistry on water and local resources. Three students of the Roodt group visited Prof. Peter Comba at the University of Heidelberg in Germany for approximately 2 months each under this programme. Two students completed their M.Sc. dissertations under Prof. Steyl's guidance during 2011 while another completed her Ph.D. with Prof. Steyl as co-supervisor.

The Roodt group contributed to more than 30 research articles in the international chemistry literature, and presented more than 30 invited lectures and conference posters at venues in Spain, the Netherlands, France and South Africa.

Additional research-related outputs

Different researchers of the Department of Chemistry participated in the Material and Nanosciences Cluster (MNS). Profs Riaan Luyt, Jannie Swarts and André Roodt are three of the four focus-area leaders and Prof. Roodt is the interim cluster coordinator. Eight students were supported from the MNS Cluster during 2010, which yielded more than 20 research papers. Marietjie Schutte and Alice Brink (Advanced Biomolecular Research Cluster) and Ellen Kuo (MNS Cluster) hold prestigious Ph.D. scholarships under this initiative.

Prof. Deon Visser was coordinator and principle negotiator for new apparatus purchases for research for the Faculty of Agricultural and Natural Sciences.

Prof. Roodt, as member of the Executive Committee and vice-president of the European Crystallographic Association (ECA), attended the Executive Meetings in Budapest, Hungary (February) and Madrid, Spain (August), also as member of the International Scientific Committee of the 27th European Crystallographic Meeting in Bergen, Norway. He also served on the international editorial board of the *Journal of Coordination Chemistry*.

Prof. Roodt was also admitted to the Academy of Sciences of South Africa.

Prof. Gideon Steyl attended a summer field school held by the University of Minnesota, Minnesota during June and assisted in teaching on aspects of chemistry and hydrogeology as it relates to South Africa. In addition he was also invited by Dr D. Risser to visit the United States Geological Survey (USGS) in Pennsylvania to investigate the impact of hydraulic fracturing on the state's water resources.

Staff matters

Prof. Marston was appointed for an additional five year period at the UFS under the Rector's Senior Professor initiative. Drs Eleanor Fourie (Physical Chemistry) and Linette Bennie (NMR Specialist) were newly appointed in the department, while Ms Annette Allemann terminated her services as professional officer in the Organic Chemistry division.

Networking

More than 20 prominent international scientists visited the department. They presented lectures and held research discussions with researchers and postgraduate students in the departmental research seminar programme, which continued very successfully with approximately 30 research presentations during 2011.

The industrial research collaboration of the Swarts group led to visits by Dr Thys Botha and Dr Philip Gibson, both from Sasol, on various industrial research issues with respect to heterogeneous catalysis. Prof. Hans Niemantsverdriet from the Schuit Institute of Catalyses at the Technical University, Eindhoven, the Netherlands and Prof. W.E. Geiger from the Dept of Chemistry at the University of Vermont, USA paid a research visit to Prof. Swarts.

Community service

Prof. Jannie Swarts and Ms Ina du Plessis organised the 16th successive science quiz competition, MINQUIZ, one of the faculty's five community service flagships and jointly sponsored by the UFS, Mintek and the Physical Chemistry division. A group of some 200 pupils, comprising the three top physical science learners of each secondary school in the Free State Province, visited the Main Campus during May 2011 where they were exposed to information on career opportunities in Chemistry, Physics and Geology. Six winning



Happy faces following the installation of the advanced Stopped Flow spectrometer for studying very fast reactions, are, from left: Renier Koen (M.Sc. student) and Tinus Viljoen and Maryke Steyn (Ph.D. students).

schools in two categories were awarded financial prizes to enhance their school science laboratories.

Prof. Conradie continued to organise and handle the ILEARN programme at the UFS for Physical Chemistry which provides question and answer quizzes for computer-guided First Year Physical Chemistry revision. She also chairs the Interest group for High Performance Computing at the University of the Free State and she organized a LINUX workshop hosted by the High Performance Computing at the University of the Free State. Fifty students from over the RSA [UCT, University of KwaZulu-Natal (Westville Campus), University of Stellenbosch, Durban University of Technology (DUT), Walter Sisulu University, Groote Schuur Hospital and the UFS] attended the course.

Dr Johan Venter, Dr Ernie Langner and Prof. Deon Visser 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 further create awareness for Chemistry and to inspire primary and secondary school learners and teachers for the subject. This show was also presented as part of the pilot study of the Rector's first year teaching initiative across all subject disciplines, UFS 101. Prof. Walter Purcell and Dr Johan Venter contributed to the Universitas Primary School Leadership programme during Jan 2011.

Dr Langner was secretary for all meetings for the HPC group during 2011. During the winter recess, Dr Langner co-hosted a



Farewell to Prof. Neil Viljoen (front right), instrumental in overseeing the completion of the Chemistry Building. Front left: Prof André Roodt (HOD, Chemistry); Back, from left: Mr Nico Janse van Rensburg and Mr Pieter Esterhuizen, Profs Ben Bezuidenhout, Walter Purcell and Jannie Swarts.

Science Adventure Camp for learners. A group of top learners from the Free State and Northern Cape spent two hours in the department and visited the Chemistry research labs.

Prof. Steyl was involved in a direct community service project and he was awarded two contracts from the regional water supplier (BloemWater) to investigate groundwater contamination in the municipal (Mangaung and Kopanong) districts.

Most lecturers were involved in continuous career guidance and laboratory demonstration sessions to individuals and school group learners. Colleagues at both campuses contributed to the university's open and Expo days.

QwaQwa campus

Overview

The Department of Chemistry at the QwaQwa campus has again performed well in terms of research activities in 2011. Several projects were completed and a number of research collaborations, both nationally and internationally, were continued during the year. Prof Riaan Luyt spent two days at the University of Stellenbosch lecturing to their honours students. Profs Luyt and Albert van Reenen also co-supervised two Master's degree students who are registered at the UFS. The polymer research group acquired a new scanning electron microscope (SEM), which is used to investigate the morphologies of the different blends,

composites, and nanocomposites prepared by the students. A new granulator and pulveriser was also purchased.

A highlight the department had, as 2011 was the international year of Chemistry, Sasol's Inzalo Foundation invited the third year students to apply for the honours fellowship programme. Ten prospective honours students were identified for fellowships for 2012 honours studies.

Departmental activities and achievements

The **Polymer Science** research area is headed by Prof. Riaan Luyt at the QwaQwa Campus. He is C1-rated by the NRF, and his group focuses on physical properties of polymer/wax mixtures, polymer/natural fibre composites and polymer nano-composites.

The QwaQwa division of the Department of Chemistry published 14 research articles and made more than 20 conference contributions. Five masters' and eight doctoral students were registered for Chemistry on the QwaQwa Campus in 2011 and there was one post-doctoral fellow. Six M.Sc. and two Ph.D. students graduated during this period.

The group at QwaQwa has collaboration with: the Vinča Institute of Nuclear Physics, Belgrade, Serbia (Dr Vladimir Djoković); Slovak Academy of Sciences, Bratislava, Slovakia (Dr Igor Krupa); Dr Krupa was involved in the M.Sc. project of Mr M.J. Mochane; University of Modena and Reggio Emilia, Modena, Italy (Prof. Massimo Messori) on a project entitled *In situ generation of fillers within polymer matrices: an innovative way to reinforced plastics*. This is an official,

NRF funded collaboration. A student of Prof. Messori, Davide Morselli, spent 30 days in the QwaQwa laboratories during November/December 2011. A QwaQwa student, Thabang Mokhothu, spent 30 days in Modena during May/June 2011 and Prof. Luyt visited Prof. Messori's group for 10 days during July 2011; University of Palermo, Italy (Prof. Eugenio Caponetti) on a project entitled *Morphology and properties of TiO₂ and ZrO₂ nanoparticles reinforced polymethylmethacrylate*. Prof. Luyt spent a week in Palermo during July 2011, and one of the QwaQwa students, Tshwafo Motaung, visited Palermo for two 10-day periods during April and December 2011; Institute of Polymer Research (IPF) in Dresden, Germany (Dr Jürgen Pionteck) on a project entitled *Electrically and thermally conductive polymer nano-composites: Improved dispersion of nano-structured graphite in polyolefins by chemical modification*. Prof. Luyt spent two weeks in Dresden during August 2011, while a Ph.D. student, Shale Sefadi, spent one month there during November/December 2011. Dr Pionteck and his student, Francesco Piana, visited QwaQwa for 20 days during November 2011; Prof. Walter Focke at the University of Pretoria on a project entitled *Graphite-filled polyethylene/wax phase-change blends for energy storage applications*; Prof. Albert van Reenen at the University of Stellenbosch on two projects entitled *Wood-polymer composites utilizing degraded polyolefins as compatibilizers* and *The influence of β-nucleation on the morphology and properties of a high-impact PP copolymer*. Two QwaQwa M.Sc. students are co-supervised on these projects.

Additional research-related outputs

Prof. Luyt is one of the focus area leaders within the UFS Research Cluster 5, Material and Nanosciences.

Staff matters

Ms M.A. Malimabe and Ms M.A. Jordaan completed a short course: SPALHE (assessor training) offered by CHESD. A new Professional Officer, Ms C.E. Clarke, was appointed to take responsibility of the SEM.



Setting up a sample on the newly acquired Scanning Electron Microscope (SEM) are prof. Riaan Luyt and M.Sc. student Motshabi Sibeko.

Networking

A Number of prominent national and international scientists visited the department at the QwaQwa campus. They presented lectures and held research discussions with students and also discussed collaborative research. There was also close collaboration with the Polymer Institute at the University of Stellenbosch in terms of honours and masters training. One staff member from this institute (Prof. Mallon) visited the QwaQwa campus to present honours lectures, and the student travelled to Stellenbosch to be lectured by Profs. Klumperman and Van Reenen.



Prof R. Luyt with Italian visitors to QwaQwa Chemistry. Left to right: Marian Valentin, Dr Pionteck, Francesco Piana, Prof. Martino, Prof. Luyt and Prof. Caponetti .



QwaQwa colleagues in the laboratory: From left: Messrs Tsietsi Tsoetsi, Mfiso Mgomezulu, Twafo Motaung and Rantooa Moji.



Research Outputs

Department of Chemistry



Research articles

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Pretorius, C., Venter, J.A. & Roodt, A. 2011. *Vanadium(III) and Vanadium(IV) complexes with O,O and O,N bidentate ligands.* Poster presented at the 40th South African Chemical Institute (SACI) Convention and the 3rd Federation of African Societies of Chemistry (FASC) Congress, University of the Witwatersrand, Johannesburg, South Africa. 16-21 January.

Purcell, W. & Nel, J.T. 2011. *Acid removal of naturally occurring radioactive material from tantalite F. Koko.* Oral presented at the New Metals Development Network Conference (ZrTa2011), Mount Grace Country House & Spa, Magaliesburg, South Africa. 12-14 October.

Romer, R., Underwood, A.P., Van der Westhuizen, J.H., Senekal, N.D., Bonnet, S.L., Duer, M.J. & Reid, D.G. 2011. *Fingerprinting leather*

tanning processes using simple non-invasive solid state NMR. Poster presented at the International Organisation for Chemical Sciences in Development (IOCD) Symposium: African Plants – Unique Sources of Drugs, Agrochemicals, Cosmetics and Functional Foods, University of the Western Cape, Cape Town, South Africa. 13-15 January.

Roodt, A. 2011. *Molecular Materials as Radiopharmaceuticals for Imaging and Therapy*. Invited lecture presented at the 6th Africa Materials Research Society Biennial Conference (6thIC-ARMS), Victoria Falls, Zimbabwe. 11-16 December.

Saladino, M.D., Motaung, T.E., Luyt, A.S., Chillura Martino, D. & Caponetti, E. 2011. *Preparation and characterization of polymethylmetacrilate and nanoSiO₂, TiO₂ and ZrO₂ composites*. Lecture presented at the Convegno Congiunto delle Sezioni Calabria e Sicilia 2011, Messina, Italy. 1-2 December.

Schutte, M., Visser, H.G. & Roodt, A. 2011. *Rhenium(I) Tricarbonyl System – Novel Ligand Systems, Kinetic Studies and Crystallographic Data*. Oral presentation delivered at the 40th South African Chemical Institute (SACI) Convention and the 3rd Federation of African Societies of Chemistry (FASC) Congress, University of the Witwatersrand, Johannesburg, South Africa. 16-21 January.

Schutte, M., Visser, H.G. & Roodt, A. 2011. *A Kinetic and Crystallographic Investigation and Correlation of the Aqua Substitution Kinetics of Re(I) Tricarbonyl Complexes*. Poster presented at the 19th International Symposium on Radiopharmaceutical Sciences (ISRS 2011), Vrije Universiteit, Amsterdam, the Netherlands. 28 August – 2 September.

Schutte, M., Visser, H.G. & Roodt, A. 2011. *Coordinated ligand effects in the substitution kinetics of fac-[Re(CO)₃]⁺ complexes* XXII. Poster presented at the XXII Congress and General Assembly of the International Union of Crystallographers (IUCr 2011), Madrid, Spain. 22-30 August.

Sefadi, J.S. & Luyt, A.S. 2011. *Comparison of EVA/EFB composites containing two different types of EVA copolymer*. Poster presented at the 11th International Conference on Frontiers of Polymers and Advanced Materials (ICFPAM 2011), University of Pretoria, Pretoria, South Africa. 22-27 May.

Steyn, M., Roodt, A. & Visser, H.G. 2011. *A Study of the Coordinative Properties of Mixed Halido and N- & O-Donating Multidentate Ligand Complexes of Zirconium(IV)*. Poster presented at the 40th South African Chemical Institute (SACI) Convention and the 3rd Federation of African Societies of Chemistry (FASC) Congress, University of the Witwatersrand, Johannesburg, South Africa. 16-21 January.

Steyn, M., Visser, H.G. & Roodt, A. 2011. *A Study on the Chelation Preferences of Zirconium(IV) with N,O-Donor Multidentate Ligands*. Lecture presented at the New Metals Development Network Conference (ZrTa2011), Mount Grace Country House & Spa, Magaliesburg, South Africa. 12-14 October.

Stuurman-Molefe, N.F. & Conradie, J. 2011. *Synthesis, electrochemistry and computational calculations (DFT) of gamma substituted beta-diketones*. Lecture presented at CATSA2011: Annual Conference of the Catalysis Society of South Africa (CATSA), Misty Hills Country Hotel, Muldersdrift, Gauteng, South Africa. 13-16 November.

Swarts, J.C. 2011. *The Cytotoxicity of Ferrocene-Containing Complexes are Governed by Structural and Electrochemical Properties*. Invited lecture presented at the BIT's 2nd Annual International Conference of Medichem 2011: Master Drug Discovery Chemistry, Beijing International Convention Center, China. 9-11 August.

Van der Merwe, K.A., Visser, H.G. & Venter J.A. 2011. *Kinetic and Structural Investigation of Numerous Metal Diphosphonate Complexes*. Poster presented at the 40th South African Chemical Institute (SACI) Convention and the 3rd Federation of African Societies of Chemistry (FASC) Congress, University of the Witwatersrand, Johannesburg, South Africa. 16-21 January.

Van der Westhuizen, J.H., Bonnet, S.L., Zietsman, P.C., Ackerman, L.G.J., Frank, H. & Allemann, A. 2011. *[E]-Asarone, a main constituent in the essential oil from Nolleteria ciliaris*. Poster presented at the International Organisation for Chemical Sciences in Development (IOCD) Symposium: African Plants – Unique Sources of Drugs, Agrochemicals, Cosmetics and Functional Foods, University of the Western Cape, Cape Town, South Africa. 13-15 January.

Van Tonder, J., Enow, C. & Bezuidenhoudt, B.C.B. 2011. *Catalytic alkene epoxidation utilizing ruthenium phthalocyanines*. Poster presented at CATSA2011: Annual Conference of the Catalysis Society of South Africa (CATSA), Misty Hills Country Hotel, Muldersdrift, Gauteng, South Africa. 13-16 November.

Venter, G.J.S., Steyl, G. & Roodt, A. 2011. *Enaminoketones: Influencing Rh(I) Dicarbonyl Complexes With Halogen Substituents*. Poster presented at the XXII Congress and General Assembly of the International Union of Crystallographers (IUCr 2011), Madrid, Spain. 22-30 August.

Venter, G.J.S., Steyl, G. & Roodt, A. 2011. *Enaminoketones: Influence of Substituents on 4-(phenylamino)pent-3-en-2-one (PhonyH) and its Associated Rh(I) Carbonyl complexes*. Poster presented at the 40th South African Chemical Institute (SACI) Convention and the 3rd Federation of African Societies of Chemistry (FASC) Congress, University of the Witwatersrand, Johannesburg, South Africa. 16-21 January.

Venter, J.A. & Purcell, W. 2011. *Applying the Tolman principle to predict the outcome of oxidative addition reactions of related rhodium complexes*. Lecture presented at CATSA2011: Annual Conference of the Catalysis Society of South Africa (CATSA), Misty Hills Country Hotel, Muldersdrift, Gauteng, South Africa. 13-16 November.

Venter, J.A. & Purcell, W. 2011. *Solvent catalysis in the migratory CO insertion of [Rh(cupf)(CO)(CH₃)(I)(PX₃)]*. Poster presented at the XIX EuCheMS International Conference on Organometallic Chemistry (EuCOMC), Institut National Polytechnique, Toulouse, France. 3-7 July.

Viljoen, J.A., Visser, H.G. & Roodt, A. 2011. *A study of the coordinative properties of mixed halido and N- & O-donating bidentate ligand complexes of hafnium(IV)*. Lecture presented at the New Metals Development Network Conference (ZrTa2011), Mount Grace Country House & Spa, Magaliesburg, South Africa. 12-14 October.

Viljoen, J.A., Visser, H.G. & Roodt, A. 2011. *Crystallographic and Kinetic Studies of Octa Coordinated Hafnium(IV) Complexes*. Poster presented at the XXII Congress and General Assembly of the International Union of Crystallographers (IUCr 2011), Madrid, Spain. 22-30 August.

Viljoen, J.A., Visser, H.G. & Roodt, A. 2011. *Synthesis and crystal structures of hafnium complexes containing O,O'- and N,O-diketonate ligands*. Poster presented at the 40th South African Chemical Institute (SACI) Convention and the 3rd Federation of African Societies of Chemistry (FASC) Congress, University of the Witwatersrand, Johannesburg, South Africa. 16-21 January.

Von Eschwege, K.G. & Conradie, J. 2011. *Redox Potentials of Ligands and Complexes - a DFT Approach*. Lecture presented at the Centre for High Performance Computing National Conference (CHPC 2011): Better HPC and data-curation adoption, better research and industrial development, CSIR International Convention Centre, Pretoria, South Africa. 7-9 December.

Von Eschwege, K.G., Conradie, J. & Kuhn, A. 2011. *A novel way to quantify the Electronic Potential of Ligand Substituents*. Poster presented at the XIX EuCheMS International Conference on Organometallic Chemistry (EuCOMC), Institut National Polytechnique, Toulouse, France. 3-7 July.

Warsink, S. 2011. *Palladium Complexes bearing N-Donor Functionalized NHC Ligands; application in transfer semi-*

hydrogenation and mechanistic investigations. Lecture presented at CATSA2011: Annual Conference of the Catalysis Society of South Africa (CATSA), Misty Hills Country Hotel, Muldersdrift, Gauteng, South Africa. 13-16 November.

Young, C.A., Bezuidenhout, B.C.B. & Roodt, A. 2011. *Bipyridine based bridging ligands as building blocks for Palladium(II) and Gold(III) catalysts.* Poster presented at the 40th South African Chemical Institute (SACI) Convention and the 3rd Federation of African Societies

of Chemistry (FASC) Congress, University of the Witwatersrand, Johannesburg, South Africa. 16-21 January.

Young, C.A., Bezuidenhout, B.C.B. & Roodt, A. 2011. *Planar organic bridging ligands for Palladium(II) carbon-carbon bond formation catalysts.* Poster presented at CATSA2011: Annual Conference of the Catalysis Society of South Africa (CATSA), Misty Hills Country Hotel, Muldersdrift, Gauteng, South Africa. 13-16 November.

Contact details

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Academic staff

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Senior Professor: Prof. Andrew Marston

Professors: Profs Jannie Swarts, Ben Bezuidenhout

Affiliated Professors: Profs Daneel Ferreira, Louis Ackerman, Connie Medlen, Thys Botha

Associate Professors: Profs Walter Purcell, Robert Dennis, Jan van der Westhuizen, Jeanet Conradie, Deon Visser, Gideon Steyl

Affiliated Associate Professor: Prof. Fanie Otto

Senior Lecturers: Dr Susan Bonnet

Lecturers: Drs Karel von Eschwege, Johan Venter, Ernie Langner, Lizette Erasmus, Rebotsamang Shago, Eleanor Fourie, Linette Bennie and Ms Anke Wilhelm-Mouton

Subject Coordinators: Dr Marietjie Versteeg (Programme director: Main and South Campus), Ms Rina Meintjes

QwaQwa Campus

Professor: Prof. Riaan Luyt

Lecturers: Mr Tsietsi Tsoetsi, Mss Moipone Mokoena, Maryam Jordaan, Mpondi Molefe

Junior Lecturer: Mr Rantooa Moji

“Students who have an IT degree are in great demand at companies. They can also either start their own businesses or carry on with postgraduate studies. The department also focuses on preparing school children for IT studies, which includes participation in the National Computer Olympiad.”

– Dr Anelize van Biljon

Department of **Computer Science and Informatics**

Overview

The Department of Computer Science and Informatics focuses on IT learning and teaching, research and community service, which are reflected in the courses offered in the undergraduate and postgraduate programmes.

The department presented two major undergraduate learning programmes, viz. B.Sc.(IT), and B.Com.(IT). These programmes deliver highly trained information technologists with skills in programming, Internet programming, database and system analysis and design, as well as software engineering, network management and human-computer interaction, supported by a background of natural science subjects.

The Honours degree consists of various modules, of which one is a research module, and a project which includes the development of a system. The Master's degree consists of a research dissertation only, or can be structured with a smaller dissertation. The department also offers a doctoral

degree. Special devices are acquired as necessary to assist the postgraduate students in their studies.

Our department is responsible for the Computer Literacy module for all new students as well as students in the extended programme and the University Preparation Programme on South Campus.

Research focus is on Human-Computer Interaction (prof. Pieter Bignaut and dr Lizette de Wet), Data Warehousing (prof. Theo McDonald and dr Eduan Kotzé) and E-learning (dr Liezel Nel).

External funds are generated by using our modern eye-tracking equipment and the Centre of Excellence (COE). The projects undertaken by the COE are funded by an industrial partner. These projects are research-related and can be implemented to provide assistance to, as well as the development of postgraduate students. New eye-tracking equipment was acquired to enable the department to do



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Dr Anelize van Biljon

Dr Anelize van Biljon is currently a committee member of SAMO (South African Mathematics Olympiad) and IMAS (an international mathematics olympiad society). She is committed to community service, which includes the preparation of learners for Mathematics Olympiads on provincial, national and international level.

usability studies on a highly competitive level. Eye-trackers from a Swedish company were also tested for accuracy.

Quite a number of our staff members on all campuses are involved in postgraduate studies. Dr T. Beelders received her Ph.D. in 2011.

Activities and achievements

The department hosts an IT Talk every Friday of the term. During these sessions staff members have the opportunity to report on their research development and postgraduate students may discuss their research topics.

Staff members presented a number of short courses on various topics. One of these courses was presented to a Bloemfontein company. A short course on Android programming, the operating system for some cell phones, was also presented.

Our department's extension on the QwaQwa campus received the award for the Best Departmental Contribution towards Teaching and Learning, as the department won five awards out of a possible seven. The following members received individual awards: Messrs F. Mudavanhu, R. Alfonsi, B. Sebastian and Ms R. Wario.

During 2011 staff members attended various national and international conferences and congresses where they delivered papers. A complete list can be found under the heading Research Outputs.

Prof. P.J. Blignaut paid a visit to the Lund University in Sweden for eye-tracking research purposes and delivered a paper at the 16th European Conference on Eye Movement 2011 (ECEM) in France.



During an academic visit to QwaQwa Campus: Front: Ms Ruth Wario, Dr Anelize van Biljon. Second row: Mr Fani Radebe, Mr Benedict Sebastian, Mr Ben Mase. Back: Mr Robert Alfonsi, Mr Teboho Lesesa, Mr Gavin Dollman.

Prof. T. McDonald attended the European Conference of Information Systems (ECIS) in Helsinki.

Messrs Wynand Nel and Jaco Marais attended an ITWeb Security Summit 2011 in Sandton, South Africa.

Ms E. Dednam and Dr E. Kotze attended the Southern African Computer Lecturer's Association 2011 conference (SACLA) in Durban.

Ms Ruth Wario and Mr F. Mudavanhu delivered papers at the conference of Higher Education Learning and Teaching



The department offered a short course in the Android Operating System. Mr Stefan Coetzee, in front of the screen, was the presenter. Most of the participants were lecturers and students in IT.

Association in Southern Africa (HELTASA), Nelson Mandela Metropolitan University.

Mr R. Alfonsi delivered a paper at the Higher Education Data Sharing (HEDS) conference in Pretoria.

Prof. P. Blignaut and two of our postgraduate students, Ms T.S. Nkai and Mr G. Dollman, attended the South African Institute for Computer Scientists and Information Technologists 2011 conference (SAICSIT) in Cape Town and presented posters.

Two of our postgraduate students, Messrs F. Greeff and L. Potgieter attended the South African Symposium for Science and Arts and delivered papers.

Staff members of the department received various awards during 2011. Dr Liezel Nel was awarded the Vice-Chancellor's award for her outstanding contribution to teaching and learning at the UFS. Dr Nel also received a HELTASA National Excellence in Teaching and Learning Award, of which only five were awarded. Mr F. Mudavanhu received the award for Best E-learning presentation at the Information and Communications Technology Showcase Day (ICT), as well as the NAS Honorary Award in Teaching and Learning.

Networking

Two of our second year students, Messrs F. van Greunen and R. Khavhagali, were selected to serve as Google Student Ambassadors at the UFS.

Messrs R. Shields and J. Visagie were selected to visit Shenzhen, China, where they learned more about the culture and best practices in international information communications technology. These students were selected for their outstanding academic performance. The project was an initiative of the Independent Development Trust in collaboration with the Huawei Overseas Student Project in China.

An initiative from CSI students led to the founding of ITSA, an Information Technology Student Association. A number of events have been organised successfully. One of the highlights was the presentation on *e-commerce and Google AdWords* by Agata Pilacinska-Jakubowska from Poland.

Mr F. Mudavanhu received the award for Best E-learning presentation at the Information and Communications Technology Showcase Day (ICT) at the UFS.



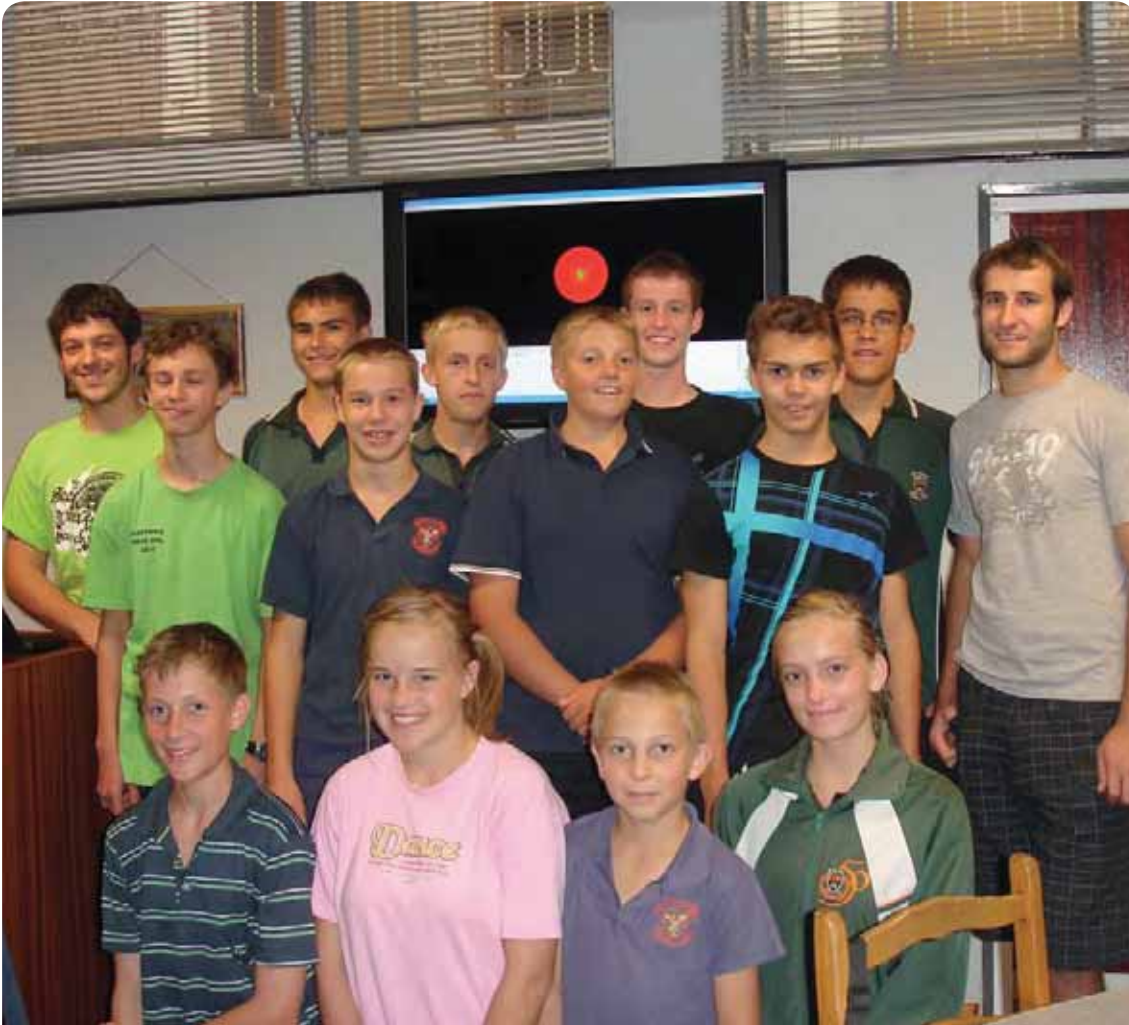


Tasha Bergson-Michelson (from Google), Dr Anelize van Biljon and Fiona Lee (from Google), during their presentation of Google Search methods localized for Africa, in one of the laboratories in the department.

Fiona Lee and Tasha Bergson-Michelson, during their presentation of Google Search methods localized for Africa, in one of the laboratories in the department.



Mr Rofhiwa Khavhagali and Mr Renier Shields



The advanced Python Project group consisting of learners from Bloemfontein schools, with the students responsible for the classes.

Community service

Community service is regarded a high priority in the department and is used also as a marketing opportunity to prospective students and the general public. Students from the service learning module of the department gave computer training to a group of unemployed individuals in collaboration with MUCPP. The classes were presented at the South Campus during the second semester.

The department runs a programming training course for two groups of learners, from grade 7 upwards, from Bloemfontein schools. These learners receive training in Python, static web page design, C# and an introduction in robotics. Three of the learners in grade 10 were in positions 11, 12 and 13, respectively, in the National Computer Olympiad.

Dr Anelize van Biljon was involved in preparing Grade 7, 9 and 10-learners for taking part in Mathematics Olympiads, such as Nautilus, the South African Mathematics Olympiad (SAMO), Po Leung Kuk (PLK) in Hong Kong and International

Mathematics Competitions (IMC) in Indonesia and Nepal. She also serves on the senior national committee of SAMO.

The Monyetla Project used the computer lab at the South Campus on Saturdays to teach Computer Applications Technology (CAT) to school children.

A few schools received older working computers not in use in the department anymore.

Facilities

The department has computer laboratories on all three UFS campuses, where our students do practical assignments.

Staff matters

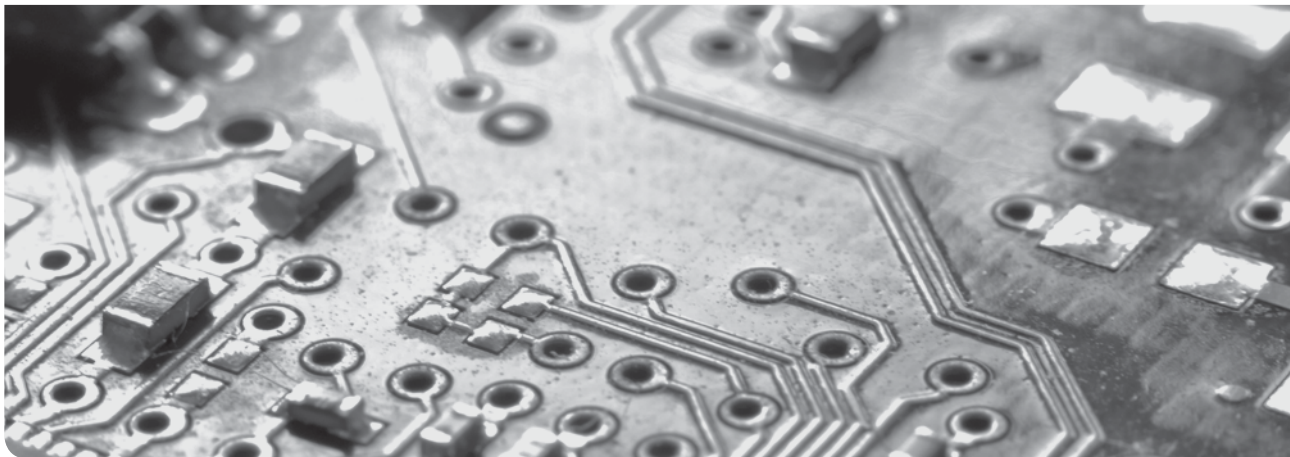
Mr N. van Zyl left the department at the end of 2011.



Some schools received older working computers not in use in the department anymore, to be used in the schools by the learners. Front: Ms Lauren Knoesen (Karel du Toit School for the Deaf). Back: Mr Jan Ackerman (Onze Rust Primary School), Mr L.B. Mlamleli (Botlehadi Primary School), Dr Anelize van Biljon, Mr Pieter Viljoen (Martie du Plessis School for the Disabled, Mr Roy Doubell (Hoërskool Sand du Plessis).

Research **Outputs**

Department of Computer Science and Informatics



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Research articles

Beelders, T.R., Blignaut, P.J. & Greeff, F. 2011. Oogvolging en spraakherkenning in plaas van 'n rekenaaruis. *Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 30(1): 1.

Messerschmidt, J.J.E. & Messerschmidt, H.J. 2011. Voorwaardelike konstruksies met indien soos gebruik in wetenskaplike tydskrifte (Deel 1: Basiese Konstruksies). *Tydskrif vir Geesteswetenskappe* 51(2): 124-141.

Nel, E. & Ndeya-Ndereya, C.N. 2011. Enhancing online social presence: The role of communication. *Progressio* 33(1): 116-137.

Potgieter, L. & De Wet, L. 2011. Die assessering van die impak van virtuele opvoedkundige koppelvlak-agente op volwassenes met beperkte of geen rekenaarvaardighede. *Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 30(1): 1.

Chapter in book

Beelders, T.R. & Blignaut, P.J. 2011. The usability of speech and eye gaze as a multimodal interface for a word processor. In *Speech Technologies*, edited by I. Ipsic, Croatia, Rijeka: InTech. pp. 385-404.

Conference contributions

Alfonsi, R.M. & Naidoo, M. 2011. *Improving teaching and learning through the sharing of best practices: The case of the University of the Free State, QwaQwa campus.* Paper delivered at the Higher Education Development and Support (HEDS'11) Higher Education and Practitioners Conference, Tshwane University of Technology, Pretoria, South Africa. 24-26 October.

Berg, L., Beelders, T.R. & Van Zyl, J.H. 2011. *Analysis of eye-tracking green recall texts.* Paper delivered at the 5th International Business

Conference (IBC2011), The Grand Mauritian Luxury Resort and Spa, Mauritius. 26-30 September.

Bergh, L., Beelders, T.R. & Van Zyl, J.H. 2011. *Cognitive recall, reference points and negative prioritization in multimodal texts*. Paper delivered at the Annual Conference of the German Linguistic Society (DGfS): Beyond Semantics – Corpus-based investigations of pragmatic and discourse phenomena, Göttingen, Germany. 23-25 February. (Abstract only).

Bergh, L., Beelders, T.R. & Van Den Berg, R.H. 2011. *Reference points, cognitive affordance and multimodal metaphors, analysing multimodal discourse*. Paper delivered at the Systematic Functional Linguistic (SFL) Conference: Analysing Multimodal Discourse (AMD) – SFL meets Pragmatics, Loughborough, UK. 1-3 September. (Abstract only).

Blignaut, P.J. 2011. *A tool to measure the accuracy and precision of eye-trackers*. Paper delivered at the 16th European Conference on Eye Movements (ECEM 2011), Marseilles, France. 21-25 August.

Dollman, G.J., De Wet, L. & Beelders, T.R. 2011. *The effects of access to technology on the usability of a BCI*. Poster presented at the South African Institute for Computer Scientists and Information Technologists (SAICSIT) 2011 Conference, Waterfront, Cape Town, South Africa. 3-5 October.

Greeff, F., De Wet, L. & Nel, W. 2011. *Die kombinerings van fisiologiese en tradisionele gebruikerstoestegnieke om sosiale netwerke op verskeie tegnologiese platforme te evalueer*. Paper delivered at the "Suid Afrikaanse Akademie vir Wetenskap en Kuns Studentesimposium", Pretoria, South Africa. 27-28 October.

Kotze, J.E. & McDonald, T. 2011. *Effectiveness of a business intelligence solution to manage the antiretroviral therapy programme*. Proceedings of the 4th International Conference on Health Informatics (HEALTHINF 2011), Rome, Italy. 26-29 January. pp. 543-546.

Nkalai, T.S. & De Wet, L. 2011. *Comparing the sensor glove and eye-tracker as alternatives to measure computer anxiety*. Poster presented at the South African Institute for Computer Scientists and Information Technologists (SAICSIT) 2011 Conference, Waterfront, Cape Town, South Africa. 3-5 October.

Potgieter, L. & De Wet, L. 2011. *Evaluering van die impak van bi-nurale ritmes op gebruikersprestasies met behulp van 'n breinrekenaar-koppelvlak*. Paper delivered at the "Suid- Afrikaanse Akademie vir Wetenskap en Kuns Studentesimposium", Pretoria, South Africa. 27-28 October.

Shih, T. & Blignaut, P.J. 2011. *The influence of gender and internet experience on the acceptability of smell as interaction modality*. Proceedings of the South African Institute for Computer Scientists and Information Technologists (SAICSIT) 2011 Conference, Waterfront, Cape Town, South Africa. 3-5 October. pp. 205-214.

Wario, R.D. & McDonald, T. 2011. *An investigation into the use of the internet and e-commerce in Kenya*. Proceedings of the International Association for the Development of the Information Society (IADIS) International Conference: Internet Technologies & Society (ITS 2011), Shanghai, China. 8-10 December. pp. 241-245.

Contact details

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Affiliated Professor: Hans Messerschmidt

Senior Lecturers: Drs Anelize van Biljon, Lizette de Wet, Liezel Nel, Eduan Kotze

Lecturers: Dr Tanya Beelders, Ms Engela Dednam, Messrs Andries Burger, Wynand Nel, Casper Wessels, Ruhan Ferreira

Junior Lecturers: Ms Marina Botha, Messrs Rouxan Fouché, Jaco Marais

Administrative Officers: Mss Erna Dippenaar, Suezette Opperman

Technical Officer: Mr Brian Campbell

Assistant, Special Equipment: Mr Daniel Wium

COE Assistant: Ms Marietjie Gerber

QwaQwa Campus:

Lecturer: Mr Robert Alfonsi, Ms Ruth Wario

Junior Lecturers: Messrs Ben Mase, Frederick Mudavanhu, Fani Radebe, Benedict Sebastian, Gavin Dollman, Teboho Lesesa

Administrative Officers: Mss Maletsatsi Bless, Palesa Rampeta

Technical Officer: Mr Peter Mosikili

South Campus:

Lecturer: Mr Ronnie Brown

Administrative Officer: Ms Suretha de Klerk

Technical Officer: Mr Nico van Zyl

“The department of Consumer Science strives to motivate and lead postgraduate students to undertake research projects to strengthen the scientific basis from which the consumer can benefit in the field of textiles and foods.”

– Prof. Hester Steyn

Department of Consumer Science

Overview

The department of Consumer Science has been reinstated as an individual department from January 2009. 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 field of textiles and foods.

The department of Consumer Science offer three undergraduate programmes and three postgraduate degrees. In the B. Consumer Science (General) programme 130 students were registered in 2011, 19 students in the B Consumer Science (Foods) and 4 in the B. Sc. Home Economics (Foods). Nine students were registered for the B.Sc. Honours in Home Economics, 7 in M.Sc. in Home Economics and 3 for a Ph.D.

Activities and achievements

Prof. H.J.H. Steyn, Ms J. Vermaas and Ms N. van Heerden (Ph.D student) attended the 10th International SAAFECS Conference in Pretoria 7th-11th March 2011. Ms Van Heerden and Prof. Steyn delivered a presentation on *The influence of laundering with Catholyte on the tensile strength, bending length, wrinkle recovery and dimensional stability of Polyamide 6,6 fabric.*

Ms M. Semuli (M.Sc Home Economics student), Ms C. Bothma (Department of Biotechnology) and Prof. H.J.H. Steyn presented a poster on *Agave americana flower buds as food substance in human diet* at the 10th International SAAFECS Conference in Pretoria 7th-11th March 2011.

Ms N. van Heerden (Ph.D student) and Prof. H.J.H Steyn attended the 5th International Consumer Sciences Research Conference on Consumer Behaviour for a Sustainable Future in Bonn, Germany from the 18th- 20th July 2011 and delivered an oral presentation on the *Evaluation of the soil removal efficiency of Catholyte on Polyamide 6,6 fabric.*

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Prof. Hester Steyn

Prof. Hester Steyn presents courses in textiles, pattern design, housing and quality management in textiles and clothing.

M.M. Mmopelwa (M.Sc student) and Prof. H.J.H. Steyn attended the 5th IFHE- Africa regional Conference hosted by the Department of Family and Consumer Sciences, University of Botswana, Gaborone, Botswana from the 26th-28th September 2011 and presented *An evaluation of food labels and students' interpretation and use of food labels*.

Prof. H.J.H. Steyn presented *Scaling up clean cooking technologies* at the 5th IFHE- Africa regional conference hosted by the Department of Family and Consumer Sciences, University of Botswana, Gaborone, Botswana from the 26th-28th September 2011 with Christiane Pakula and Rainer Stamminger from the University of Bonn.

Prof. H.J.H. Steyn and Ms J.S. van Zyl are members of the programme committee Household Technology and Sustainability of the International Federation for Home Economics. Prof. Steyn attended the annual meeting of the committee on the 21st July, held at the University of Bonn in Germany.

Research

Research done in the department of Consumer Science in 2011 are mainly projects that investigate the possibility of using electrochemically chemically activated water (anolyte and catholyte) as an alternative detergent and the effect

of the treatment on the properties of the textile fibres on natural textile fibres and fabrics available in Southern Africa. Projects on *Gonometa Postica* silk and *Alpaca Huycaya* fibres are currently in progress.

Community service

The department of Consumer Science continued with the Mamello community development programme in the "old milkshed" on the experimental farm of the University of the Free State. In the first semester the final year students under the supervision of Ms Ismari van der Merwe worked with a group of unemployed members from the community. They identified the needs of the group and planned with the group a skills development plan for 2011. The students and the community group identified income generating skills as one of their major needs. They planned a series of lecture demonstrations and workshops to enable the community group members to do quilting, hand embroidering, crocheting, knitting, ribbon weaving and patchwork.

In the second semester Ms Doretha Jacobs continued with the Mamello group to improve their sewing skills. They learned to sew chef jackets and made jackets that are sold to students to wear in the Foods laboratory.



Mariël Bruytenbach, 4th year student demonstrates a sewing technique to one of the members of the Mamello needlework project.



Ms N. van Heerden a research assistant, busy with a demonstration for the students of the Francistown college of Education, Botswana.



Lecturers of the Francistown College of Education, Botswana with Prof. H.J.H. Steyn of the department of Consumer Science.

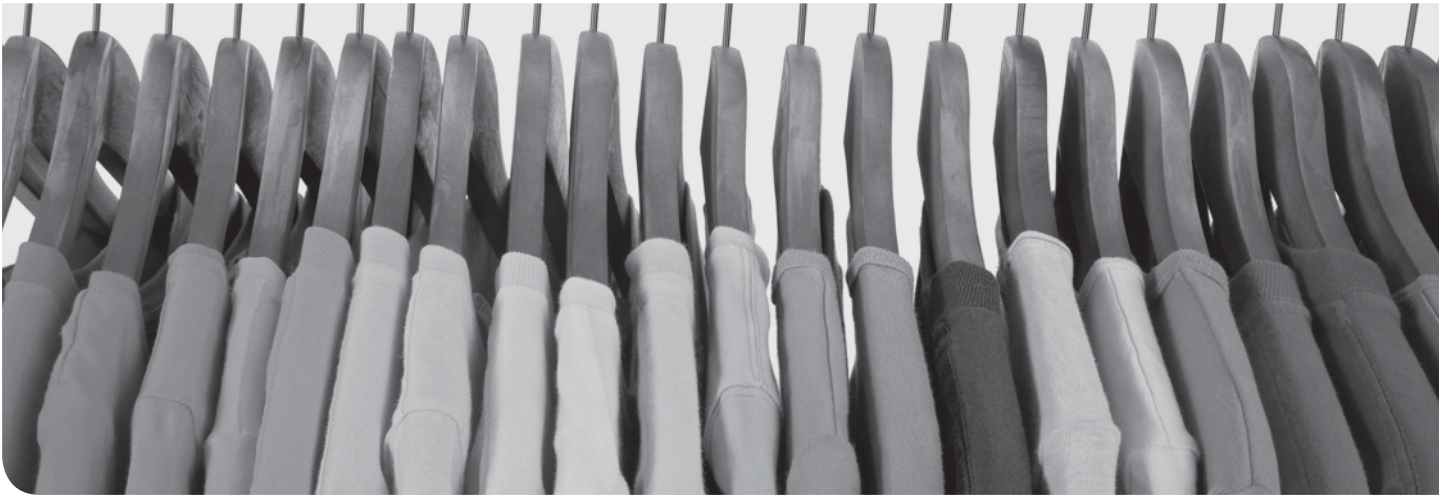
Collaboration

A group of 28 students and lecturers from the Francistown College of Education in Francistown, Botswana visited the department of Consumer Science on the 29th November 2011 and attended practical workshops on textile dyeing and painting techniques and food technology appropriate for class activities.



Research **Outputs**

Department of Consumer Science



Conference contribution

Van Heerden, N. & Steyn, H.J.H. 2011. *Evaluation of the soil removal efficiency of Catholyte on Polyamide 6,6 fabric.* Paper delivered at the 5th International Consumer Sciences Research Conference (ICSRC): Consumer Behaviour for a Sustainable Future, Faculty of Agriculture, University of Bonn, Bonn, Germany. 18–20 July.

Contact details

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Associate professor: Prof. H.J.H. Steyn

Lecturers: Ms I. van der Merwe, Ms J. Vermaas

Junior lecturers: Ms J.S. van Zyl, Ms P.Z. Swart

“The Department of Genetics showed exceptional growth since its inception in 2008.”

– Prof. Johan Spies

Department of Genetics

Teaching

The Department of Genetics showed exceptional growth since its inception in 2008 (Table 1).

Table 1. Average number of students per module for the period 2008–2011

	2008	2009	2010	2011
First year	374	389	553	431
Second year	122	106	184	205
Third year	59	63	71	100
Honours	16	14	23	18
M & D	20	22	23	23

Short courses in Forensic Sciences were developed as well as a part-time Forensic Genetics Honours programme.

Schools were visited to introduce the children to Genetics.

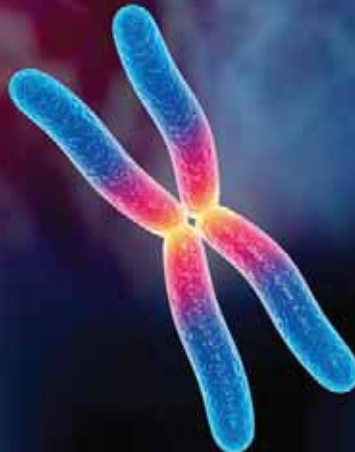
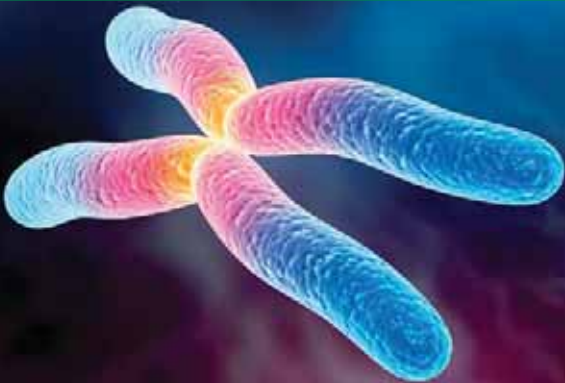
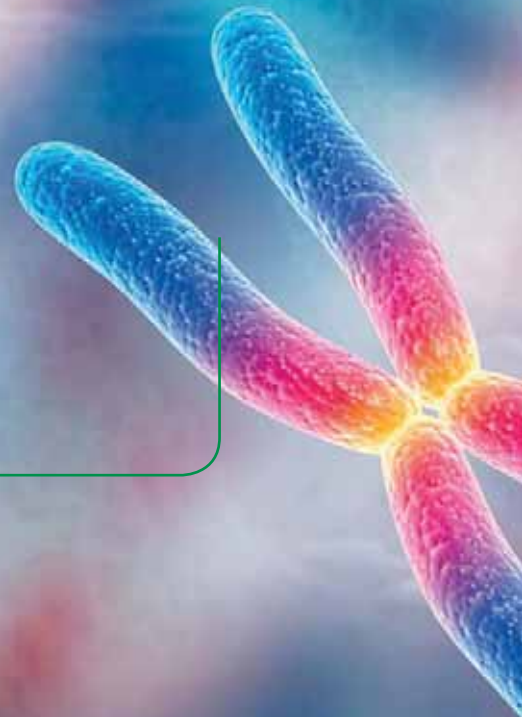
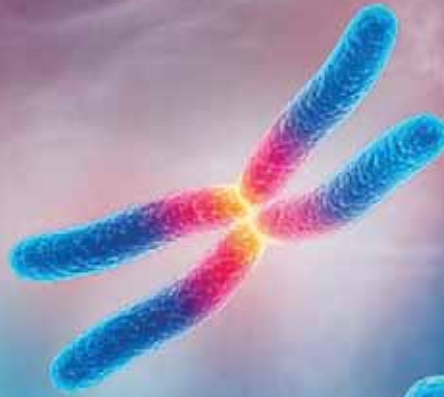
Research

Animal and Forensic Genetics (Profs Grobler, Turner & Kotzé, Dr Dalton, Mss Ehlers, Van der Westhuizen & Wessels):

Projects

- The genetic structure of freshwater mussels in the south-eastern United States (with Virginia Tech); concluded and the results were published in the *Journal of Heredity*.
- The nature and extent of hybridization between blue and black wildebeest in South Africa; continues; a review has been published in the *European Journal of Wildlife Research* (in collaboration with the University of Pretoria, the National Zoological Garden (NZG), the National Museum in Bloemfontein and conservation officers from the Free State and KwaZulu-Natal Provinces).
- With rhino poaching now a regular feature of news bulletins, two projects on rhinos are ongoing: a method to use Endonuclease V mismatch cleavage mediated methods for SNP discovery (with National Zoological Gardens and Iqaba Biotech); and research towards an individual-based conservation strategy (in collaboration with the Mpumalanga Tourism and Parks Agency).
- The geographic genetic structure of vervet monkey populations across Africa continues in collaboration with University of California (Los Angeles) and University of Wisconsin-Milwaukee in the USA.

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Prof. Johan Spies

The areas of expertise of Prof. Johan Spies are in cytogenetics, behavioural genetics and molecular systematics.

- The tracking of the origin of pea weevils (a serious threat to agriculture) in Ethiopia.
- The genetic structure of sheep breeds in South Africa (with the NZG and Agricultural Research Council (ARC).
- Population genetic studies on Southern ground hornbills (NZG; Endangered Wildlife Trust, Southern Ground Hornbill Working Group; Mabula Ground Hornbill Research and Conservation Project; Natural History Museum, Paris, France).
- Molecular insights into the genetic variation of the ground pangolin (National Zoological Gardens, the African Pangolin Working Group).
- Microsatellite marker development for red-billed oxpeckers (NZG, EWT).
- Development and optimization of DNA isolation techniques from problematic forensic samples such as bone, cigarette butts and other forensic samples, including touch DNA.
- The validation of cross species markers in various wildlife species for forensic application (NZG).

Plant genetics

(Prof. Spies, Mr Maleka & Ms Spies)

Projects:

- Genetic variation and phylogenetic relationships in *Clivia*, *Lachenalia* and *Gethyllis* (with ARC Roodeplaat).
- DNA barcoding of various petaloid monocots (International Barcode of Life organisation).
- Identification and characterization of genes involved in the formation of flower colour in *Clivia*.
- Providing information to *Clivia* breeders.

Behavioural and human genetics

(Prof. Spies, Mss Odendaal & Schneider)

Projects:

- The effects of neurochemical cluster genes (the serotonergic and dopaminergic systems) on different behavioural patterns.
- The role of genetic and environmental influences on aggressive behaviour.
- The allelic frequencies of several selected neurochemical cluster genes within different South African populations.

Staff matters

Dr Paul Grobler was promoted to Professor and his NRF rating also improved.

Ms Sue-Rica Schneider and Ms Hesmari van der Westhuizen were appointed as junior lecturers during 2011.

Ms Hesmari van der Westhuizen obtained her M.Sc. during 2011.

Professional activities

The Department of Genetics hosted the Inaugural Genetics Symposium in September. Proceedings of the Symposium were published as the peer-reviewed journal, *Philosophical Transactions in Genetics*, with Profs Spies & Grobler as editors.



Postgraduate students on a catfish sampling expedition.



Forensic students and lecturers at the automated laboratory of the South African Forensic Laboratories.

Prof. Grobler is currently serving his third term on the Council of the Southern African Wildlife Management Association (SAWMA). He is also the genetics associate-editor for the *Southern African Journal of Aquatic Sciences*. He is also a deputy member of the faculty in the Department of Fish and Wildlife Conservation at Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, USA and serves on the graduate committee of a Ph.D. student in that department.

Prof. Antoinette Kotzé is currently Chair of the African Association of Zoos and Aquariums Conservation Science and Research Committee, Chair of the National Zoological Gardens of South Africa's Ethics and Scientific Committee.

She serves on the Board of Directors of the Mabula Ground Hornbill Research and Conservation Project and IBREAM SA (Institute for the Breeding of Rare and Endangered African Mammals). She received the Pan African Association of Zoos and Aquaria (PAAZAB) Conservation Award (in recognition of outstanding and significant contributions to the conservation of African species).

Ms Paula Spies is a member of the Executive Council of the South African Genetics Society.

Ms Sue-Rica Schneider received the Muller Potgieter Medal for the best nonclinical publication by a member of the Faculty of Health Sciences.

Research articles

Aggarwal, R.K., Allainguillaume, J., Bajay, M.M., Barthwal, S., Bertolino, P., Chauhan, P., Consuegra, S., Croxford, A., Dalton, D.L., Den Belder, E., Diaz-Ferguson, E., Douglas, M.R., Drees, M., Elderson, J., Esselink, G.D., Fernández-Manjarrés, J.F., Frascaria-Lacoste, N., Gäbler-Schwarz, S., García de Leaniz, C., Ginwal, H.S., Goodisman, M.A., Guo, B., Hamilton, M.B., Hayes, P.K., Hong, Y., Kajita, T., Kalinowski, S.T., Keller, L., Koop, B.F., Kotzé, A., Lalremruata, A., Leese, F., Li, C., Liew, W.Y., Martinelli, S., Matthews, E.A., Medlin, L.K., Messmer, A.M., Meyer, E.I., Monteiro, M., Moyer, G.R., Nelson, R.J., Nguyen, T.T., Omoto, C., Ono, J., Pavinato, V.A., Pearcy, M., Pinheiro, J.B., Power, L.D., Rawat, A., Reusch, T.B., Sanderson, D., Sannier, J., Sathe, S., Sheridan, C.K., Smulders, M.J., Sukganah, A., Takayama, K., Tamura, M., Tateishi, Y., Vanhaecke, D., Vu, N.V., Wickneswari, R., Williams, A.S., Wimp, G.M., Witte, V. & Zucchi, M.I. (The Molecular Ecology Resources primer development consortium). 2011. Permanent Genetic Resources added to Molecular Ecology Resources Database 1 August 2010 – 30 September 2010. *Molecular Ecology Resources* 11: 219-222.

Bubb, A., Ehlers, K., Kotzé, A. & Grobler, J.P. 2011. The effect of sample age and storage method on DNA yield and microsatellite amplification from baboon (*Papio ursinus*) faecal samples. *European Journal of Wildlife Research* 57: 971-975.

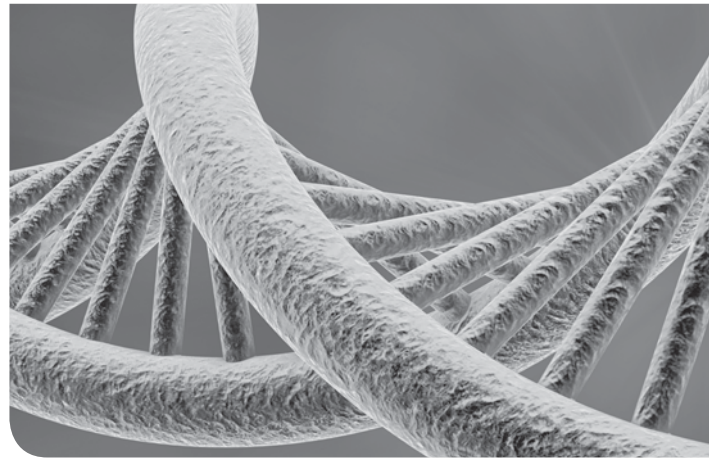
Charruau, P., Fernandes, C., Orozco-ter Wengel, P., Peters, J., Hunter, L., Ziaie, H., Jourabchian, A., Jowkar, H., Schaller, G., Ostrowski, S., Vercammen, P., Grange, T., Schlötterer, C., Kotzé, A., Geigl, E., Walzer, W. & Burger, P. 2011. Phylogeography, genetic structure and population divergence time of cheetahs in Africa and Asia: evidence for long-term geographic isolates. *Molecular Ecology* 20: 706-724.

Conradie, W., Harvey, J., Kotzé, A., Dalton, D.L. & Cunningham, M.J. 2011. Confirmed amphibian chytrid in the Mount Mulanje Area, Malawi. *Herpetological Review* 42: 369-371.

Dalton, D.L. & Kotzé, A. 2011. DNA barcoding as a tool for species identification in three forensic wildlife cases in South Africa. *Forensic Science International* 207: e51-e54.

Dalton, D.L., Kotzé, A. & Van Wyk, A.M. 2011. Isolation and characterization of species-specific microsatellite loci in the blesbok. *Conservation Genetic Resources* 3: 677-679.

Ehlers, K. & Wessels, L. 2011. The art of genotyping. *Philosophical Transactions in Genetics* 1: 152-167.



Grobler, J.P. & Van der Westhuizen, H.M. 2011. Co-evolution: towards using *Imbrasia belina* and *Colophospermum mopane* as a model system. *Philosophical Transactions in Genetics* 1: 138-151.

Grobler, J.P., Jones, J.W., Johnson, N.A., Neves, R.J. & Hallerman, E.M. 2011. Homogeneity at nuclear microsatellite loci masks mitochondrial haplotype diversity in the endangered fanshell pearly mussel (*Cyprogenia stegaria*). *Journal of Heredity* 102: 196-206.

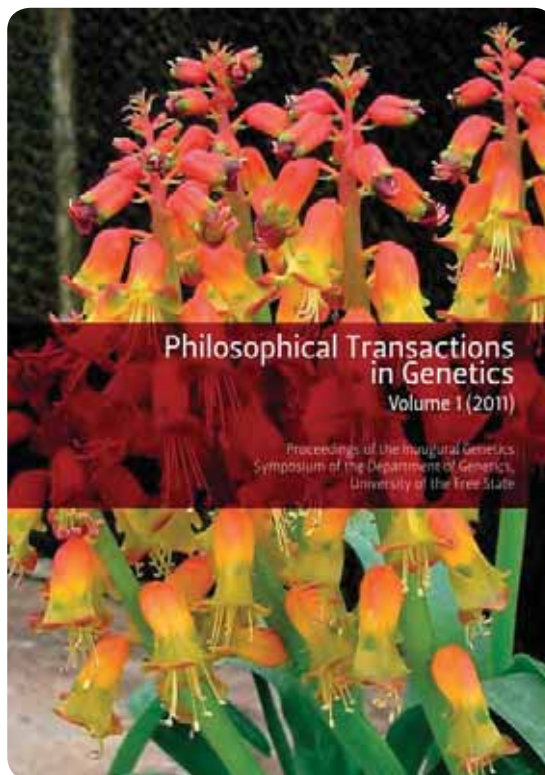
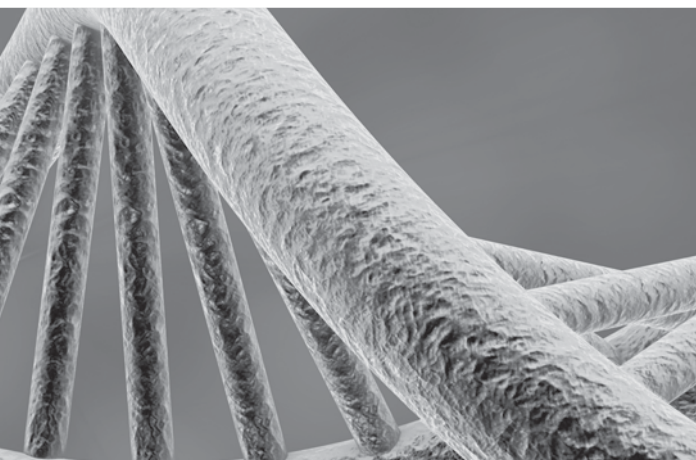
Grobler, J.P., Rushworth, I., Brink, J.S., Bloomer, P., Kotzé, A., Reilly, B. & Vrahimis, S. 2011. Management of hybridization in an endemic species: decision making in the face of imperfect information in the case of the black wildebeest – *Connochaetes gnou*. *European Journal of Wildlife Research* 57: 997-1006.

Imasuen, A.A., Aisien, M.S.O., Weldon, C., Dalton, D.L., Kotzé, A. & Du Preez, L.H. 2011. Occurrence of *Batrachochytrium dendrobatidis* in amphibian populations of Okomu National Park, Nigeria. *Herpetological Review* 42: 379-382.

Kleynhans, R. & Spies, J.J. 2011. Requirements for the development and breeding of new flower bulb crops. *Philosophical Transactions in Genetics* 1: 79-101.



Group of post-graduate behavioural genetics students in the newly established human molecular laboratory.



First issue of the Philosophical Transactions in Genetics.

Kotzé, A. & Nxomani, C. 2011. The National Zoological Gardens of South Africa: a National Research Facility. *International Zoo Yearbook* 45: 30–37.

Laubscher, N., Odendaal, Z., Schneider, S. & Spies, J.J. 2011. A review of the influence of some neurotransmitter genes and emotional intelligence on aggression. *Philosophical Transactions in Genetics* 1: 42–66.

Maleka, M.F., Mafofo, J., Rees, D.J.G. & Spies, J.J. 2011. The identification of genes involved in colour formation in *Clivia miniata* flowers. *Clivia* 13: 42–50.

Mogamedi, K.L.M., Sibara, M.M., Grobler, J.P. & Goyvaerts, E.M.A. 2011. An assessment of genetic diversity among marula populations using the amplified fragment length polymorphism (AFLP) technique. *African Journal of Agricultural Research* 6: 790–797.

Müller, B., De Klerk-Lorist, L., Henton, M., Lane, E., Parsons, S., Gey Van Pittius, N., Kotzé, A., Van Helden, P. & Tanner, M. 2011. Mixed infections of *Corynebacterium pseudotuberculosis* and non-tuberculous mycobacteria in South African antelopes presenting with tuberculosis-like lesions. *Veterinary Microbiology* 147: 340–345.

Naidoo, V., Wolter, K., Espie, I. & Kotzé, A. 2011. Vulture rescue and rehabilitation in South Africa: An urban perspective. *Journal of the South African Veterinary Association* 82: 24–31.

Odendaal, Z., Spies, P., Schneider, S. & Spies, J.J. 2011. Review of the psychobiology of aggression in humans, focussing on the serotonergic pathway. *Philosophical Transactions in Genetics* 1: 102–137.

Shimelis, H.A. & Spies, J.J. 2011. Aneuploids of wheat and chromosomal localization of genes. *African Journal of Biotechnology* 10: 5545–5551.

Spies, J.J. 2011. Building the *Clivia* puzzle. *Clivia News* 20(4): 5–7.

Spies, J.J., Snyman, M.C. & Viljoen, C.D. 2011. The identification of genes for flower colour in *Clivia*. *Clivia* 13: 51–58.

Spies, J.J., Spies, P. & Kleynhans, R. 2011. Basic chromosome numbers in the genus *Lachenalia* (Hyacinthaceae). *Philosophical Transactions in Genetics* 1: 67–78.

Spies, P., Grobler, J.P. & Spies, J.J. 2011. A review of phylogenetic relationships in the genus *Clivia*. *Philosophical Transactions in Genetics* 1: 168–207.

Spies, P., Van der Westhuizen, H.M., Stegman, S., Watson, M. & Spies, J.J. 2011. Bar-coding *Clivia* for species identification. *Clivia* 13: 26–37.

Spies, J.J. 2011. Observations on 'batch study of *C. miniata* x *C. nobilis* crosses'. *Clivia News* 20(1): 12–13.

Van der Westhuizen, H.M., Spies, P. & Spies, J.J. 2011. Identifying *Clivia nobilis* and *C. mirabilis* in the laboratory. *Clivia* 13: 38–41.

Zimmerman, D., Anderson, M.D., Lane, E., Van Wilpe, E., Carulei, O., Douglass, N., Williamson, A. & Kotzé, A. 2011. Avian poxvirus epizootic in a breeding population of Lesser Flamingos (*Phoenicopterus minor*) at Kamfers Dam, Kimberley, South Africa. *Journal of Wildlife Diseases* 47: 989–993.

Research reports

Botha, A., Coetzee, R., Hagens, Q., Hockey, P., Jansen, R., Jordan, L., Jordan, M., Kemp, A., Kotzé, A., Little, R., Meares, K., Moss, D., Rehse, T., Theron, N. & Turner, A. 2011. Southern Ground Hornbill (*Bucorvus leadbeateri*): Species Recovery Plan for South Africa. Report delivered to the Southern Ground Hornbill Interest Group, South Africa.

Conference contributions

Coetzer, R., Grobler, J.P. & Turner, T. 2011. *The genetic structuring of Vervet Monkeys (Chlorocebus aethiops) in the south-eastern parts of South Africa*. Poster presented at the 7th International Wildlife Ranching Symposium (IWR5): The Business of Conservation – Science, Livelihoods and Values, Kimberley, South Africa. 10–14 October.

Dalton, D.L. & Kotzé, A. 2011. *Application of the genetics toolbox for the conservation of zoo and wildlife populations*. Paper delivered at the 22nd Conference and Annual General Meeting of the Pan African Association of Zoos and Aquaria (PAAZAB): Zoos and Aquaria as Learning Environments, National Zoological Gardens of South Africa, Pretoria, South Africa. 17–22 May.



Gethyllis (Koekemakranka) specimen collected for research.

- Dalton, D.L. & Kotzé, A.** 2011. *DNA barcoding as a tool for species identification in forensic wildlife cases.* Paper delivered at the 3rd Annual African DNA Forensics Conference, National Zoological Gardens of South Africa, Pretoria, South Africa. 27-28 October.
- Dalton, D.L. & Kotzé, A.** 2011. *DNA research and the need for population management.* Paper delivered at the Pickersgill's Reed Frog *ex situ* Conservation and Research Workshop, Johannesburg Zoo, Johannesburg, South Africa. 2 November.
- Dalton, D.L. & Kotzé, A.** 2011. *Meshing molecules and management: the genetics of wildlife conservation.* Paper delivered at the 7th International Wildlife Ranching Symposium (IWRs): The Business of Conservation – Science, Livelihoods and Values, Kimberley, South Africa. 10-14 October.
- Dalton, D.L. & Kotzé, A.** 2011. *Social structure of free ranging cheetah in Botswana revealed by DNA profiling.* Paper delivered at the Joint Conference of the Zoological Society of Southern Africa (ZSSA) and the Parasitological Society of Southern Africa (PARSA), Stellenbosch University, Stellenbosch, South Africa. 10-13 July.
- Dalton, D.L., Grobler, J.P., Jansen, R. & Kotzé, A.** 2011. *Southern Ground Hornbills: population structure explained by stepping stone dispersal.* Paper delivered at the 8th International Conference on Behaviour, Physiology and Genetics of Wildlife, Berlin, Germany. 14-17 September.
- Danzy, J., Grobler, J.P. & Turner, T.E.** 2011. *Sunbathing and social relationships among vervet monkeys.* Paper delivered at the 9th Annual Meeting of the Primate Ecology and Genetics Group (PEGG) of the South African Primatology Association, Tradewinds Country Inn, Mtunzini, Kwa-Zulu Natal, South Africa. 1-3 July.
- Danzy, J., Grobler, J.P., Freimer, N. & Turner, T.** 2011. *Temporal differences in affiliative behaviour among male vervet monkeys, Chlorocebus aethiops.* Poster presented at the Behaviour 2011: Joint Meeting of the Animal Behaviour Society (ABS) and the International Ethological Conference (IEC), Indiana University, Indiana, USA. 25-30 July.
- Danzy, J., Grobler, J.P., Freimer, N. & Turner, T.R.** 2011. *Sunning: A behavioral response to seasonal climatic change in South African vervet monkeys.* Poster presented at the 80th Annual Meeting of the American Association of Physical Anthropologists (AAPA), The Hilton, Minneapolis, USA. 13-16 April.
- Danzy, J., Grobler, J.P., Gaetano, T., Schmitt, C.A., Lorenz, J., Freimer, N. & Turner, T.** 2011. *A link between colour and secondary sexual characteristics among free ranging vervet monkeys (Chlorocebus aethiops pygerythrus).* Paper delivered at the 34th Meeting of the American Society of Primatologists (ASP), Austin, Texas, USA. 16-19 September.
- Ehlers, K. & Wessels, L.** 2011. *Tertiary training of Forensic Scientists in South Africa: The UFS perspective.* Paper delivered at the 2nd Interpol Southern African Forensic DNA Conference, Pretoria, South Africa. 14-15 December.
- Ehlers, K. & Wessels, L.** 2011. *The art of genotyping.* Paper delivered at the Inaugural Genetics Symposium, University of the Free State, Bloemfontein, South Africa. 9 September.
- Espie, I.W., Hlokwe, T.M., Gey van Pittius, N.C., Lane, E.P., Tordiffe, A.S.W., Michel, A.L., Muller, A., Kotzé, A. & Van Helden, P.D.** 2011. *Diagnosis and implications of Mycobacterium bovis in a black rhinoceros (Diceros bicornis minor) in South Africa.* Paper delivered at the 8th International Conference on Behaviour, Physiology and Genetics of Wildlife, Berlin, Germany. 14-17 September.
- Espie, I.W., Hlokwe, T.M., Gey van Pittius, N.C., Lane, E.P., Tordiffe, A.S.W., Michel, A.L., Muller, A., Kotzé, A. & Van Helden, P.D.** 2011. *Pulmonary Infection due to Mycobacterium bovis in a black rhinoceros (Diceros bicornis minor) in South Africa.* Paper delivered at the 22nd Conference and Annual General Meeting of the Pan African Association of Zoos and Aquaria (PAAZAB): Zoos and Aquaria as Learning Environments, National Zoological Gardens of South Africa, Pretoria, South Africa. 17-22 May.
- Gaetano, T.J., Danzy, J., Mtshali, S., Theron, N., Schmitt, C.A., Grobler, J.P., Freimer, N. & Turner, T.R.** 2011. *Ecological and Anthropogenic Determinants of Parasite Species Richness in wild vervet monkeys (Chlorocebus aethiops).* Poster presented at the Midwest Primate Interest Group 2011 Meeting, Kent State University, Kent, Ohio, USA. 14-15 October.
- Grobler, J.P. & Van der Westhuizen, H.M.** 2011. *Co-evolution: towards using Imbrasia belina and Colophospermum mopane as a model system.* Paper delivered at the Inaugural Genetics Symposium, University of the Free State, Bloemfontein, South Africa. 9 September.
- Grobler, J.P., Rushworth, I., Kotzé, A., Bloomer, P., Reilly, B. & Vrahimis, S.** 2011. *Management of hybridization in a widely utilized endemic species: decision making in the face of imperfect information in the case of the black wildebeest (Connochaetes gnou).* Paper delivered at the 7th International Wildlife Ranching Symposium (IWRs): The Business of Conservation – Science, Livelihoods and Values, Kimberley, South Africa. 10-14 October.
- Jasinska, A.J., Tran, N., Huang, Y., Schmitt, C., Choi, O-W., De Young, J., Jung, Y., Coppola, G., Ma, M., Apetrei, C., Pandrea, I., Turner, T., Grobler, J.P., Antonio, M., Dione, M., Wasserscheid, J., Dewar, K., Warren, W. & Freimer, N.** 2011. *Vervet or African green monkey (AGM) as a system for genetic study of SIV infection and progression.* Poster presented at the 29th Annual Symposium on Nonhuman Primate Models for AIDS, Seattle, Washington State, USA. 25-28 October.
- Kleynhans, R. & Spies, J.J.** 2011. *Requirements for the development and breeding of new flower bulb crops.* Paper delivered at the Inaugural Genetics Symposium, University of the Free State, Bloemfontein, South Africa. 9 September.
- Kotzé, A.** 2011. *The National Zoological Gardens of South Africa as a research platform.* Paper delivered at the Conference of the European Association of Zoos and Aquaria (EAZA), Montpellier, France. 20-24 September.
- Kotzé, A.** 2011. *The tip of the horn: multi-disciplined approaches to safeguard rhinos.* Paper delivered at the 10th Meeting of the Species Survival Commission (SSC) of the International Union for Conservation

of Nature (IUCN): African Rhino Specialist Group, Mokala Nature Reserve, Kimberley, South Africa. 5-10 March.

Kotzé, A., Dalton, D.L., Van Marle-Koster, E. & Jonker, T. 2011. *The Tankwa goat: A real cliff hanger*. Paper delivered at the 44th Biennial South African Society for Animal Science (SASAS) Congress, Stellenbosch University, Stellenbosch, South Africa. 11-14 July.

Laubscher, N., Odendaal, Z., Schneider, S. & Spies, J.J. 2011. *A review of the influence of some neurotransmitter genes and emotional intelligence on aggression*. Paper delivered at the Inaugural Genetics Symposium, University of the Free State, Bloemfontein, South Africa. 9 September.

Odendaal, Z., Spies, P., Schneider, S. & Spies, J.J. 2011. *Review of the psychobiology of aggression in humans, focussing on the serotonergic pathway*. Paper delivered at the Inaugural Genetics Symposium, University of the Free State, Bloemfontein, South Africa. 9 September.

Spies, J.J., Spies, P. & Kleynhans, R. 2011. *Basic chromosome numbers in the genus Lachenalia (Hyacinthaceae)*. Paper delivered at the Inaugural Genetics Symposium, University of the Free State, Bloemfontein, South Africa. 9 September.

Spies, P., Grobler, J.P. & Spies, J.J. 2011. *A review of phylogenetic relationships in the genus Clivia*. Paper delivered at the Inaugural Genetics Symposium, University of the Free State, Bloemfontein, South Africa. 9 September.

Spies, P., Kleynhans, R. & Spies, J.J. 2011. *Cytogenetic and phylogenetic studies in the genus Lachenalia*. Paper delivered at the 9th Congress of the Southern African Society for Systematic Biology (SASSB), Grahamstown, South Africa. 19-21 January.

Turner, T.E. & Grobler, J.P. 2011. *Update on the Ingerated Genetics and Genomics project on vervet monkeys*. Paper delivered at the 9th Annual Meeting of the Primate Ecology and Genetics Group (PEGG) of

the South African Primatology Association, Tradewinds Country Inn, Mtunzini, Kwa-Zulu Natal, South Africa. 1-3 July.

Van Aswegen, E. & Grobler, J.P. 2011. *Variability in BMP4 gene sequences and microsatellite allele frequencies in springbok from two geographical areas*. Poster presented at the 7th International Wildlife Ranching Symposium (IWRS): The Business of Conservation – Science, Livelihoods and Values, Kimberley, South Africa. 10-14 October.

Van Wyk, A., Dalton, D.L. & Kotzé, A. 2011. *The bontebok and blesbok hybrid dilemma*. Paper delivered at the Southern African Wildlife Management Association (SAWMA) Symposium: The Human-Natural Resource Interface – Reconciling Conflicting Trade-offs? ATKV Holiday Resort, Hartenbos, South Africa. 18-21 September.

Van Wyk, A.M., Dalton, D.L. & Kotzé, A. 2011. *DNA hybridisation test: Rapid diagnostic tool to detect hybrid bontebok and blesbok*. Paper delivered at the Joint Conference of the Zoological Society of Southern Africa (ZSSA) and the Parasitological Society of Southern Africa (PARSA), Stellenbosch University, Stellenbosch, South Africa. 10-13 July.

Warren, W.C., Jasinska, A., Tran, N., Huang, Y., Dewar, K., Wasserscheid, J., Juretic, N., Turner, T., Grobler, J.P., Weinstock, G., Wilson, R.K. & Freimer, N. 2011. *Gaining genetic insights into quantitative traits from the vervet genome*. Poster presented at the 24th Annual Cold Spring Harbor Meeting (CSHM) on Genome Science: The Biology of Genomes, Cold Spring Harbor, New York, USA. 10-14 May.

Wessels, L., Kotzé, A., Ehlers, K., Vrahimis, S. & Grobler, J.P. 2011. *Cross-species microsatellite markers for the detection of hybrids in the species Connochaetes*. Poster presented at the 7th International Wildlife Ranching Symposium (IWRS): The Business of Conservation – Science, Livelihoods and Values, Kimberley, South Africa. 10-14 October.

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Affiliated Professor: Prof. Trudy Turner

Affiliated Associate Professor: Prof. Antoinette Kotzé

Affiliated Senior Lecturer: Dr Desiré Dalton

Lecturers: Ms Karen Ehlers, Ms Paula Spies, Mr Frank Maleka

Affiliated Lecturer: Lt.-Col. Anton Lucassen

Junior Lecturers: Ms Zurika Odendaal (Programme Director), Sue-Rica Schneider, Hesmari van der Westhuizen, Letecia Wessels

Senior Professional Officer: Ms Susan Reinecke

“The Department of Geography at the University of the Free State focuses, within the context of space, place and time, on issues around the physical-human environment which impact on the quality of this environment and the people who live and work in it.”

– Prof. Peter Holmes

Department of Geography

Overview

The year 2011, like the years prior to it, saw a sustained tempo of student enrolment. Geography remains a popular choice for students in both the natural sciences and the humanities in terms of a vocation. This is primarily because of a sustained demand from government and industry for those who are trained to identify and assess real-world environmental issues and potential problems, as well as to remedy these problems.

Bloemfontein campus

Collaborative research with foreign and local institutions, and the involvement of postgraduate students, have grown in significance over the past couple of years. This forms the basis of this report. Strong ties now exist with a number of foreign and local institutions. Details of specific conferences attended and papers presented are provided in full below. In March, Dr Shirley Brooks and Master's student Mr Mngqobi Ngubane presented a paper at a Stellenbosch workshop entitled *Mapping Political Ecologies of Conservation in sub-Saharan Africa*. Doctoral student Ms Jenny Josefsson

attended the International Studies Association (ISA) annual Conference in Montreal and presented a paper, with financial support from the UFS.

In June 2011, Dr Brooks and her students contributed to the 23rd Biennial Conference of the Southern African Historical Society. Dr Brooks organised a panel on “Critical Conservation Histories of KwaZulu-Natal”, at which most of the students presented their work. The project gained a special mention in *Business Day*. This was followed by a trip to the Netherlands where Dr Brooks presented a joint paper with Dutch colleague Prof. Marja Spierenburg and students from the Vrije Universiteit, Amsterdam. The conference, held at the Institute for Social Studies in The Hague in early July, was entitled *Nature Inc.? Questioning the Market Panacea in Environmental Policy and Conservation*. The paper presented by the research team focused on the practices of nature commodification evident in high-end trophy hunting on South African game farms.

Prof. Peter Holmes attended the International Union for Quaternary Research (INQUA) conference in Bern, Switzerland, in

The image features a topographic map background with brown contour lines on a light tan surface. A green square with rounded corners is positioned on the left side, containing the white number '12'. A thin green line extends from the bottom-right corner of the square across the page. A vertical line runs down the center of the page, and a horizontal line runs across the middle, intersecting at the center.

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Dr Charles Barker

Dr Charles Barker is a member of the South African Council for Natural Scientific Professions. His research interests are in Fluvial and Aeolian Geomorphology, GIS and IT, Environmental science and Philosophy of Science.

July, and then visited the University of Leicester in the UK. He is collaborating with Dr Andrew Carr on a project entitled *Neogene Palaeoecology of South Africa* sponsored by PAST (The Palaeontological Scientific Trust). In September, Prof. Holmes and Prof. Mark Bateman from the University of Sheffield, along with Dr Carr, and Ms Hatley Cawthra from the Council for Geoscience, conducted an extensive bathymetric survey of the floors of the Wilderness lakes. This is part of ongoing research into late Quaternary palaeoenvironments of the southern Cape. Profs Holmes and Bateman and Dr Carr also sampled lignites (immature coal) in the Knysna area as part of the Neogene palaeoecology project mentioned above.

Dr Charles Barker and eight senior undergraduate and honours students attended the GISSA (FS) conference during October. Babalwa Mtshawu, Anneri Pretorius and Paul Kruger presented papers on their research conducted during the year.

Also in October Dr Brooks' two doctoral students, Ms Jenny Josefsson and Mr Tariro Kamuti, attended the International Wildlife Ranching Symposium held in Kimberley. The theme of the conference was *The Business of Conservation: Science, Livelihoods and Values*.

Dr Brooks was invited to participate in a Norwegian-funded research project entitled *Cultures of Biodiversity – Perceptions and Practices*. The project is based at the

University of Oslo in the Anthropology Department and it includes colleagues working in a range of different settings around the globe, from Greenland to Malaysia. Dr Brooks traveled to Oslo for a two-day workshop on the topic in October. She will be working with colleague Dr Knut Nustad who is also undertaking research on the history and politics of conservation in KwaZulu-Natal.

Prof. Gustav Visser attended the Association of American Geographers and the International Geographical Union conferences and commission meetings in April in the USA and in Chile in November. He was also an invited panelist at the *Political Geography/Sexuality and Space Preconference* meeting in Tacoma, USA. Dr Dan Hammett from the University of Sheffield visited the Department as a guest of Prof. Visser in June and July, while Dr Alec Thornton from the University of New South Wales visited the Department in August. During September, Prof. Visser accompanied the F1 class of 2011 to the Universities of Antwerp and Ghent in Belgium.

Other news

The interdisciplinary initiative launched by Dr Brooks in 2010, in collaboration with Prof. Neil Roos of the Postgraduate School, grew and prospered in 2011. A range of local and international scholars from different disciplines presented papers at meetings of the Critical Studies Group. Thirteen



From left to right Prof. Mark Bateman (Sheffield) Prof. Peter Holmes (UFS), Mr Davie Antas (SA National Parks) and Dr Andy Carr (Leicester) about to set out on a bathymetric survey of Swartvlei.



Dr Shirley Brooks' two doctoral students, Ms Jenny Josefsson and Mr Tariro Kamuti, get to grips with wildlife at the International Wildlife Ranching Symposium held in Kimberley. The theme of the conference was *The Business of Conservation: Science, Livelihoods and Values*.

Postgraduates

seminars, based on pre-circulated research papers, were held during the course of 2011. The seminar is acquiring a national and even international reputation and is making an important contribution to the intellectual life of the University of the Free State.

Prof. Visser chaired the external review panel of the Department of Geography at the University of Pretoria.

Two of Prof. Visser's students, Sibonginkosi Mazibuko and Gijsbert Hoogendoorn, were awarded their Ph.D.s in April. Ms Aretha Steenekamp, junior lecturer in the Department, was awarded her M. degree in April, as was Mr Francois Deacon. Ms Mulalo Rabumbulu, the other junior lecturer on the Bloemfontein campus, completed her Master's degree at the end of the year.

Awards and prizes

At the Agricultural Economics Association of South Africa (AEASA) annual congress with the theme: AEASA 1961–2011: a Foundation for the next 50 years colleagues from our University received the prize for the best conference contribution. AESA was a special occasion, celebrating the 50th anniversary of the Association.

The title of the winning contribution was: **Ogundeji A.A., Viljoen M.F., Booysen H.J., De Villiers G.D.T.** 2011. *Impact of climate change on planning and dealing with flood disasters in South Africa: a case study of Soweto on Sea.*

QwaQwa campus

An exciting new initiative launched in 2010 received further impetus on the QwaQwa campus in 2011. The Emerging Farmers' initiative is both a research, as well as a community service based project involving the staff of the Geography

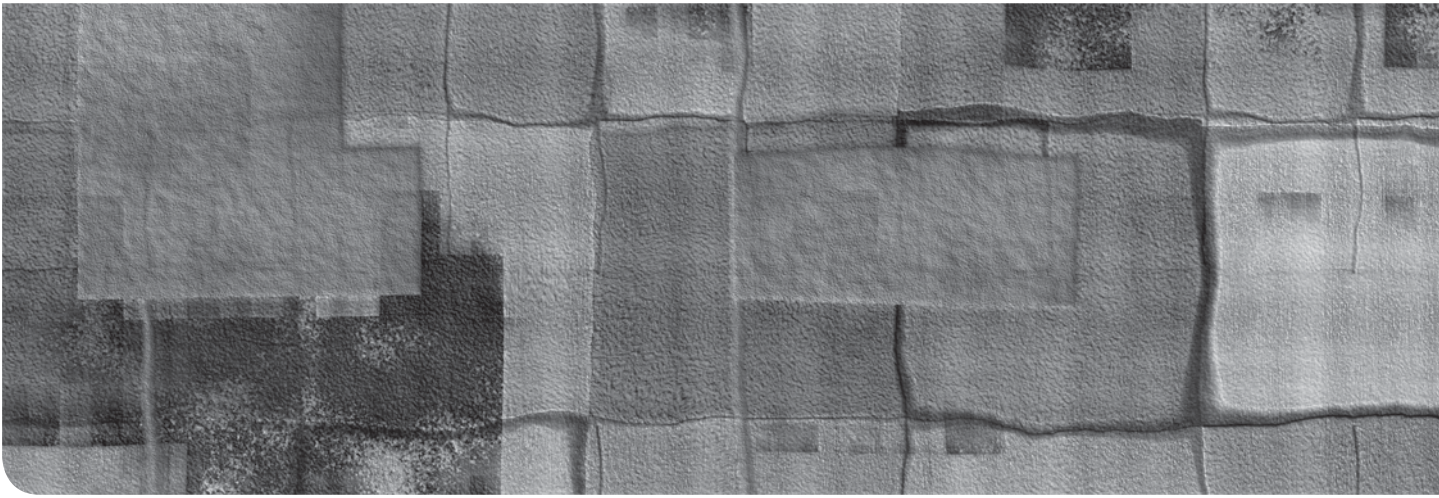
Department on the QwaQwa campus. It is led by Dr Hennie Claasen (subject head) and Dr Geoffrey Mukwada, with Ms Merle Naidoo and Mr Pululu Mahasa making up the rest of the team. The project is based on the assumption that, in the developing world, land reform is considered as a crucial feature of economic development. While the objectives of land reform may be attractive, achieving them is only possible if the beneficiaries of the process are sufficiently equipped and supported. In South Africa an important objective of land reform is the attainment of food security. This research examines the challenges that emerging farmers are experiencing in grain production in the QwaQwa area in the eastern Free State. Preliminary results indicate that the challenges constraining emerging farmers in grain production are linked to the prevailing demographic conditions such as age, the skills and training that the farmers have and lack of agricultural resources, and that the criteria for selecting land reform beneficiaries need to be re-evaluated if emerging farmers are to make a more significant contribution to food security in the country.



From the left Mr Pululu Mahasa, an unidentified Emerging Farmer from QwaQwa, Dr Geoffrey Mukwada, and Dr Hennie Claassen during fieldwork.

Research Outputs

Department of Geography



Research articles

Barker, C.H. 2011. Utilising published data for DTM construction and drainage basin delineation in the Modder River catchment Free State South Africa. *South African Geographical Journal* 93: 89-103.

Bateman, M.D., Carr, A.S., Dunajko, A., Holmes, P.J., Roberts, D.L., McLaren, S., Bryant, R., Murray-Wallace, C. & Marker, M.E. 2011. The evolution of coastal barrier systems: a case study of the Middle-Late Pleistocene Wilderness barriers South Africa. *Quaternary Science Reviews* 30: 63-81.

Brooks, S.J., Spierenburg, M., Van Brakel, L., Kolk, A. & Lukhozi, K. 2011. Creating a commodified wilderness: tourism, private game farming, and 'third nature' landscapes in KwaZulu-Natal. *Tijdschrift voor Economische en Sociale Geografie* 102: 260-274.

Hammett, D.P. 2011. British media representations of South Africa and the 2010 FIFA World Cup. *South African Geographical Journal* 93: 63-74.

Hammett, D.P. 2011. Resistance, power and geopolitics in Zimbabwe. *Area* 43: 202-210.

Hammett, D.P. & Mather, C. 2011. Beyond decoding: political cartoons in the classroom. *Journal of Geography in Higher Education* 35: 103-119.

Hammett, D.P. & Staeheli, L. 2011. Respect and responsibility: Teaching citizenship in South African high schools. *International Journal of Educational Development* 31: 269-276.

Hoogendoorn, G. & Visser, G.E. 2011. Economic development through second home development: Evidence from South Africa. *Tijdschrift voor Economische en Sociale Geografie* 102: 275-289.

Hoogendoorn, G. & Visser, G.E. 2011. Tourism, second homes, and an emerging South African postproductivist countryside. *Tourism Review International* 15: 183-197.

Manatsa, D., Nyakudya, I.W., Mukwada, G. & Matsikwa, H. 2011. Maize yield forecasting for Zimbabwe farming sectors using satellite rainfall estimates. *Natural Hazards* 59: 447-463.

Manatsa, D., Reason, C.J. & Mukwada, G. 2011. On the decoupling of the IODZM from the southern Africa rainfall variability. *International Journal of Climatology* 32(5): 727-746.

Molapo, M.E. & Mukwada, G. 2011. Impact of customer retention strategies in the South African cellular industry: The case of the eastern Free State. *International Journal of Business, Humanities and Technology* 1: 52-60.

Rogerson, C. & Visser, G.E. 2011. African tourism geographies: Existing paths and new directions. *Tijdschrift voor Economische en Sociale Geografie* 102: 251-259.

Rogerson, C. & Visser, G.E. 2011. Current themes in tourism and development in southern Africa. *Tourism Review International* 15: 1-3.

Rogerson, C. & Visser, G.E. 2011. Rethinking South African urban tourism research. *Tourism Review International* 15: 77-90.

Visser, G.E. & Hoogendoorn, G. 2011. Current paths in South African tourism research. *Tourism Review International* 15: 5-20.

Wiggs, G.F.S. & Holmes, P.J. 2011. Dynamic controls on wind erosion and dust generation on west-central Free State agricultural land, South Africa. *Earth Surface Processes and Landforms* 36: 827-838.

Research reports

Booyesen, H.J., Du Plessis, A., Jordaan, A.D. & Jordaan, A.J. 2011. *Flood Risk Assessment for the Northern Cape Province, South Africa.* Report commissioned by the Northern Cape Province, South Africa.

Seaman, M.T., Watson, M., Avenant, M.F., Barker, C.H., Buschke, F.T., Dennis, I., Joubert, A., Kemp, M.E., King, J., Le Roux, P.A.L., Redelinghuys, N., Rossouw, L., Rowntree, K., Sokolic, F., Van der Waal, B., Van Rensburg, L.D., Van Tol, J.J. & Vos, A.T. 2011. *Report on the Mokolo River Workshop input to Decision Support System (DSS).* Report commissioned by the Water Research Commission, Pretoria, South Africa.

Seaman, M.T., Watson, M., Avenant, M.F., Barker, C.H., Buschke, F.T., Dennis, I., Joubert, A., Kemp, M.E., King, J., Le Roux, P.A.L., Redelinghuys, N., Rossouw, L., Rowntree, K., Sokolic, F., Van der Waal, B., Van Rensburg, L.D., Van Tol, J.J. & Vos, A.T. 2011. *Second progress report on testing a prototype methodology for Environmental Water Requirements in non-perennial systems*

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(phase 3). Report commissioned by the Water Research Commission, Pretoria, South Africa.

Chapters in book

Boaduo, N.A.P., Milondzo, K.S. & Adjei, A. 2011. Genesis of peace and education in an era of xenophobia and terrorism: The case of Africa. In *African History*, edited by C.J. Korieh & R.C. Njoku. San Diego: Cognella Academic Publishers. pp. 517-526.

Conference contributions

Alfonsi, R.M. & Naidoo, M. 2011. *Improving teaching and learning through the sharing of best practices: The case of the University of the Free State, QwaQwa Campus*. Paper delivered at the Higher Education Development and Support (HEDS'11) Higher Education and Practitioners Conference, Tshwane University of Technology, Pretoria, South Africa. 24-26 October.

Brooks, S.J. 2011. *Negotiating wilderness: The origins of the Umfolozi and Hluhluwe Game Reserves in British Zululand, 1887-1897*. Paper delivered at the 23rd Biennial Conference of the Southern African Historical Society: The past and its possibilities - Perspectives of southern Africa, University of KwaZulu-Natal, Durban, South Africa. 27-29 June.

Brooks, S.J., Snijders, D., Spierenburg, M., Brandt, F., Wels, H. & Andrews, N. 2011. *Trophy Nature: Exploring the discourses and social practices of trophy hunting on game farms in South Africa - focus on the sable antelope*. Paper delivered at Nature Inc? - Questioning the Market Panacea in Environmental Policy and Conservation, Institute for Social Studies, The Hague, the Netherlands. 30 June - 2 July.

Holmes, P.J., Scott, L., Carr, A. & Bateman, M. 2011. *A record of Late Glacial-Holocene environmental change from two adjacent biophysical regimes in the southern Cape, South Africa*. Poster presented at the XVIII International Quaternary Research (INQUA) Congress: Quaternary Sciences - The View From the Mountains, Bern, Switzerland. 21-27 July.

Holmes, P.J., Bateman, M., Carr, A., Roberts, D., Bryant, R., Marker, M.E., Murray-Wallace, C., Dunajko, A. & McClaren, S. 2011. *The evolution of coastal barrier systems: A case study of the Middle-Late Pleistocene Wilderness barriers, South Africa*. Paper delivered at the

XVIII International Quaternary Research (INQUA) Congress: Quaternary Sciences - The View From the Mountains, Bern, Switzerland. 21-27 July.

Josefsson, J.B. & Brooks, S.J. 2011. *Deleting history to create heritage: Struggles over the 'Real' Zulu of the Emakhosini Valley*. Paper delivered at the 23rd Biennial Conference of the Southern African Historical Society: The past and its possibilities - Perspectives of southern Africa, University of KwaZulu-Natal, Durban, South Africa. 27-29 June.

Lukhozi, K., Kjelstrup, L. & Brooks, S.J. 2011. *New conservation geographies versus old landscape identities: The impacts of private game reserves on farm dwellers' sense of place*. Paper delivered at the 23rd Biennial Conference of the Southern African Historical Society: The past and its possibilities - Perspectives of southern Africa, University of KwaZulu-Natal, Durban, South Africa. 27-29 June.

Ngubane, M. & Brooks, S.J. 2011. *Land beneficiaries as game farmers in the "new" South Africa: Conservation as empowerment or the extension of chiefly power?* Paper delivered at the Workshop: Mapping Political Ecologies of Conservation in sub-Saharan Africa - Regional Variations and Shifting Assemblages of Policy and Practice, Stellenbosch, South Africa. 17-18 March.

Visser, G.E. 2011. *The matter of representation in South African urban geographical and planning discourse*. Paper delivered at the Annual Meeting of the Association of American Geographers (AAG), Seattle, Washington, USA. 12-16 April.

Visser, G.E. 2011. *The moving gay ghetto: Transforming and relocating LGBTQ neighbourhoods in international perspective*. Paper delivered at the Political Geography/Sexuality and Space Pre-conference, University of Washington, Tacoma, USA. 10-11 April.

Visser, G.E. & Hoogendoorn, G. 2011. *Current paths in South African tourism research*. Paper delivered at the 2nd Tourism Educators South Africa (TESA) Student Conference and the 2011 STH Tourism and Hospitality Colloquium, University of Johannesburg, Johannesburg, South Africa. 13-14 September.

Visser, G.E. & Hoogendoorn, G. 2011. *Tourism, second homes and an emerging South African post-productivist countryside*. Paper delivered at the Regional Geographic Conference (UGI 2011) of the International Geographical Union (IGU), Military School, Santiago, Chile, USA. 14-18 November.

Contact details

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Main Campus:

Professors: Profs Peter Holmes and Gustav Visser

Senior Lecturers: Drs Charles Barker and Shirley Brooks

Lecturers: Mss Eldalize Kruger, Tobeka Mehlomakhulu and Sheila Vrahimis

Junior Lecturers: Mss Mulalo Rabumbulu, Aretha Steenekamp

QwaQwa Campus

Senior Lecturer: Dr Hennie Claassen

Lecturers: Mr Alex Adjei, Dr Geoffrey Mukwada and Ms Merle Naidoo

Junior Lecturer: Mr Pululu Mahasa



“The postgraduate Mineral Resource Management programme is becoming increasingly popular with 15 Magister students enrolling for 2011.”

– Prof. Willem van der Westhuizen

Department of Geology

Overview

Teaching and research activities continued unabated during 2011. A slight decrease in student numbers was evident as a result of the newly-implemented selection process. This practice has already provided evidence of an increase in the standard of students in the department. Selection will continue through all the years to raise the standards even higher. It is expected that student numbers will continue to decrease for the next two years after which numbers should remain constant. First year student numbers declined from 234 students (GLG114) in 2010 to 194 in 2011. Second year student numbers were 98 for GLG214 (89 in 2010) while third year numbers for GLG324 were 81 (64 in 2010). Honours students totalled 24 (29 in 2010).

The postgraduate Mineral Resource Management programme is becoming increasingly popular with 15 Magister students enrolling for 2011. Workshops were conducted at the Council for Geoscience in Pretoria. The following number of Geology degrees was conferred in 2011: 49 B.Sc., 26 B.Sc. (Honours), 4 M.Sc. and 4 MRM degrees. Graduates from this institution continue to be preferred by employers in the mining industry.

A new Panalytical X-ray diffractometer (XRD) was installed as part of the equipment replacement and purchasing strategy of the Faculty of Natural and Agricultural Sciences, replacing the previous XRD that gave excellent service over a period of 22 years.

Prof. Marian Tredoux contributed to the monthly column for Media24 published in the Saturday edition of *Die Burger*, Cape Town, under the title *Die wetenskap vandag*. During part of the second semester she was on sabbatical leave in Europe and while in Germany, presented a workshop entitled *The geochemistry of the platinum-group elements*, from 15-17 July at the Martin Luther University in Halle, which attracted a full complement of 15 participants from several German universities. Prof. Tredoux and M.Sc. student Ms B. Kennedy also participated in a workshop on platinum-group elements in Prague that was hosted by the Czech Geological Survey and the Society for Economic Geologists.

Dr Freddie Roelofse presented a popular lecture titled *The $M_w=9.0$ Tohoku earthquake and the wrath of the giant wriggling catfish* in the Department of Geology, University



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**Prof. Willem
van der Westhuizen**

Prof. Willem van der Westhuizen's field of research includes: Geology and geochemistry of ancient volcanic successions, Mineralogy and Mineral Resource Management.

of the Free State, on 24 March 2011. Due to popular demand the lecture was repeated at the Boyden Observatory, Bloemfontein, on 6 May 2011.

A student conference was held during November 2011 where postgraduate students presented their research results. Three alumni, Messrs N. Scholtz, H. Kennedy and Ms T. Lekgetlo also presented talks. Lecturing staff contributed to the proceedings by presenting talks on a variety of subjects.

Prof. C.D.K. Gauert gave two public lectures at the Natural History Museum, Berlin, Germany on the Critical Zone transition of the eastern Bushveld Complex and on Gold provenance of the Black Reef at the East Rand on 10 February 2011.

Research

Research during 2011 covered a variety of disciplines including mineralogical and geochemical characteristics of the Bushveld Igneous Complex, the largest layered complex in the world hosting massive platinum group element ore reserves. Other research areas covered were that of economic geology, including chrome deposits, gold and uranium, nickel, lithium and coal deposits, Witwatersrand gold deposits, kimberlites, clay mineralogy and geochemistry, sedimentology, basin analysis, gas occurrences in the Karoo, ancient volcanology, hydrogeochemistry and more. Research concerned with optimising the mining value chain is also building momentum, especially with the appointment of Dr Johann Claassen, formerly from Exxaro Mining Company.

The Inkaba research initiative, a German-South African collaborative programme, continued during 2011. The research in this programme covered a variety of topics from research concerning the platinum value chain to the occurrence of heavy metals relating to a number of factors in the arena of environmental geochemistry. Ms B. Kennedy visited the Steinmann Institute in Bonn, Germany during July/August and continued to the Goldschmidt Congress in Prague, Czech Republic. Mss Bianca Kennedy and Nequita McDonald also attended the 9th annual "Suid-Afrikaanse Studentesimposium" where both presented oral presentations on their recent research findings.

Visitors to the department

Prof. Becky Flowers from the University of Colorado presented a departmental talk entitled *Unroofing and uplift histories of cratonic plateaus and cratonic settings from apatite (U-Th)/He thermochronometry: examples from the Colorado Plateau, Canadian Shield and southern Africa* on the 2nd of August.

Prof. Wlady Altermann from the University of Pretoria visited the Department of Geology during January 2011 to discuss matters relating to economic geology with Prof. C. Gauert.

Prof. Johan Kruger, formerly from the Department of Geology, University of the Witwatersrand, presented lectures to the honours students on geochemistry and the interpretation of geochemical data.



Additional to the Inkaba meeting in Cape Town was a visit of the delegates to view granite exposures at Langebaan.



The Inkaba excursion visiting the fossil park at Langebaan.

Dr Michael Wiedenbeck, a leading expert in SIMS technology from the Geoforschungszentrum (GFZ) in Potsdam, Germany, gave a fascinating talk on SIMS technology on the 3rd of December 2011 in the Geology Department. He plans to set up a virtual SIMS laboratory in South Africa, which will be linked to a state-of-the-art, upgraded, Camecca 1280 HR SIMS instrument that the GFZ has recently purchased.

Dr Neil Anderse and Mr Junior Potgieter from GEX paid a number of visits to the Geology Department to discuss

matters relating to the fracking and extraction of gas from Karoo shales.

Staff members visiting abroad

Prof. C.D.K. Gauert conducted the following international visits: Natural History Museum, Berlin, Germany in October. In February he used the LA-ICP-MS at the Curt Engelhorn Centre for Archaeometry in Mannheim, Germany, and the sy-



Inkaba students on their way to a meeting in Cape Town.

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XRF at Karlsruhe Institute of Technology/ANKA, Germany for 5 days to determine trace elements in gold. During a visit to the Martin Luther University at Halle in Germany in June 2011 he had a meeting with Prof. Gregor Borg to discuss future cooperation with the Geology Department at UFS. Leoben in Austria was also included in his itinerary where potential cooperation with the mining academy was on the table.

He visited Chile and Peru, where he attended the Society for Geology Applied to Ore Deposits (SGA) Conference in Antofagasta, Chile, presented a talk in September 2011, attended an excursion to several mines (Li-salt, copper porphyries) and also visited an exploration company in Lima, Peru with a field trip to prospects in the mountains to investigate iron-oxide-copper-gold (IOCG) and Pb-Zn-Ag deposits.

Prof. Marian Tredoux spent three months in Germany, during which time she attended the prestigious Goldschmidt 2011 Congress in Prague during 14-19 August 2011 where she contributed two oral presentations and one poster. Three M.Sc.-students from the department also attended: Mss M. Purchase and J. Potgieter delivered oral presentations while Ms B. Kennedy contributed a poster presentation. Before the conference she visited the University of Leoben to discuss their joint research projects on the Bushveld complex with the platinum-group mineral experts Dr F. Zaccarini and Prof. G. Garuti.

While at the University of Halle, Prof. Tredoux paid visits to postgraduate students now resident in Germany (in Leipzig and Magdeburg) to discuss their research, started co-supervision of a M.Sc. student of Prof. G. Borg, and did field trips in the region to sample the local Kupferschifer

deposits. She also spent two days in Potsdam to discuss research related to the "Platinum value chain" project with co-workers from the Geoforschungszentrum (Potsdam), the University of Potsdam, the Technical University of Berlin and the German Geological Survey (Hannover).

Local conferences and workshops

The Colloquium on African Geology Congress 23, organised by the Geological Society of Africa, was held in Johannesburg from 8-14 January. Profs Tredoux, Gauert, Ms H. Pretorius, Mr A. Odendaal Ms M. du Plessis and students J.C. Ngaruye (Rwanda), B. Kennedy, M. Purchase, J. Clarke, N. Chabangu and K. Milanzi, attended the congress and presented oral presentations and posters. Prof. Tredoux also served as a panellist for a workshop about women in the geoscience workplace, which was organised for CAG23 by the organisation SAWISE (South African Women in Science and Engineering). Prof. Gauert led the 4-day Bushveld-Nkomati excursion with international scientists from Australia, France and Holland. Prof. Tredoux was co-leader (with Prof. M. Coetzee of the University of Northwest) of a field trip to the Vredefort impact structure.

The AMREP Workshop took place in February in Rustenburg with two excursions to the open pit/tailling dams at Impala Platinum and Anglo platinum mines. Profs Gauert and Tredoux as well as staff from the Physics and Chemistry Departments attended to discuss results to date (the presentations being given by UFS postgraduate students

from all 3 departments, who are doing the research) and plan for further cooperation with German scientists from GFZ-Potsdam, BGR-Hannover and the University of Hannover. Delegates of three SA Platinum companies were also present. A 3-day visit to the eastern Bushveld at Two Rivers Platinum and Nkwe Platinum mines with the German scientists was co-organised by Prof. Gauert. He also led the 4-day eastern Bushveld excursion with the international group from GFZ. Part of this excursion was also a visit to Anglo Platinum's Driekop Core Storage Facility together with UFS Honours students.

The Inkaba-8 meeting was held in Cape Town from 5 to 8 September, to coincide with the Geosynthesis 2011 meeting which was organised by SAGA (South African Geophysical Association). As has become standard at Inkaba meetings, the UFS contingent was the largest, and the Geology Department's group was the largest within it. Profs M. Tredoux and C.D.K. Gauert contributed oral presentations and both also chaired sessions during the meeting. The following students presented either oral presentations or posters: N. McDonald (oral and poster), N. Chabangu (oral), J. Clark (oral), B. Kennedy (oral), J. Beukes (oral), T. Legoale (oral), M. Dimick-Touw (oral), M. Shai (oral) and K. Milanzi.

Student excursions

The following student geological excursions took place during 2011.

During the first semester a number of excursions that form the GLG232 course were undertaken in the Bloemfontein area and at Austin's Post towards the eastern Free State to introduce students to the intricacies of field mapping techniques, aerial photographic interpretation, road cut mapping as well as core logging. Eighty-nine students participated in this course.

An economic geology excursion took place from 5 June until 15 June and, during this excursion, a total of ten mines were visited including the Kalgold Gold mine, Thabazimbi Iron Ore, Palaborwa Cu and Phosphate Mine, Black Reef Gold mine and platinum mines in the Bushveld Igneous Complex. Prof. C.D.K. Gauert and Mr A. Odendaal accompanied the students.

Three one day excursions (79 students) to Harmony Gold Mines were undertaken during August: Tsepong, Masimong and Phakisa shafts. Prof. C.D.K. Gauert led the excursions.

From 1-5 October Dr H.E. Praekelt, Messrs L. Nel, A. Odendaal and Ms M du Plessis accompanied the second year students (GLG202) on the annual field school to Barkly East. The students had instruction in field mapping, geological observations, section drawing, sedimentary and volcanological interpretations and report writing. Seventy-eight students attended the excursion.

Second semester first year students (GLG124) were split into two groups and each group attended a one day field school in the Jagersfontein area in the southern Free State on the 14th and 15th October.



Megan Purchase, M.Sc. student, next to a spiral on a visit to the Mint.

Prof. Tredoux and Dr Roelofse accompanied a group of 57 students to the Vredefort Impact Structure to instruct them on impact related aspects as well as metamorphic/igneous petrology and geochemistry (15-16 April).

Structural Geology honours students under the leadership of Prof. Wayne Colliston, undertook their yearly underground mapping school to Harmony Gold's Tsepong Mine from 21 to 25 March.

Interaction with industry

Samancor Chrome - Eastern Chrome Mine, Xstrata Alloys Kroondal, African Rainbow minerals/Nkomati Mine, Norilsk Nickel, Dt. Rohstoff AG, Two Rivers Platinum (Impala), Great Basin Mines, Rand Uranium, Gold One, Harmony Gold Mines, Xstrata and Exxaro.

The following M.Sc.-students graduated during 2011

1. Lombard, A.: *A mineralogical and geochemical study of seven meteorites from Malawi, Namibia and Lesotho.*
2. Netshitungulwana, R.N.: *An investigation of the trace element composition of gold from Zimbabwe and South Africa: Implications for tracing the source of archaeological gold artefacts.*
3. Pecher, M-L.: *Field relationships and petro-chemical investigation of mafic sills and dykes in the vicinity of the Uitkomst Complex, Mpumalanga, South Africa.*
4. Potgieter, J.: *Volatiles around two dimensional defect structures in the diamond window as indicated by micro-diamonds in decompression cracks.*
5. Ngaruye, J-C.: *Petrographic and geochemical investigation of Sn - W - Nb - Ta - pegmatites and mineralized quartz veins in south-eastern Rwanda.*

Magister in Mineral Resource Management

1. Birch, C.
2. Coffee, P.
3. Mashao, M.
4. Vorster, W.

Community Service

EarthWISE report 2011

A. EarthWISE activities 2011

1. **23rd Colloquium of African Geology and Young Earth Scientists (YES) symposium (8 – 14 January)**
EarthWISE attended CAG23 and had a poster entitled: *Geotourism and its place in Africa's future.*
2. **SciFest Africa in Grahamstown (4 – 10 May)**
EarthWISE assisted the science exhibition of the Faculty of Natural and Agricultural Sciences, UFS at the annual SciFest in Grahamstown. The theme of the festival was *Science Across Nations* and the Faculty's theme was *Crime Scene: Do Not Cross*. EarthWISE and the Department of Geology contributed by adding a forensic geology section to the interactive exhibition.
3. **ScienceUnlimited Express in Bloemfontein (22 – 24 March)**
EarthWISE partook in the Science Unlimited Express and the coordinator had a presentation entitled: *Whoa! My continent is moving!* and Ms Megan Purchase (Department of Geology) had a presentation entitled: *The Story beneath our Feet*. Both of these presentations were given multiple times to Grade 6 – 9 learners from different schools. The coordinator also had a presentation entitled *Whoa! My continent is moving* for educators.



EarthWISE coordinator (Marika du Plessis) playing the role of a forensic geologist at the SciFest festival.

4. **“Tohoku Earthquake: Japan’s day of terror” & “Are we at risk with nuclear after the Fukushima incident?” (24 March)**

In the aftermath of the massive Tohoku earthquake on 11 March 2011, EarthWISE and the Department of Physics organized a public lecture on this event. The speakers were Dr F. Roelofse (Geology) and Dr John Prior (nuclear specialist, NECSA).

5. **First Science & Technology Train and Space Geodesy Observatory Workshop, Matjiesfontein (28 March – 1 April)**

EarthWISE attended the abovementioned workshop and would actively want to participate in the future endeavours.

6. **Kovsie Open Day, University of the Free State, Bloemfontein (2 May)**

EarthWISE organized the interactive exhibition to encourage learners to study geology.

7. **Science Adventure Camp in Bloemfontein (7 – 9 July)**

Held as a marketing event by the Faculty of Natural and Agricultural Sciences, the top grade 12 achievers from different high schools in the Free State were invited. During this camp several life sciences, physical science and space science activities and presentations were given. EarthWISE assisted by organizing a geology representative to partake in this camp.

8. Sasol TechnoX Science Exhibition in Sasolburg (16 – 19 August)

EarthWISE assisted the science exhibition of the Faculty of Natural and Agricultural Sciences, UFS at the annual TechnoX festival.

9. Science Day, De Aar (25 October)

The CED presented EarthWISE the opportunity to organize this year's Science Day at De Aar High School. The coordinator arranged 8 science presenters and a marketing manager to participate in this day and presented to around 300 learners.

10. Inkaba yeAfrica Workshop in Cape Town (28 Augustus – 2 September).

The coordinator attended this workshop and had a poster presentation entitled: *EarthWISE community outreach – the future is bright!*

11. 6th Science Centre World Congress, Cape Town (4 – 8 September)

EarthWISE coordinator attended the above mentioned congress.

B. Ongoing plans and future developments

1. EarthWISE website

EarthWISE and Riptide cc is in progress of developing an informative earth science website for learners and educators.

2. EarthWISE – “taking science to the people”

EarthWISE in collaboration with the Science & Technology Train is in progress of establishing a mobile science centre.

3. Geotourism

Exposing tourists to the geological wonders of our beautiful country.

4. Minquiz 2012

EarthWISE will organize the Free State provincial part of the Minquiz 2012 annual science competition.

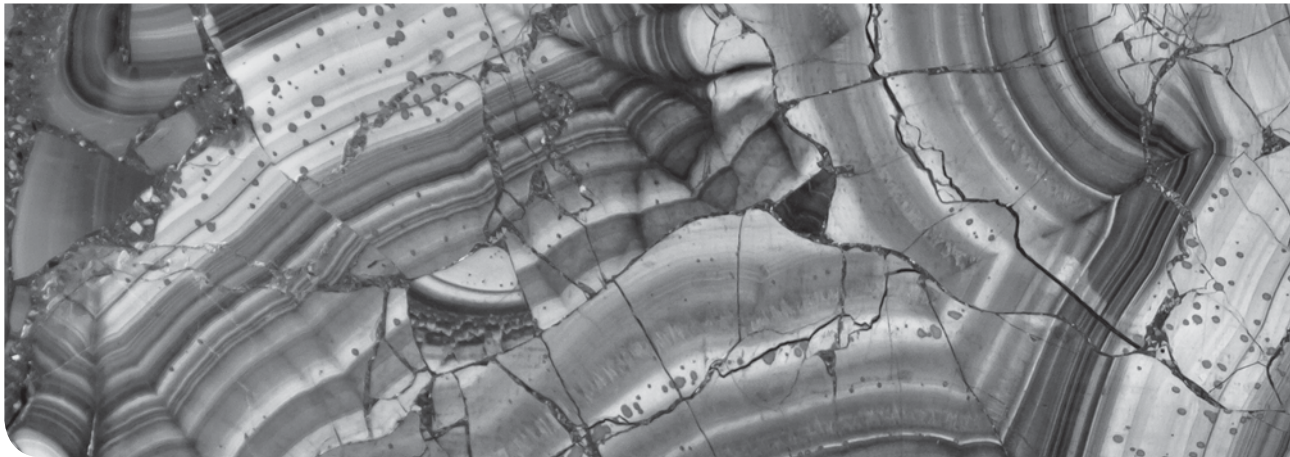
5. Drakensberg talk, Eunice high school

EarthWISE was asked by Eunice high school, Bloemfontein, to present a talk on the geology of the Drakensberg (including the Amphitheatre and Mount-Aux-Sources).



Research Outputs

Department of Geology



Research articles

Gauert, C., Batchelor, D., Fuchs, S. & Kloess, G. 2011. *Black Reef and Witwatersrand Gold fingerprints, South Africa.* *Mineralogical Magazine* 75(3): 897. (Abstract only).

Kennedy, B., Tredoux, M., Ballhaus, C., Steyl, G., Helmy, H.M., Swart, H.C. & Coetsee, E. 2011. Studying possible PGE nano-structures in magmatic systems, using synthetic sulphide melts. *Mineralogical Magazine* 75(3): 1169. (Abstract only).

Rantzsch, U., Gauert, C.D.K., Van der Westhuizen, W.A., Duhamel, I. & Cuney, M. 2011. Mineral chemical study of U-bearing minerals from the Dominion Reefs, South Africa. *Mineralium Deposita* 46: 187-196.

Reisberg, L., Tredoux, M. & Harris, C. 2011. Re and Os distribution and Os isotope composition of the Platreef at the Sandsloot-Mogolakwena mine, Bushveld complex, South Africa. *Chemical Geology* 281: 352-363.

Roelofse, T. & Roelofse, F. 2011. On the occurrence of loughlinite (Nasepiolite) in pans of the Northern Cape Province, South Africa. *South African Journal of Geology* 114: 201-206.

Sommer, H. & Gauert, C. 2011. Hydrating laterally extensive regions of continental lithosphere by flat subduction: A pilot study from the North American Cordillera. *Journal of Geodynamics* 51: 17-24.

Tredoux, M., Zaccarini, F., Garuti, G., Kotke-Levin, J. & Gauert, C. 2011. Geochemistry and PGE mineralogy of chromitite seams of the eastern Bushveld complex, South Africa. *Mineralogical Magazine* 75(3): 2030. (Abstract only).

Wildau, A., Williams-Jones, A. & Tredoux, M. 2011. Hydrothermal mechanisms in the Bon Accord Ni-oxide body, Barberton, Republic of South Africa. *Mineralogical Magazine* 75(3): 2159. (Abstract only).

Research report

Mei, T. & Tredoux, M. 2011. *Toxicity effects of tungsten, molybdenum and copper on the environment at the Tweedam tungsten mine, Namaqualand, South Africa.* Report prepared for the Department of Mining of the Northern Cape Province, South Africa.

Conference contributions

Ashwal, L.D., Roelofse, F. & Webb, S.J. 2011. *Construction of the Bushveld Complex by repeated intrusion of crystal-rich magmas.*

Paper presented at Geosynthesis 2011, integrating the Earth Sciences Conference & Exhibition, during the 8th Annual Inkaba yeAfrica (IyA) Workshop, Cape Town International Conference Center, Cape Town, South Africa. 28 August – 2 September.

Chabangu, N., Tredoux, M. & Madala, F. 2011. *An investigation of nickel mineralization in the northwestern part of the Barberton Greenstone Belt, South Africa.* Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 69.

Clark, J.H.A., Tredoux, M. & Van Huyssteen, C.W. 2011. *The environmental geochemistry of mercury in Bloemfontein, South Africa.* Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 80.

Gauert, C. 2011. *Chemical fingerprinting of Black Reef Conglomerate Gold at the West and East Rand, South Africa.* Paper presented at Geosynthesis 2011, integrating the Earth Sciences Conference & Exhibition, during the 8th Annual Inkaba yeAfrica (IyA) Workshop, Cape Town International Conference Center, Cape Town, South Africa. 28 August – 2 September.

Gauert, C. & Roettger, S. 2011. *Mineral provenance aspects of the Black Reef conglomerate in the East and (far) West Rand areas.* Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 4.

Gauert, C., Brauns, M., Batchelor, D. & Simon, R. 2011. *Gold Provenance of the Black Reef Conglomerate, West and East Rand, South Africa.* Proceedings of the 11th Biennial Meeting and Conference of the Society of Geology Applied to Mineral Deposits (SGA2011): Geochemistry of ore deposits, Antofagasta, Chile. 26-29 September. pp. 232-234.

Gauert, C.D.K. & Mphatse, C.T. 2011. *Genetic aspects of the PGE-bearing Mg chromitite layers of the Bushveld Complex – PGE ore bodies of the future?* Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 154.

Kennedy, B. & Tredoux, M. 2011. *The behaviour of platinum group elements (PGE) in synthetic sulphide melts.* Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 216.

Legoale, T., Tredoux, M. & Roelofse, F. 2011. *Degree of nickel weathering from Vredefort komatiites and possible influence on*

adjacent soils. Paper presented at the Inkaba Workshop of the Geosynthesis 2011, integrating the Earth Sciences Conference & Exhibition, during the 8th Annual Inkaba yeAfrica (IYA) Workshop, Cape Town International Conference Center, Cape Town, South Africa. 28 August – 2 September.

Ngaruye, J.C. & Gauert, C. 2011. *Ta (-Au) mineralizations in the mineral deposits of eastern Rwanda*. Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 302.

Ngaruye, J.C. & Gauert, C.D.K. 2011. *Metallogenetic aspects of Sn-W-Nb-Ta (-Au) mineralizations in the mineral deposits of eastern Rwanda*. Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 203.

Pecher, M.-L. & Gauert, C.D.K. 2011. *Petro-chemical investigation of (ultra-) mafic sills in the vicinity of the Uitkomst Complex, Mpumalanga, South Africa*. Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 331.

Pretorius, H.C.F., Andreoli, M.A.G., Tredoux, M. & Vermeulen, D. 2011. *Natural radionuclides in groundwater from Vaalputs, Namaqualand, South Africa*. Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 342.

Purchase, D.M., Sommer, H., Regenauer-Lieb, K., Gasharova, B. & Potgieter, J. 2011. *Water around two-dimensional defect structures coexistent with melt inclusions in garnets from peridotites from*

Bultfontein, south (UNESCO IGCP 557). Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 343.

Roelofse, F. & Ashwal, L.D. 2011. *The Lower Main Zone, northern limb, Bushveld Complex: product of mush emplacement?* Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 352.

Shaat, S.K.K., Roelofse, F., Swart, H.C. & Ntwaeaborwa, O.M. 2011. *Synthesis and photoluminescence properties of Tb³⁺-doped Sr_{0.5}Zn_{0.5}Al₂O₄ phosphor prepared via combustion process*. Proceedings of the 56th Annual Conference of the South African Institute of Physics (SAIP2011), UNISA, Pretoria, South Africa. 12-16 July. pp. 285-290.

Sommer, H. & Gauert, C. 2011. *Hydrating laterally extensive regions of continental lithosphere by flat subduction (UNESCO IGCP 557)*. Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 371.

Tredoux, M., Wildau, A., Miller, D., Cloete, M., Zaccarini, F. & Garuti, G. 2011. *Micro-phases in a Ni-rich rock type from an Archean ophiolite, South Africa*. Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 401.

Van der Westhuizen, W.A., Grobler, J., Gauert, C.D.K. & Viljoen, S. 2011. *Ultra high pressure waterjet cutting: The future of deep Gold mining?* Proceedings of the 23rd Colloquium on African Geology (CAG23), University of Johannesburg, South Africa. 8-14 January. p. 413.

Contact details

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EarthWise-officer: Ms Marike du Plessis

Affiliated Lecturers: Prof. Gerhard Beukes, Messrs André Dunne, Johann Grobler, Derek Hall, Ian Hunt, PG Laurens, Ron Vrijens, Adrian Paine, Philip Viljoen

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Officer: Professional Services: Mr Peet Roodt

Assistant Officer: Mr Jonas Choane

Technical Officer: Mr Daniël Radikgomo

“The department finished the year with a new record in publication outputs.”

– Prof. Robert Schall

Department of **Mathematical Statistics and Actuarial Science**

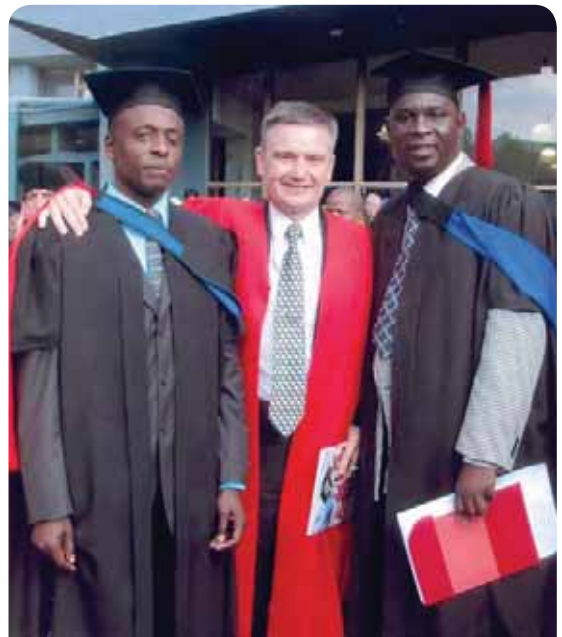
Overview

The Department of Mathematical Statistics and Actuarial Science has about 4 000 undergraduate and 40 postgraduate students. The Actuarial programme is accredited (Level 2) with the Actuarial Society of South Africa under a mutual recognition agreement with the Institute of Actuaries in the United Kingdom.

Departmental activities and achievements

The department finished the year with a new record in publication outputs.

The department received several national and international visitors, among them Professors Jan Dhaene (CU Louvain) and Pieter van Gelder (TU Delft), both of whom presented lectures at the annual *Workshop on Applications of Statistics and Probability in Energy, Finance and Actuarial Science*, hosted by the Department in March 2011. The workshop was organised by Mr Frans Koning, leader of the department's Actuarial Programme.



Knowledge Chinhamu, winner of the Chancellor's medal for the best Master's degree student at the University of the Free State, with Prof. Robert Schall and fellow Master's graduate in Statistics, Retius Chifurira.

A 3D bar chart with several orange bars of varying heights, set against a dark orange background with a grid of thin lines. A green square with rounded corners is positioned on the left side, containing the white number '14'.

14



Prof. Robert Schall

Prof. Robert Schall's area of expertise lies in Bioequivalence, Biostatistics, Categorical Data Analysis, Generalized Linear Models, Mixed Models, Pharmacokinetics and Statistical Consultation.

Prof. Abrie van der Merwe and Dr Delson Chikobvu won the prestigious Herbert Sichel medal for their paper "A process capability index for averages of observations from new batches in the case of the balanced random effects model" that appeared in the *Journal of Statistical Planning and Inference* in 2010. The Herbert Sichel Medal is awarded annually by the South African Statistical Association for the best paper published by a member of the association.

Mr Morné Sjölander, lecturer in the department, handed in his Ph.D. for examination and is to graduate in April 2012.

Dirk Bester, Honours graduate in Actuarial Science, won both the Dean's medal as the best Honours degree student at the Faculty of Natural and Agricultural Sciences, and the Chancellor's Medal for the best Honours degree student at the University of the Free State.

Knowledge Chinhamu, a Master's student of Dr Delson Chikobvu, was the winner of the S_2A_3 medal for original research at Master's level (Dean's Medal of the Faculty of Natural and Agricultural Sciences), and of the Chancellor's Medal for the best Master's degree student at the University of the Free State.

Two first year students in Actuarial Science, Mbongeleni Dlamini and Bongani Msimango won bursaries sponsored by *Hannover Reinsurance Group* which comprehensively cover the costs of their studies through to Honours level. Both bursaries on offer countrywide were awarded to UFS students.

Staff members were involved in several national and international collaborative research projects:

Prof. Max Finkelstein, an international authority in the area of mathematical reliability, gave two invited talks at the MMR2011 (Mathematical Methods in Reliability) Conference in Beijing, China (20 - 24 June, 2011). One talk was on *Burn-in in mixed populations*, and the second on *Warranty for products with burn-in*. Furthermore, Prof. Finkelstein was a visiting researcher at the Max Planck Institute for Demographic Research in Rostock, Germany (15 July - 30 August, 2011) where he presented a lecture on *Ordered Subpopulations and Population Mortality at Advanced Ages*. He also paid research visits to the St. Petersburg Elektropribor Institute, Russia (4 - 24 December 2011) and presented a short course of lectures on reliability of large systems. Prof. Finkelstein is the editor of the *South African Statistical Journal*.

Mr Frans Koning was invited to Al Neelain University in Khartoum, Sudan (April 2011), to audit the Local Actuarial Programme and present a series of lectures.

Prof. Daan de Waal and his research group continued their work on risk in the energy market, a project funded by Eskom. Research concentrated on the modelling and prediction of rainfall and inflow into the Gariiep Dam. The research is relevant to the optimisation of hydroelectric power generation by Eskom. Prof. De Waal presented invited lectures at the *Conference in Honour of Prof. M. Goovart*, Catholic University of Louvain, June 2011, and at the *Workshop on Forecasting*



Departmental staff.

and Modelling in Energy and Finance organized by the NMMU, Port Elizabeth, October 2011.

Prof. Abrie van der Merwe continued his research on Bayesian methods in quality control, random effects models and linear and non-linear functions of parameters of the

binomial and Poisson distributions. Prof. Van der Merwe supervised a large number of Master's and several Ph.D. students based at other South African universities. Three of Prof. Van der Merwe's Ph.D. students were ready to hand in their dissertations for examination by the end of 2011.



Postgraduate students in the department.

Prof. Robert Schall is a statistical consultant to Quintiles, an international clinical contract research organisation, and to Boehringer Ingelheim, an international pharmaceutical company. Prof. Schall's research is in the area of clinical trials and biostatistics, in particular on the statistical modelling and analysis of electrocardiographic data. Prof. Schall and his co-worker, Dr Arne Ring of Boehringer Ingelheim (now Oxford

University), were invited to present two invited papers at the *International Symposium on Biopharmaceutical Statistics* in Berlin, Germany, in March 2011. Prof. Schall also was invited to present a lecture at Boehringer Ingelheim's "Colloquium on TQT Studies" in Biberach, Germany, in March 2011.

Prof. Schall serves as an Associate Editor of the *South African Statistical Journal*.

Research **Outputs**

Department of Mathematical Statistics and Actuarial Science

Research articles

Cha, J.H. & Finkelstein, M.S. 2011. Burn-in and performance quality measures in heterogeneous populations. *European Journal of Operational Research* 210: 273-280.

Cha, J.H. & Finkelstein, M.S. 2011. Burn-in for systems operating in the environment with shocks. *IEEE Transactions on Reliability* 60: N4.

Cha, J.H. & Finkelstein, M.S. 2011. On new classes of extreme shock models and some generalizations. *Journal of Applied Probability* 48: 258-270.

Cha, J.H. & Finkelstein, M.S. 2011. On stochastic models for accelerated burn-in procedure. *International Journal of Applied Mathematics and Statistics* 24: 1-11.

Cha, J.H. & Finkelstein, M.S. 2011. Stochastic intensity for minimal repairs in heterogeneous populations. *Journal of Applied Probability* 48: 868-876.

De Waal, D.J., Bekker, S.J. & Pretorius, J.H. 2011. Modeling inflows to Gariep Dam. *South African Statistical Journal* 45: 135-147.

Finkelstein, M.S. 2011. On the rate of aging in heterogeneous populations. *Mathematical Biosciences* 232: 20-23.

Janse van Rensburg, E., Tait, K., Watt, A. & Schall, R. 2011. Comparative Evaluation of the Roche Cobas AmpliPrep/Cobas TaqMan HIV-1 Version 2 Test using the TaqMan 48 Analyzer (CAP/CTM-48 v2) and the Abbott Real Time HIV-1 Assay. *Journal of Clinical Microbiology* 49: 377-379.

Missov, T.I. & Finkelstein, M.S. 2011. Admissible mixing distributions for a general class of mixture survival models with known asymptotics. *Theoretical Population Biology* 80: 64-70.

Raubenheimer, L. & Van der Merwe, A.J. 2011. Bayesian estimation of functions of binomial rates. *South African Statistical Journal* 45: 41-64.

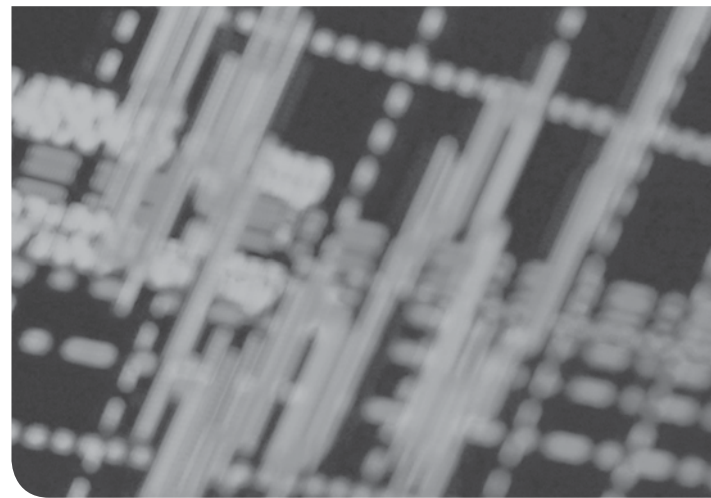
Schall, R. 2011. Mixed models for data from thorough QT studies: Part 2. One-step assessment of conditional QT prolongation. *Pharmaceutical Statistics* 10: 293-301.

Schall, R. & Ring, A. 2011. Mixed models for data from thorough QT studies: Part 1. Assessment of marginal QT prolongation. *Pharmaceutical Statistics* 10: 265-276.

Schall, R. & Luus, H.G. 2011. Comparative evaluation of ectoparasiticide efficacy: Non-inferiority and superiority assessment. *Veterinary Parasitology* 178: 173-179.

Shafiee, M., Finkelstein, M.S. & Chukova, S. 2011. Burn-in and imperfect preventive maintenance strategies for warranted products. *Journal of Risk and Reliability* 225: 211-216.

Shafiee, M., Finkelstein, M.S. & Chukova, S. 2011. On optimal upgrade level for used products under given cost structures. *Reliability Engineering and System Safety* 96: 286-291.



Sigauke, C. & Chikobvu, D. 2011. Prediction of daily peak electricity demand in South Africa using volatility forecasting models. *Energy Economics* 33: 882-888.

Van der Merwe, L. & Wilkinson, A. 2011. Mapping the field of statistics education research in search of scholarship. *International Journal for the Scholarship of Teaching and Learning* 5(1).

Van Zyl, J.M. 2011. Application of the Kolmogorov-Smirnov test to estimate the threshold when estimating the extreme value index. *Communications in Statistics: Simulation and Computation* 40: 211-219.

Van Zyl, J.M. 2011. The Laplace likelihood ratio test for heteroscedasticity. *International Journal of Mathematics and Mathematical Sciences*: Article ID 249564.

Verster, A. & De Waal, D.J. 2011. A method for choosing an optimum threshold if the underlying distribution is Generalized Burr-Gamma. *South African Statistical Journal* 45: 273-292.

Conference contributions

Du Plessis, E. & Van der Merwe, A.J. 2011. A comparison between Bayesian and generalized variable methods for interval estimation of the common mean of several normal populations. Proceedings of the 53rd Annual Conference of the South African Statistical Association (SASA), CSIR International Convention Centre, Pretoria, South Africa. 31 October - 4 November. pp. 1-9.

Du Plessis, E. & Van der Merwe, A.J. 2011. *Bayesian estimation of the ratio and product of two Poisson rates*. Proceedings of the 53rd Annual Conference of the South African Statistical Association (SASA), CSIR International Convention Centre, Pretoria, South Africa. 31 October – 4 November. pp. 88–99.

Koning, F.F. 2011. *Analyzing non-linear time series with varying volatility and extreme clusters*. Paper delivered at the Memorable Actuarial Research Conference (MARC), Louvain, Belgium. 13 June.

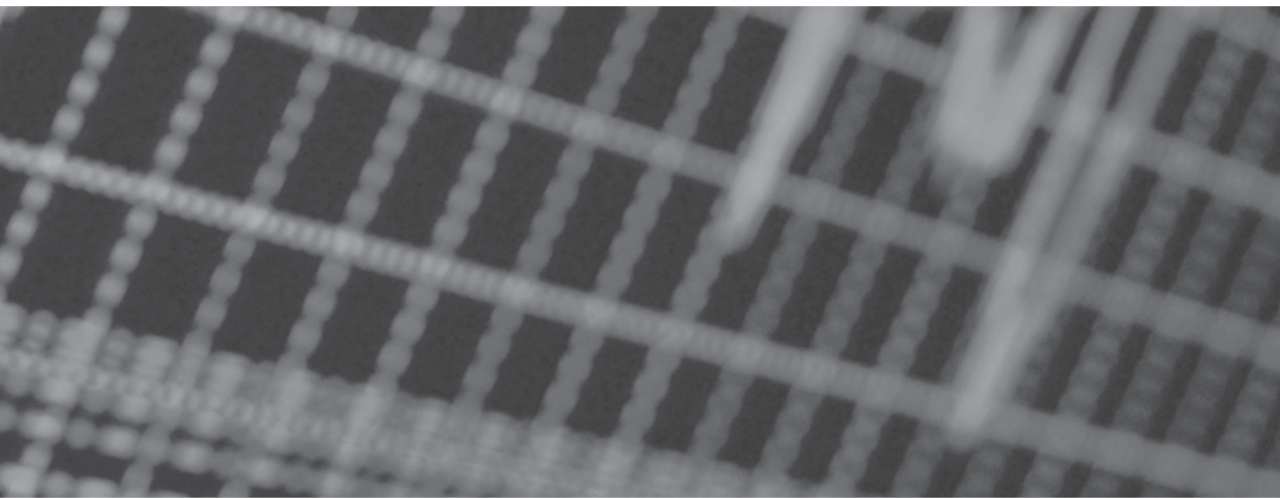
Koning, F.F. 2011. *Analyzing non-linear time series with varying volatility and extreme clusters*. Paper delivered at the 15th Insurance Mathematics and Economics (IME) Conference, Trieste, Italy. 14–17 June.

Koning, F.F. 2011. *Hedging annuities and assurances the natural way – A new approach*. Paper delivered at the 15th Insurance Mathematics and Economics (IME) Conference, Trieste, Italy. 14–17 June.

Koning, F.F. 2011. *Investigation of hedging strategies between assurances and annuities for the purpose of mitigating longevity risk*. Paper delivered at the 40th ASTIN & AFIR Colloquia, Madrid, Spain. 19–22 June.

Raubenheimer, L. & Van der Merwe, A.J. 2011. *Bayesian estimation of the product of binomial proportions*. Paper delivered at the Hierarchical Models and Markov Chain Monte Carlo Conference (in Honour of Adrian F.M. Smith), Crete, Greece. 2–5 June.

Sigauke, C. & Chikobvu, D. 2011. *Modeling daily peak electricity load forecasting in South Africa using a multivariate non-parametric regression approach*. Paper delivered at the 19th Triennial Conference for the International Federation of Operational Research Societies (IFORS), Melbourne Convention and Exhibition Centre, Melbourne, Australia. 10–15 July.



Contact details

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Senior Lecturers: Ms Linda van der Merwe, Mr Frans Koning, Dr Martin van Zyl

Lecturers: Drs Andréhette Verster, Delson Chikobvu; Mss Elizabeth Girmay, Zani Ludick, Wallina Oosthuizen; Messrs Dries Naudé, Morné Sjölander, Sean van der Merwe, Michael von Maltitz

Part-time Lecturers and Research Assistants: Dr Ariane Neethling; Mss Elzanne du Plessis, Trudie Schutte; Messrs Stefan Britz, Rohan Fraser, Rodrigue Gnitchogna, Charl Marais

Secretary: Ms Elize Mathee

Assistant Officer: Ms Ella Hayes

Messenger: Mr William Baranye

“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 that are interested in Mathematics Olympiads.”

– Prof. Johan Meyer

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 on the applicable side of Mathematics. Students that finish their studies in our department typically obtain the degrees B.Sc., B.Com. and sometimes even B.A. We also offer service modules to many students that study in other scientific directions, such as Biology.

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 that are interested in the Mathematics Olympiads.

Activities and achievements

Prof. J.H. Meyer continued his research by visiting a colleague in Hungary, as well as a colleague and Ph.D. student at NMMU in Port Elizabeth. He also received a visit from a former Ph.D. student to continue further research that results from the student's dissertation. Two research papers (one of which is already accepted for publication) were written

thanks to these visits. Furthermore, Prof. Meyer was closely involved (as in the past 20 years) with the training and set of papers with respect to Mathematics Olympiads, nationally and internationally. He also reviewed several papers for *Zentralblatt Math* (published by Springer).

Dr S. Dorfling collaborated with Dr M.J. Dorfling in the area of graph theory and a paper *Graph colourings with forbidden k-coloured subgraphs*, was submitted for publication.

Prof. T.M. Acho was appointed as external examiner for a Master's student at the University of the Witwatersrand. He also acted as external examiner for certain modules presented at the Central University of Technology. Furthermore, he reviewed four papers for the *American Mathematical Society Math Review* database.

Prof. J. Schröder took part in a research project with respect to numbers and transformations, Kirchhoff's laws and combinatorial sums, continuous functions on products and elementary submodels. He was also a moderator of two Master's dissertations during his visit to the Freie Universität Berlin.

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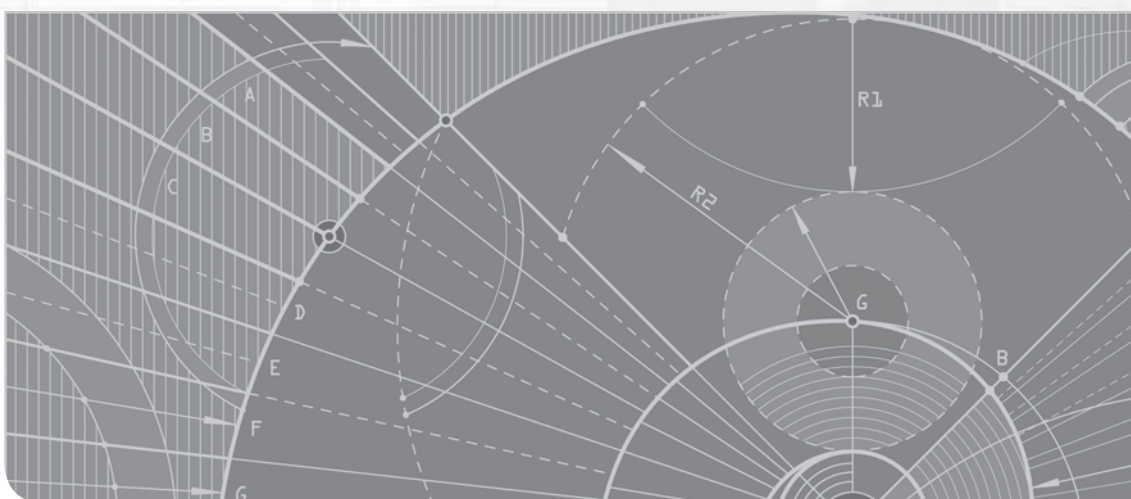
Prof. Johan Meyer

Prof. Johan Meyer's research includes Ring theory (matrices and homogeneous functions of ring modules) and Nearing theory (matrix nearings and group nearings).

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Research **Outputs**

Department of Mathematics and Applied Mathematics



Conference contributions

Acho, T.M. 2011. *Eigenfunctions and Eigenvalues for High Energy Resonance Contributing Operators*. Paper presented at the 7th International Congress on Industrial and Applied Mathematics (ICIAM), Vancouver Convention Centre, Vancouver, British-Columbia, Canada. 18-22 July.

Dorfling, S. 2011. *Graph colourings with forbidden k -coloured subgraphs*. Paper presented at the Joint International Congress of the American and South African Mathematical Societies (SAMS-AMS), NMMU, Port Elizabeth, South Africa. 29 November – 3 December.



Children taking part in the Interprovincial Mathematics Olympiad in 2011. Notice the fact that they do not use pocket calculators.

Meyer, J.H. 2011. *On polynomials and divisibility*. Paper presented at the Joint International Congress of the American and South African Mathematical Societies (SAMS-AMS), NMMU, Port Elizabeth, South Africa. 29 November – 3 December.

Meyer, J.H. 2011. *Recent developments in matrix nearings*. Invited plenary talk presented at the 22nd International Conference on Nearings, Nearfields, and Related Topics, Southeastern Louisiana University, Hammond, Louisiana, USA. 25-29 July.

Schröder, J. 2011. *The two-parameter class of invertible Schröder transformations*. Paper presented at Colloquium on Combinatorics/ Kolloquium über Kombinatorik (KolKom'11), Magdeburg, Germany. 11-12 November.

Schröder, J. 2011. *The two-parameter class of invertible Schröder transformations*. Paper presented at the Joint International Congress of the American and South African Mathematical Societies (SAMS-AMS), NMMU, Port Elizabeth, South Africa. 29 November – 3 December.

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Main campus

Professors: Profs Johan Meyer (chairperson), Alain Clout, Schalk Schoombie.

Associate professor: Prof. Thomas Acho

Senior lecturers: Dr Hubertus Bargenda, Ms Julia van Niekerk

Lecturers: Dr Samantha Dorfling, Ms Ansa Kleynhans, Mr Christiaan Venter

Temporary lecturers: Prof. Dana Murray, Mss Larisse Bolton, Elizabeth Viljoen, Magrietha Theron, Anita Swart, Annelie Litthauer, Marina Botha, Mr Jon Smit.

QwaQwa Campus

Associate professor: Prof. Jo Schröder (subject head)

Lecturer: Mr Patrick Mbambo

Junior lecturer: Ms Christa Faber

Temporary lecturer: Mr Nallapan Sebastian

“One of the major highlights of 2011 was undoubtedly the inauguration of the new undergraduate laboratory complex on 31 October by the Vice-Chancellor, Prof. Jonathan Jansen”

– Prof. James du Preez

Department of **Microbial, Biochemical and Food Biotechnology**

Overview

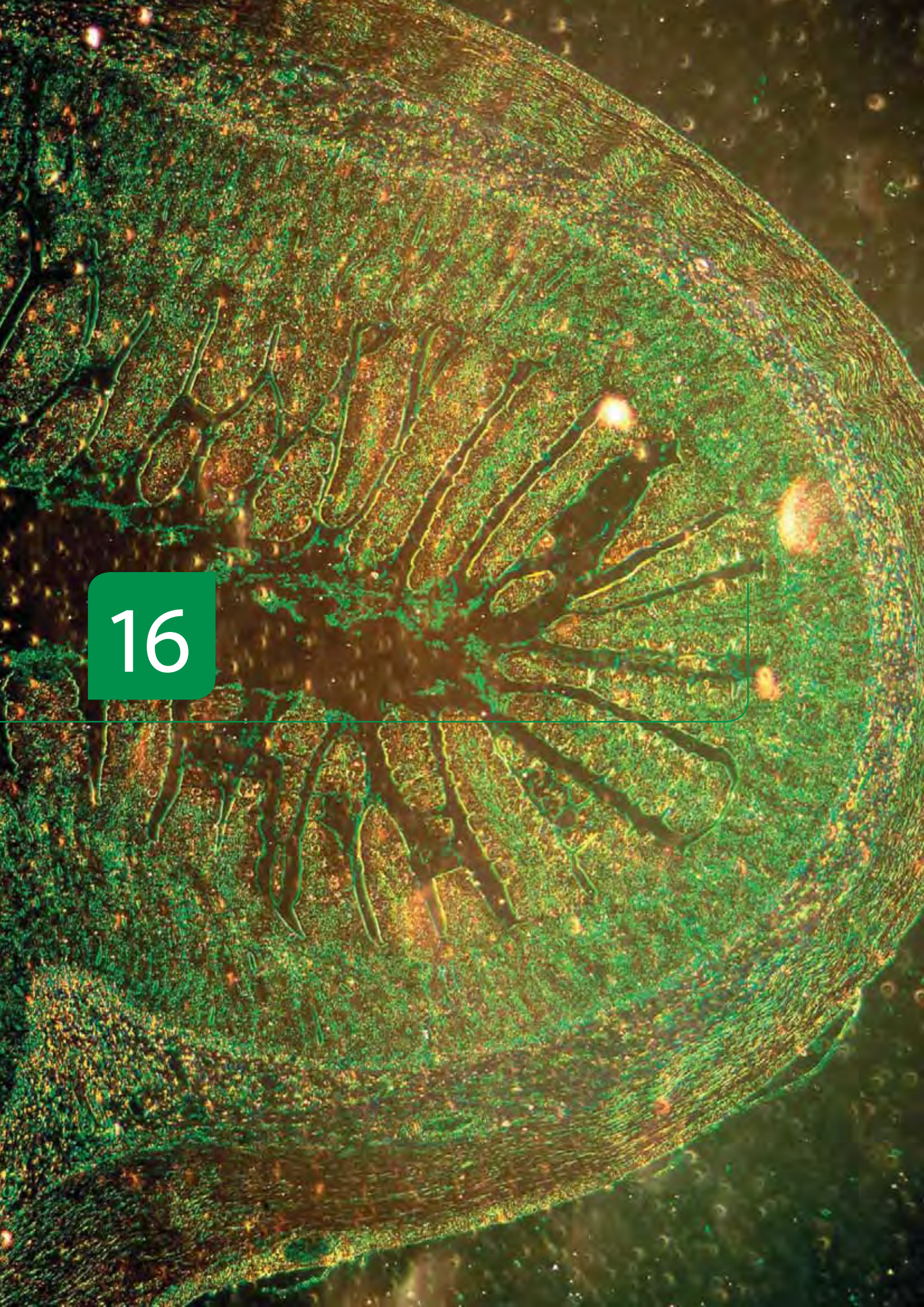
One of the major highlights of 2011 was undoubtedly the inauguration of the new undergraduate laboratory complex on 31 October by the Vice-Chancellor, Prof. Jonathan Jansen. The new building, adjacent to the existing Biotechnology building, comprises a third-year laboratory that can accommodate 120 students and a larger laboratory with 160 seats for first and second-year students. The latter laboratory can be divided into two smaller units so that up to three different practical sessions can be simultaneously hosted. Also part of the complex are a preparatory laboratory, a cold room, two incubation rooms, an autoclave room, a washroom as well as restroom facilities for students. Construction started in July 2010. The cost of the building project amounted to R15,9 million, of which R11,6 million was granted by the Department of Higher Education. These new laboratories were much needed to accommodate the large numbers of undergraduate biochemistry and microbiology students of the past few years. Funds are being sought to convert the old undergraduate laboratories to graduate research laboratories to relieve the current constraint of inadequate research laboratory space in the department.

Members of the department excelled in terms of research and published articles, as indicated below. Prof. Lodewyk Kock had an exceptional year, receiving several invitations to present keynote addresses in China, Greece and the USA (see below). This stemmed from the novel application of a new imaging nanotechnology for his research on yeast ultrastructure as well as medical research, i.e. Nano Scanning Auger Microscopy (NanoSAM) that can be used in conjunction with yeast bio-assays to search for new drugs.

The number of postgraduate degrees conferred in 2011 was 4 Ph.D, 10 M.Sc. and 15 B.Sc. Hons. degrees. A staff member also improved his academic qualifications: Dr. André van Tonder obtained his M.Sc. in Science Education at Unisa with distinction.

Activities and achievements

Several research articles from the department caught international attention. The work by a team under the leadership of Prof. Esta van Heerden of the Department's Extreme Biochemistry group and counterparts in Belgium and the USA was published in the June 2011 edition of the



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Prof. James du Preez

Prof. James du Preez has a special interest in continuous cultures, yeast physiology and the biotechnological application of microbial cells for the production of metabolites in submerged culture. His focus is on the effects of cultivation conditions on growth, product formation and microbial physiology and the quantification of these effects in terms of growth kinetic parameters.

prestigious academic journal *Nature* (*Nature* **474**: 79-82). At the head of the research was Prof. Gaetan Borgonie of Ghent University in Belgium, a world leader in the discipline of nematode research. The article titled *Nematoda from the terrestrial deep subsurface of South Africa* sheds more light on life - in the form of a small worm - under extreme conditions in deep hot mines. It was discovered 1,3 km under the surface of the earth in the Beatrix Gold Mine close to Welkom and is the first multi-cellular organism found so far beneath the surface of the earth. The worm (nematode) was discovered in a rock face that was between 3 000 and 12 000 years old. This research relates to the possibility of life on other planets, previously considered impossible under such extreme conditions. Other key role players and co-authors were Prof. T. C. Onstott (USA), Dr Antonio García-Moyano (a former postdoctoral fellow of the Metagenomics Platform), Prof. Derek Litthauer and postgraduate students Armand Bester, Mariana Erasmus and Christelle van Rooyen.

FEMS Yeast Research, which is the top international journal in this field of research, recently announced their three "most read articles" of 2011, based on the number of downloads from their website. Of these three published papers, two were from the Department: The article titled *The yeast Saccharomyces cerevisiae - the main character in beer brewing* was authored by Prof. Bettie Lodolo and Mr Martin Brooks (Brewing Consultant and Chief Brewer of the SAB Ltd. Brewing Centre of Excellence in Alrode, Johannesburg, respectively), Prof. Lodewyk Kock (Department of Microbial, Biochemical and Food Biotechnology) and Prof. Barry Axcell

(Global Chief Brewer, SABMiller, Sandton). Prof. Lodolo also is an Affiliated Professor in the Department. The authors of the second paper titled *The alcohol dehydrogenases of Saccharomyces cerevisiae: a comprehensive review*, were Dr. Olga de Smidt (researcher at the Central University of Technology and a former Ph.D. student of the Department), Prof. Koos Albertyn and Prof. James du Preez.

The research of the Lipid Biotechnology research group under the leadership of Prof. Lodewyk Kock on yeast spore movement in micron space, as well as related research on yeast lipids and nanobiotechnology, also received international recognition. Prof. Kock was invited to publish a chapter and review on his research in a highly accredited book series on yeasts (*The Yeasts: A Taxonomic Study*, 5th Ed.) and a medical journal, *Expert Opinion*, respectively. He presented this work on invitation in video e-conference format on the lecture website of the *Journal of Translational Biomedicine* (<http://vimeo.com/21056636>). His research was also applied to the benefit of the community and formed part of an investigative journalism TV program presented by Carte Blanche. Prof. Kock was elected Honourable Guest and Host of the Opening Ceremony of the 2nd World Congress on Biotechnology, held in Philadelphia, USA. He was awarded the Dean's Medal for Research at the end of the year function of the Faculty of Natural and Agricultural Sciences.

Prof. Celia Hugo was invited by the Bergery's Manual Trust to co-author a chapter in the authoritative *Bergery's Manual of Systematic Bacteriology* together with two international leaders on the taxonomy of *Chryseobacterium*. This chapter was published during 2011.



Profs Jonathan Jansen (vice-chancellor), James du Preez (head of department), Corli Witthuhn (vice-dean) and Neil Heideman (dean) at the inauguration of the new undergraduate laboratories.



The new undergraduate laboratories: before start of construction (top) and at completion (bottom).

A second living organism has been named after Bloemfontein. In an article in the highly acclaimed scientific journal, *International Journal of Systematic and Evolutionary Microbiology* (vol. 61, pp 2320–2327), Dr Carlien Pohl-Albertyn, Prof. Martie Smit and Prof. Koos Albertyn describe four new yeast species, one of which is named after Bloemfontein. This species, isolated from pine needles from Bloemfontein, was named *Rhodotorula bloemfonteinensis*. ‘Rhodo’ refers to the reddish colour of this type of yeast. This yeast is only the second living organism to be named after Bloemfontein. (The other is a mite, *Pilogalumna bloemfonteinensis*, which was described in 1972.) These isolates were added to the UNESCO MIRCEN yeast culture collection of the Department, which is the largest yeast culture collection in the southern hemisphere. Dr Pohl-Albertyn received the Faculty award for research at the end of the year function of the Faculty of Natural and Agricultural Sciences.

An international workshop entitled ‘New horizons for international investigations into carbon cycling in the deep crustal biosphere’ was hosted by the Extreme Biochemistry group on campus from 18 - 23 January. The purpose of the workshop was to discuss microbiological, biochemical and geochemical research related to the deep subsurface biosphere. This workshop was sponsored by the *Deep Carbon Observatory* (<http://dco.gl.ciw.edu/>) and brought together scientists from Canada, Germany, Belgium, Switzerland, Japan, China, the United States and South Africa to explore new approaches for retrieving geochemical, isotopic, metagenomic, transcriptomic, metabolomic and proteomic information from the deep subsurface biosphere where cell concentrations and metabolic rates are very low. The delegates also explored one of the deep terrestrial biomes in a coordinated sampling effort at Beatrix Gold Mine close to Welkom.



Delegates of the Carbon Cycling workshop at the Beatrix Gold Mine.

Seven academic staff members of the UFS, including Prof. James du Preez, were elected as members of the Academy of Science of South Africa (ASSAf) and were inaugurated in Pretoria by Minister Naledi Pandor on 13 October 2011. The key objective of the academy is to promote and apply scientific thinking in the service of society, ultimately determining the quality and scope of the role the academy can play in the country's life and progress. Prof. James du Preez was also appointed as the American Society for Microbiology's ambassador for southern Africa. The responsibilities include establishing a communication network between microbiologists in southern Africa and with ASM, increasing international membership and promoting ASM services available to the microbiology community in Southern Africa.

The research of Prof. Arno Hugo of the Department's Division of Food Science on the injection levels of brine in frozen chickens may lead to new regulations to protect the consumer against this malpractice. Irregularities in the chicken industry in South Africa have been receiving media attention for some time now. On request of the Sunday newspaper *Rapport*, Prof. Hugo analysed the frozen chickens of four brands. This research featured in the main article of the *Rapport* and *Citi Press* newspapers of 6 February 2011, as well as a two-page article in *Landbouweekblad* of 28 October 2011. It was established that in some brands of frozen chickens a thawing and cooking loss of more than 48% occurred. The High sodium level in the chickens is another cause for concern, due to the problems it can cause for unsuspecting hypertension and kidney sufferers. Nutrient dilution and increased oxidation levels were also identified. Further research on this important issue will continue in 2012 with a collaborative research project between the University of the Free State (UFS), the Agricultural Research Council (ARC) and The Department of Agriculture, Forestry and Fisheries (DAFF).

The congress of the South African Society for Microbiology took place in Cape Town from 6 – 9 November. The nine academic staff members plus 28 postgraduate students of the Department of Microbial, Biochemical & Food Biotechnology who attended made a total of six oral and 22 poster presentations. At the conference Ms Carmien Tolmie and Dr Chantel Swart received awards for the best undergraduate and Ph.D. student, respectively. Mr Ruan Ells was one of five students who received a R1 500 travel bursary, awarded on academic merit. Prof. Koos Albertyn was elected as vice president of the society, Dr Carlien Pohl-Albertyn as treasurer and Prof. James du Preez as council member.

On 6 and 7 October 65 third-year microbiology students of the Department of Microbial, Biochemical & Food Biotechnology undertook the annual excursion to SA Breweries (SAB) in Gauteng, accompanied by Prof. James du Preez and Ms Laurinda Steyn. The group was accommodated at the SAB Training Institute in Kyalami, where Prof. Bettie Lodolo, SAB Brewing Consultant and also an affiliate professor at UFS, presented a lecture on the brewing process. The next morning the group toured the SAB Alrode brewery (the largest brewery in Africa), followed by a visit to the SAB World of Beer museum in central Johannesburg. The students found this exposure to industry highly stimulating and enjoyed the excursion (and the beer) a great deal. SAB partially sponsored the tour.

Research

The department comprises two divisions, namely Microbiology & Biochemistry and Food Science. Within these divisions there are various research groups. Activities of some of these research groups not reported above are indicated below.



Students and staff at the SASM congress in Cape Town, enjoying the view.

The research of Prof. Garry Osthoff of the **Food Science Division** on dairy biotechnology involves the improvement of the raw material as well as improvement of processing. For the improvement of the raw material the milk of non-dairy animals provided new ideas. Process improvement involves the inclusion of yeasts as adjuncts to provide enzymes with specificity and kinetics that aid the ripening time and taste development of cheese. Both research approaches have led to invited contributions as chapters in books, namely *Processed Cheeses and Analogues* and the *Encyclopedia of Dairy Science, 2nd Edition*.

Dr Maryna de Wit and her students were able to demonstrate the influence of cultivar, season and locality on the lipid content, fatty acid composition and lipid quality of cactus pear seeds. The research was expanded to the investigation of the antioxidant quality and potential of the fruit (pulp and peel), seeds and cladodes from these plants. A major compound in cactus pear fruit and cladodes is mucilage, which is responsible for the slimy appearance. Technologically, water binding polysaccharides find application as fat replacers for the textural function that they can exert. The mucilage is currently investigated for its role as fat replacer, water binder, emulsifier and gelling agent in food products such as mayonnaise, polony and Turkish Delight. A patent was registered on the microwave extraction method of mucilage from the cladodes of *Opuntia ficus indica*.

The research of Prof. Celia Hugo is focused on the microbial quality of food, especially on the chryseobacteria and their significance in food. In 2011 a study was completed on the growth and spoilage characteristics of the



At the SASM conference Dr Chantel Swart (left) and Ms Carmien Tolmie (right) received awards for the best Ph.D. and undergraduate student, respectively. Mr Ruan Ells (centre; Ph.D student) was one of five students who received a R1 500 travel bursary, awarded on academic merit.

chryseobacteria in milk. It was discovered that the growth of some *Chryseobacterium* species in milk resulted in higher spoilage scores than the well-known food spoiler, namely *Pseudomonas*. Another study on the taxonomy of the chryseobacteria resulted in a new species being described, namely *Chryseobacterium carnipullorum*.

The **Extreme Biochemistry Group**, where the TIA/UFS Metagenomics Platform is hosted, had a year of intense international interaction. The research and collaboration is well documented in the new book by Marc Kaufmann – *The first contact*. The book describes the sampling efforts in the Deep subsurface and its impact not only on South African research but also our views on Astrobiology and the limits of life. The Deep Mine research is now extended within



Third-year microbiology students at the SAB Alrode brewery.

the Deep Life Directorate of the Deep Carbon Observatory (DCO) (sponsored by the Alfred P. Sloan Foundation) and investigation continues with respect to the microbiology of the rock-hosted subsurface biosphere. Microbial communities contained within rock-hosted subsurface environments may be important conduits for the exchange of carbon and energy between the deep Earth and the biosphere - yet surprisingly little is known of their extent, their identities, or their activities. The research specifically addresses microbial carbon transformations in environments influenced by high hydrogen fluxes and abiogenic production of organic molecules.

The USA-led DCO group sampled all through June and July and several new subsurface species have been isolated, including a novel species closely related to *Tepidanaerobacter syntrophicus*, and are being characterized. The search for new nematodes was also extended with another visit by Prof. Borgonie from Belgium. The fluorescently activated cell sorting and whole genome amplifications of samples collected from the various deep fracture projects continue this year.

The knowledge gained from the deep subsurface work is also extended to applied environmental benefits to the mining industry. Dr Mary DeFlaun and a team from Geosyntec Consultants, USA led the construction phase in Mpumalanga where the first pilot bioreactor for chrome remediation was constructed. The reactor capacity is 60 000 litres per day and the bioremediation is ten times more cost effective than physical membrane plants. This research was also extended to a uranium bioremediation pilot reactor and more mobile units that will deal with petroleum degradation are planned for 2012.

In the **Food Biotechnology research group** led by Prof. Bennie Viljoen, research continued to focus on indigenous fermented foods and beverages. These predominantly focussed on special lactic acid bacteria and yeast species capable of exhibiting antagonistic or mutualistic characteristics. A valuable reservoir of unique species were collected from various southern African countries that exhibited bacteriocin production and/or probiotic activity as well as interactive activity as a result of the sequence of growth of different bacteria and yeasts in the raw product. Recently, excessive amylase activity was also observed within some cereal fermentations. Preliminary results showed that the activity may originate from a specific plant root or from microorganisms associated with the roots. Research was also conducted on inhibitory substances against yeasts. Foodborne yeasts remain a major problem in the food industry, resulting in severe economic losses. Novel composite disinfectants which included silver, peroxide, biguanide and chlorhexidine were tested and applied as fogging agents and normal CIP sanitizers with great success. The disinfectants proved to be very effective against a variety of yeast species, the use of which is further enhanced because they are odourless, cause no eye or skin irritation and do not produce any chloramine or other irritating substances.

The **Lipid Biotechnology research group** (including its community service unit, SAFOI) under the leadership of Prof. Lodewyk Kock and Dr Carlien Pohl-Albertyn was very productive in 2011 (see Overview above and www.ufs.ac.za/myoilguide). Two postdoctorates (Dr Chantel Swart and Dr Desmond Ncango) and four students (sponsored

by SAFOI) successfully presented their work at the FEMS-2011 Congress held in Geneva, Switzerland. In line with their mission, this group concentrated on the development of novel medicines such as antifungal and anticancer drugs. Here, yeasts linked to nanotechnology, specifically Nano Scanning Auger Microscopy (NanoSAM), are used to uncover novel medicines. Nanobiotechnology methods utilising Scanning Electron Microscopy in conjunction with NanoSAM and targeted ion etching have been developed in collaboration with Profs Hendrik Swart and Pieter van Wyk of the UFS Department of Physics and the UFS Centre for Microscopy, respectively. The applicability of NanoSAM to nanomedicine has been identified as a research priority and will be researched in collaboration with laboratories from the Mayo Clinic Medical School and Boys Town National Research Hospital, all based in the USA. A second research focus is the metabolism of lipids by pathogenic fungi. Some of these fungi are able to produce lipid hormones, a virulence factor important in host pathogen interaction. This interaction was studied further and it was found that the fatty acid composition of the human host cells play a critical role in the production of prostaglandins by both the pathogen and the host during infection. In addition, certain long chain polyunsaturated fatty acids elicit their antifungal activity by increasing oxidative stress, decreasing mitochondrial activity and inducing apoptosis of the yeast cells. Both these findings indicate the importance of fatty acids during infection by pathogenic yeasts.

The **Fermentation Biotechnology research group** is led by Profs James du Preez and Stephanus Kilian, with group members Ms Laurinda Steyn and Mr Du Toit Schabot. The project on the physiological role of alcohol dehydrogenases (Adh) in *Saccharomyces cerevisiae*, in collaboration with Prof. Koos Albertyn, focused on the role of the Adh5 isozyme in respect of ethanol metabolism. The growth characteristics of a quadruple *adh* deletion mutant with the *ADH5* gene as the only intact alcohol dehydrogenase gene was investigated in aerobic carbon-limited continuous culture. This cultivation strategy was used to minimise the accumulation of acetaldehyde during cultivation, which would otherwise result in the early inhibition of growth.

Further investigation of ethanol production from a novel lignocellulosic biomass source, namely the cladodes of the prickly-pear cactus (*Opuntia ficus-indica*), demonstrated the feasibility of producing ethanol from this feedstock, albeit still at low concentrations, and that the thermotolerant yeast *Kluyveromyces marxianus* had potential as an alternative to *S. cerevisiae* for bioethanol production. The advantage of using this feedstock is that *O. ficus-indica* is well adapted for cultivation in semi-arid regions. Ethanol yields obtained with *K. marxianus* were similar to those of *S. cerevisiae*, but *K. marxianus* could give a volumetric ethanol productivity of up to double that obtained with *S. cerevisiae*. One drawback of using this yeast for ethanol production is that it cannot ferment sugars to ethanol under aerobic conditions and is Crabtree negative. The critical dissolved oxygen levels for the onset of fermentation of glucose and xylose, respectively,



Prof. Lodewyk Kock and Dr Chantel Swart presented a keynote and oral presentation, respectively, at the 2nd World Congress on Biotechnology held in Philadelphia, USA.

in *K. marxianus* were therefore investigated to determine the range of dissolved oxygen levels where ethanolic fermentation could take place. In collaboration with Prof. Albertyn, the transformation of *K. marxianus* with foreign xylose isomerase and xylulokinase genes to improve co-factor imbalance during the fermentation of the pentose sugar D-xylose is also being undertaken. A start was made with ¹³C-metabolic flux analysis to investigate the central metabolic flux patterns in *K. marxianus*. These data would aid metabolic engineering strategies for improvement of ethanolic fermentation by *K. marxianus*. The protein enrichment of the *O. ficus-indica* cladodes for use as animal feed was also investigated, using cultivation of *K. marxianus* on the cladode hydrolysate as an alternative to the widely used *Candida utilis*. Prof. Du Preez presented some of the above work at the 29th International Specialised Symposium on Yeasts that was held in Guadalajara, Mexico, where he also represented South Africa at the meeting of the International Commission on Yeasts.

Prof. Kilian's research on prebiotic oligosaccharides produced by yeasts continued. Prebiotics beneficially modify the intestinal microbial population when ingested, resulting in an improvement of the individual's health. Progress was made on the isolation of novel oligosaccharides that will facilitate their identification and testing of their prebiotic potential.

The aim of the **Biocatalysis research group** of Prof. Martie Smit is to develop excellent whole-cell biocatalysts for hydroxylation reactions. The group focuses on the terminal hydroxylation of alkanes, alkylbenzenes, fatty acids and fatty acid derivatives by cytochrome P450 monooxygenases as well as benzylic hydroxylation of alkyl phenols by vanillyl-alcohol oxidases (VAOs). In collaboration with Prof. Albertyn

and Dr Dirk Opperman, genes encoding different P450s and VAOs are expressed in *Escherichia coli* and different yeasts. During June Prof. Smit spent two weeks in the laboratory of Prof. Gert Vriend at the Nijmegen Centre for Molecular Life Sciences to work with Dr Henk-Jan Joosten on a P450 database based on three dimensional structures obtained from X-ray crystallography databases. During this trip Prof. Smit also gave an invited oral presentation on heterologous expression of cytochrome P450 monooxygenases at the

17th International Conference on Cytochrome P450 held in Manchester UK and postdoctorate Dr Rama-Krishna Gudiminci presented a poster at the same meeting. Before returning to SA Prof. Smit also spent a day with Dr Opperman at the Diamond Synchrotron near Oxford in the UK to collect X-ray diffraction data for enzyme crystals prepared by Dr Opperman. In October Prof. Smit, Dr Opperman, Prof. Albertyn and two students, Mr Chris Theron and Ms Suzanne Litthauer, attended Biotrans 2011, the 10th International Symposium on Biocatalysis in Giardini Naxos, Sicilia, where they presented three posters. During the June and October trips Prof. Smit also visited Prof. Vlada Urlacher at the Institute of Biochemistry, Heinrich Heine University, Düsseldorf, Germany with Dr Gudiminci and Mr Theron. During the October trip Prof. Albertyn and Dr Opperman also presented lectures at the Department of Biotechnology of the Delft University of Technology.



Prof. Lodewyk Kock using Inca-guided river transport in Amazonia in search of special yeasts for use in drug discovery. The Cuyabeno river forms part of the Cuyabeno Wild Reserve and is infested with anaconda snakes, piranha and cayman crocodiles.



Prof. James du Preez among Agave piñas (the sugar feedstock for fermentation) at a tequila factory in Mexico.

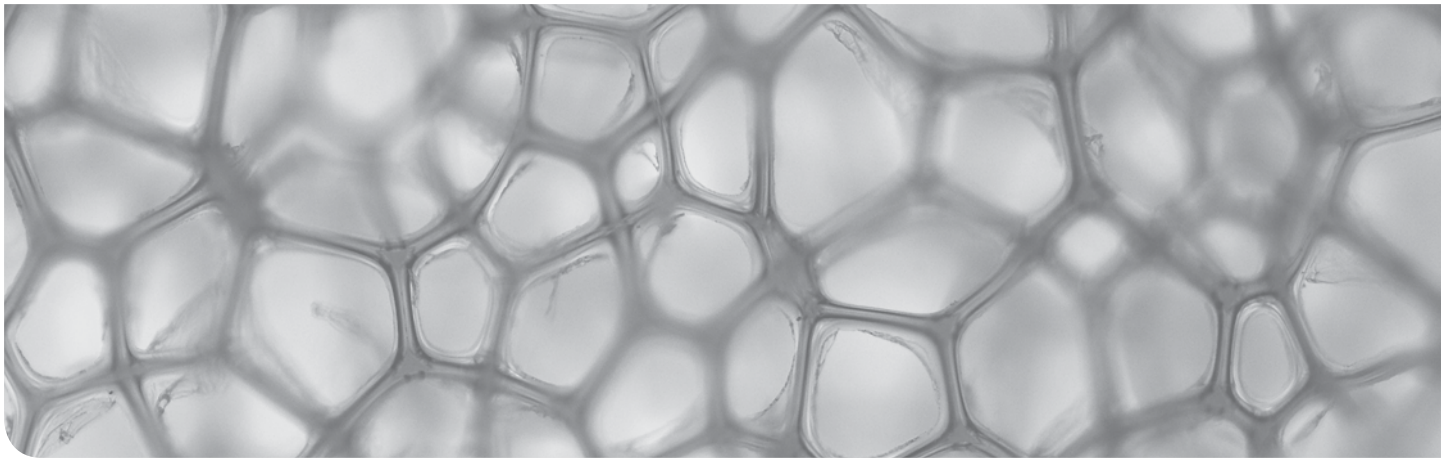
The main highlight of the **Veterinary Biotechnology research group** of Prof. Rob Bragg and Ms Charlotte Boucher was a three month sabbatical which was undertaken by Ms Boucher – a junior lecturer within the group. She visited INRA in France, mainly to obtain technology for the expression of selected genes of various pathogens onto the surface of a yeast species. She was able to express the coat protein gene of beak and feather disease virus into this yeast expression system while in France. This technology can be applied to a number of potential vaccine projects. The possibility of using this recombinant yeast species as a vaccine for the control of this disease in parrots will be investigated during 2012. Ms Boucher and Prof. Bragg as well as two senior students (Mr Wouter van der Westhuizen and Ms Arina Jansen) attended the World Veterinary Poultry Association congress in Cancun, Mexico. One oral presentation and four posters were presented at this congress. A multiplex PCR system was established to evaluate the virulence genes of avian pathogenic *Escherichia coli*, and this was published in *Avian Pathology* – the top subject specific journal. An experimental vaccine for the control of a bacterial disease in rainbow trout was developed during this year. This vaccine is currently undergoing testing on two rainbow trout farms during the summer of 2011/2012. Further understanding of the mode of action of disinfectants on bacteria was studied using the exciting NanoSAM technology. It was established that the disinfectant causes leakage of the bacterial cytoplasm, resulting in the collapse of the bacterial cell. Prof. Bragg also visited a large poultry company in India and he will be assisting them with various aspects of disease control, mainly focusing on infectious coryza, caused by the bacterium *Avibacterium paragallinarum*.

Staff matters

Prof. Derek Litthauer resigned at the end of April as professor in biochemistry to take up the post of director of the National Control Laboratory, also on the UFS campus. Drs Frans and Trudi O'Neill were appointed as senior lecturers in biochemistry as from January 2012. Ms Ilze Auld started work on 1 March as secretary in the Food Science division.

Research Outputs

Department of Microbial, Biochemical and Food Biotechnology



Research articles

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Van der Westhuizen, W. & Bragg, R.R. 2011. *An alternative to antibiotic therapy of avian pathogenic Escherichia coli (APEC): Bacteriophage therapy.* Poster presented at the 17th Annual World Veterinary Poultry Association (WVPA) Congress, Moon Palace Hotel, Quintana Roo, Cancún, México. 14-18 August.

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Association (WVPA) Congress, Moon Palace Hotel, Quintana Roo, Cancún, México. 14-18 August.

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Derek Litthauer, Hugh Patterson
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André van Tonder.

Lecturer: Dr Olihile Sebolai.

Junior lecturers: Ms Charlotte
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Secretary: Ms Ilze Auld.

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Eileen Roodt.

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Sarah Senokoane.

Cleaner: Mr Edward Mtshotana.

“The Physics Department continues to accelerate towards its goals of relevant and challenging programmes for undergraduate and graduate students and high quality, internationally recognized research.”

– Prof. Hendrik Swart

Department of Physics

Overview

The Physics Department continues to accelerate towards its goals of relevant and challenging programmes for undergraduate and graduate students and high quality, internationally recognized research. The department hosts state of the art infrastructure in very well-equipped nano surface laboratories and is actively involved with local, provincial and national communities.

Most of our staff members are also involved in the Boyden Science Centre of which a summary of the annual report is attached.

Research highlights

An outstanding highlight of the year was the successful application by Prof. Hendrik Swart to the Strategic Research Infrastructure Grants (SRIG) committee of the NRF. His proposal received financial support of R9 million! The grant will be used to add a highly sensitive (parts per billion) Time of Flight Secondary Ion Mass Spectrometer (TOF-SIMS) to the new nano surface characterization facilities (NNSCF) in the

department. The instrument was ordered at the end of 2011 and construction (see photo) to a new research lab at the southeast end of the Physics building is nearing completion. The new spectrometer is expected to be in operation during August 2012.

Prof. Swart was also elected as a member of the Academy of Science of South Africa (ASSAf). The academy includes only the country's most outstanding scholars as members.

Activities and achievements

It was an excellent year for our postgraduate students and they almost made a clean sweep of prizes at the 56th Conference of the South African Institute of Physics in the field of Condensed Matter Physics and Materials Sciences. The winners are:

- **Mr Gebhu Ndlovu** – (Promoters: Profs Wiets Roos and Thembela Hillie) in the category Doctorate Oral for the best oral presentation;
- **Mr Abdub Ali** (Promoters: Profs Hendrik Swart and Francis Dejene) and



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Prof. Hendrik Swart

Prof. Hendrik Swart's main research topics are the degradation of phosphors for field emission displays and the development of processes whereby various types of semiconductor nanoparticles and thin films are synthesised and deposited.

- **Mr Shaun Cronjé** (Promoters: Dr Ted Kroon and Prof. Wiets Roos) shared the prize in the category Doctorate Poster for the best poster presentation;
- **Mr Charl Jafta** – (Study leaders: Profs Wiets Roos and Koos Terblans) in the category Master's Publication Award for the best Publication from a M.Sc. dissertation.
- **Mr Pieter Barnard** (Study leaders: Profs Hendrik Swart and Koos Terblans) won the prize for the best Master's Poster; and
- **Mr Luyanda Noto** (Study leaders: Profs Hendrik Swart and Koos Terblans) was specially recommended for the prize – best M.Sc. poster.
- **Mr George Tshabalala** (Promoters Profs Martin Ntwaeaborwa and Hendrik Swart) won the prize for the best Poster Presentation at the Korean Materials Research Society Symposium on JeJu Island, 26-27 May.
- **Mr Gebhu Ndlovu** (Promoters: Profs. Wiets Roos and Thembela Hillie) won the SMM prize for the best paper on an Innovative Microscopy Technique, presented at the 49th Conference of the Microscopy Society of Southern Africa. He also won the Wirsam Tescan prize for the most exceptional presentation at the same conference.
- **Mr Shaun Cronjé** (Promoters: Prof. Wiets Roos and Dr Ted Kroon) won third prize for the best oral presentation at the 11th Symposium of the Suid-Afrikaanse Akademie vir Wetenskap en Kuns in Pretoria.

In 2011 Dr Lisa Coetsee, appointed as researcher and chief operator on the NanoSAM and XPS Versa Probe spectrometers, was rated as a Y2 researcher by the NRF.



Members of the Physics department in Brussels on their way to a Phosphor workshop in Ghent, Belgium.



Prof. Wiets Roos, Mr Charl Jafta and Prof. Micha Polak discussing science at the ACSIN 2011 conference in St. Petersburg Russia.



The construction site of the new TOF SIMS laboratory.



SAIP 2011 Prize winners and their study leaders and promoters (from the left): Prof. Wiets Roos, Dr Ted Kroon, Prof. Matie Hoffman, Prof. Hendrik Swart, Mr Abdub Ali (front), Prof. KoosTerblans, Mr Shaun Cronje, Mr Charl Jafta, Mr Luyanda Noto, Mr Pieter Barnard.



The Physics Departments of Shantou University, China and our Physics department signed a collaboration agreement. From the left Profs Ping Wu, KoosTerblans, Hendrik Swart and Jiang Wang.

National and international collaboration

Prof. Swart and Terblans visited Prof. Jiang Wang in Shantou, China, and signed a collaboration agreement. Prof. Jiang Wang received his Ph.D. in Physics at the University of the Free State in 1997.

The interaction between the Departments of Microbiology, Plant Science and Physics is still paying off and ground breaking experimental work has been done. The group is using surface sensitive spectrometers combined with Ar-ion sputtering in biological applications. Their imaging technology is concentrating on mycology and drug development.

Strong ties were established with the Laser group at the University of Stellenbosch (US) and the Nelson Mandela Metropolitan University (NMMU). Colleagues attended a seminar presented by the Photonic Institute of South Africa (PISA) and financial support from PISA was used to assist Ms Mart-Mari Duvenhage (visiting the University of Florida, USA)

and Ms Sylvia Mbule (visiting the Korean Institute of Science and Technology, South Korea), with their Ph.D. studies.

The collaboration with the CSIR in the divisions, National Centre for Nano-structured Materials and Energy and Processes, is continuing and two of their Ph.D. students are currently registered at the University of the Free State in the department of Physics.

Ph.D. students Mr George Tshabalala and Ms Sylvia Mbule spent three months each at the Korea Institute of Science and Technology (KIST) in Seoul studying Ultra Violet up-conversion phosphors and the incorporation of quantum dots in organic solar cell devices. These visits were part of an exchange programme for the NRF/DST funded research collaboration between UFS and KIST.

Prof. Hendrik Swart, Wiets Roos and Koos Terblans, Mr Jack Madito and colleagues from the departments of Geology



An international photonic conference was co-organised with NMMU and UP at Kariega Game Reserve. From the left: Dr Shreyas Pitale, Dr Indrajit Nagpure, Dr Japie Dolo, Dr Moses Mothudi, Prof Hendrik Swart (chair of conference), Dr Daniel Bem and Prof. Martin Ntwaeaborwa.

and Chemistry attended the Inkaba yeAfrica Workshop on the Platinum Value Chain in Rustenburg, March 24 – 26. The workshop was a Germany-South Africa initiative. One of the highlights was a visit to the ImPlats Platinum Mine near Rustenburg.

Staff members are positioned and excited about the new M.Sc. qualification in Nanoscience. This is an interdisciplinary structured programme allowing for inter-university (UFS, NMMU, UJ & UWC) and multi-site delivery. The first students in this programme are expected in 2012.

Boyden Observatory and Science Centre

Summary overview:
October 2010 to September 2011

Taken from the annual Boyden observatory and Science Centre report.

The Boyden Observatory and Science Centre, one of only two professional optical observatories in South Africa, is an important catalyst for science and mathematics education, science communication and astronomical research. Its impact is not restricted to its geographical location in central South Africa, but thanks to regular exposure on radio and TV, as well as research projects, the observatory enjoys national and international significance. The facilities are situated on a beautiful site that is accessible to the public and lends itself to the promotion of nature conservation and

eco-tourism. Furthermore, Boyden is home to important books, documents and astronomical artefacts housed in a constellation of buildings, including a library in the historical main building. Prof. Matie Hoffman is the Project Manager.

The development of the Boyden Observatory and Science Centre, situated near Bloemfontein in the Free State, includes the upgrading of existing facilities and the proposed establishment of a state of the art digital dome planetarium theatre, the first of its kind in South Africa. We launched the Boyden development funding campaign in March 2009 with the goal of raising 12-15 million rand (depending on escalation and exchange rate assumptions). The project is being implemented in stages as funding becomes available. The general heightened awareness of astronomy in South Africa at present has contributed to the increased interest and popularity of activities and programmes at the Boyden Observatory.

Ongoing Boyden Observatory Science Centre activities and programmes during this period were its research, education and public science communication events. High-profile visits from international scientists and astronauts generated considerable publicity for the observatory in the local media and on national radio. Many meetings were held with a view to establishing networks amongst the science communication and education communities. In addition to these meetings, Prof. Matie Hoffman presented a series of astronomy lectures at various venues in the Free State in support of the provincial government's focus on promoting astro-tourism in the region. There were also regular radio interviews on local and national stations, which reached audiences of many thousands.



From the left : Dr. Gordon MacLeod, Dr. Robert Williams, Profs. Hendrik Swart, Jonathan Jansen (Rector, UFS), Pieter Meintjes, Charles McGruder, and Jeff Hoffman.

The focus of the infrastructure improvements at Boyden in this period, were the Conservancy and Environment Project and the launching and development of the Boyden Heritage Museum Project.

Infrastructure improvements

The year 2010 marked the completion of the entertainment area and the first phase of the improvements to the Boyden entrance area and the public walkways on the site. During the period starting October 2010, the focus shifted to upgrading outdoor lighting, the detailed planning of the artificial wetland - that will also improve the storm water management - and phase 2 of improvements to the Boyden entrance area. The detailed design and quotations have been received and construction commenced in October 2011. A contribution from the Charl van der Merwe Foundation as well as the University of the Free State makes this next phase possible. The renovation of the Boyden Observatory Main Building has been completed. The building will house an interactive astronomy museum. The renovations were funded by contributions from the Rupert Historiese Huise-stigting, the Hermann Othlaver Trust, the Joan St. Leger Lindbergh Charitable Trust, Mr. Ndaba Ntsele and Pamodzi.

Ongoing programmes

During the period under review a large variety of programmes were presented at Boyden. Details of demographics and numbers of visitors are available. Visitors to Boyden exhibits at science shows are not included in these numbers.

Education and outreach

During the period October 2010 to September 2011 approximately 130 intensive educational programmes were presented to approximately 8 600 people amounting to approximately 22 000 "learning hours". These programmes included the following high impact events:

- Approximately 630 teachers benefitted from programmes and workshops;
- 2 240 grade 10-12 learners benefitted from programmes and workshops;
- 45 top achievers in physical science, mathematics and biology attended a Science Adventure Camp;



From the left: Dr Robert Williams, Prof. Aylva Schoch, Prof. Pieter Meintjes, Prof. Jeff Hoffman, Michael Poli, Prof. Charles McGruder (front) Dawie van Jaarsveldt, Pat van Heerden, Dr Gordon MacLeod (front) and Prof. Matie Hoffman.



Prof. Kip Thorne, Prof. Pieter Meintjes and Dr. Jeandrew Brink.



From the left Prof. Koos Terblans, Mr Pat van Heerden, Dr Ellen Baker (NASA astronaut), Profs Wiets Roos, Pieter Viljoen and Matie Hoffman from the UFS Department of Physics.

- In collaboration with the Centre for Education Development at the UFS School of Education a special programme was presented at Boyden for 148 grade 10-12 top achievers in physical science from 13 different schools;
- The NEC 302 Community Service Module of the UFS made an important contribution to two township schools;
- Approximately 400 grade 5 learners from approximately 100 schools all over the Free State participated in SAASTA's Astronomy Quiz competition. The Free State leg of the competition is co-coordinated by the Boyden Science Centre in collaboration with the Free State Department of Education. J.A. Malherbe, Primary School, Petrus Steyn, won the Free State leg of the competition.
- A three day workshop was presented at Boyden in collaboration with South Africa's SKA Project for 27 SKA bursary holders.

Public events and science communication

- In addition to the numerous education programmes many public groups also visited the observatory on demand;
- Prof. Hoffman is a regular guest on the popular SABC programme "Sterre en Planete";
- Prof. Hoffman also helped to keep Boyden Observatory and Science Centre in the news with regular radio interviews on SABC (e.g. Monitor), as well as on a monthly basis on a community radio station. The national radio broadcasts reached hundreds of thousands of people;
- On 14 September 2010 the rector of the UFS hosted special guests of the UFS at Boyden Observatory;
- On 18 September 2010 a special programme of the SABC programme, Sterre en Planete, was recorded at Boyden Observatory;
- On 10 November 2010 we hosted a high profile visit by astronaut Jeff Hoffman, President of the International

Astronomical Union (IAU), Dr. Robert Williams, and Prof. Charles McGruder at Boyden;

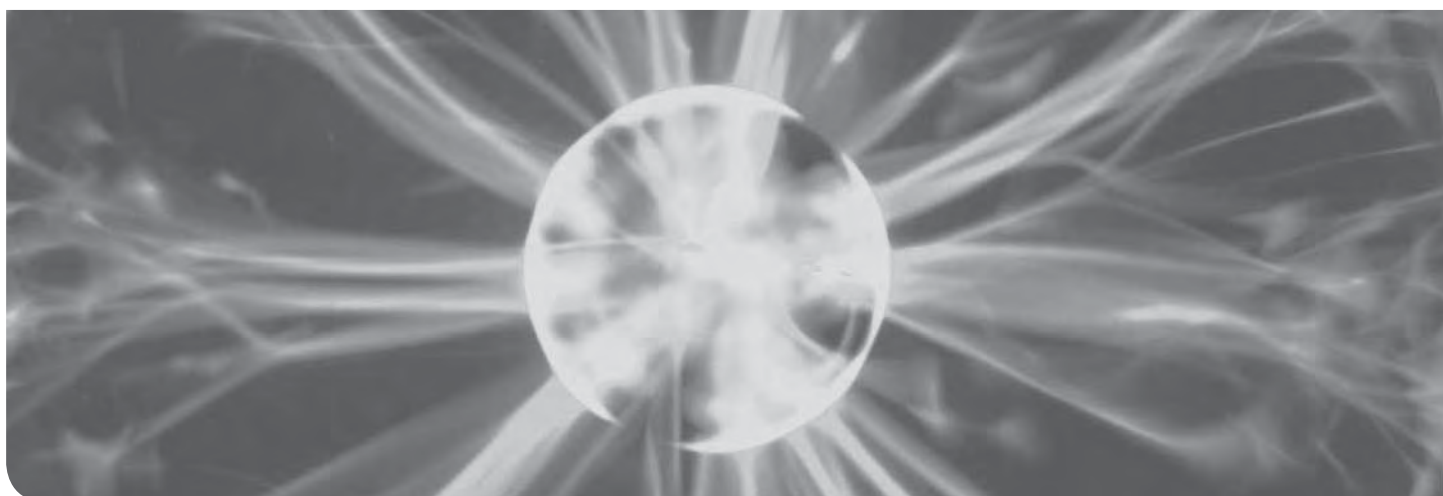
- World renowned cosmologist, Prof. Kipp Thorne from Caltech, gave a talk at Boyden on 15 November 2010;
- On 12 September 2011 another NASA astronaut, Dr. Ellen Baker, gave a talk at Boyden;
- The Boyden Observatory Science Centre participated in the 6th Science Centre World Conference from 5 to 8 September 2011 in Cape Town with an exhibit title "The Boyden Observatory Science Centre: Our Heritage and Our Environment";
- On 30 September 2011 Prof. Patrick Seitzer, international patron of the Friends of Boyden Observatory, visited the Boyden Observatory and unveiled the Lamont-Hussey Telescope Exhibit;
- 8 astro-tourism programmes were presented at various venues in the Free State and North-West in collaboration with the Free State Department of Economic Development, Tourism and Environmental Affairs (DETEA), the Afrikaanse Handelsinstituut (AHI) and the SABC programme "Sterre en Planete".

Research

The astrophysical research team has grown substantially during the last few years with an average enrolment of 8 M.Sc. and Ph.D. students. Most of these students are involved with the Boyden educational activities and they regularly make popular presentations on their research. In this way they make a valuable contribution as role models for the future scientists who visit Boyden. The Watcher Robotic telescope of the University College Dublin in Ireland, which is located at Boyden, had another productive year. All contributions are listed under the output section of the department of Physics.

Research Outputs

Department of Physics



Research articles

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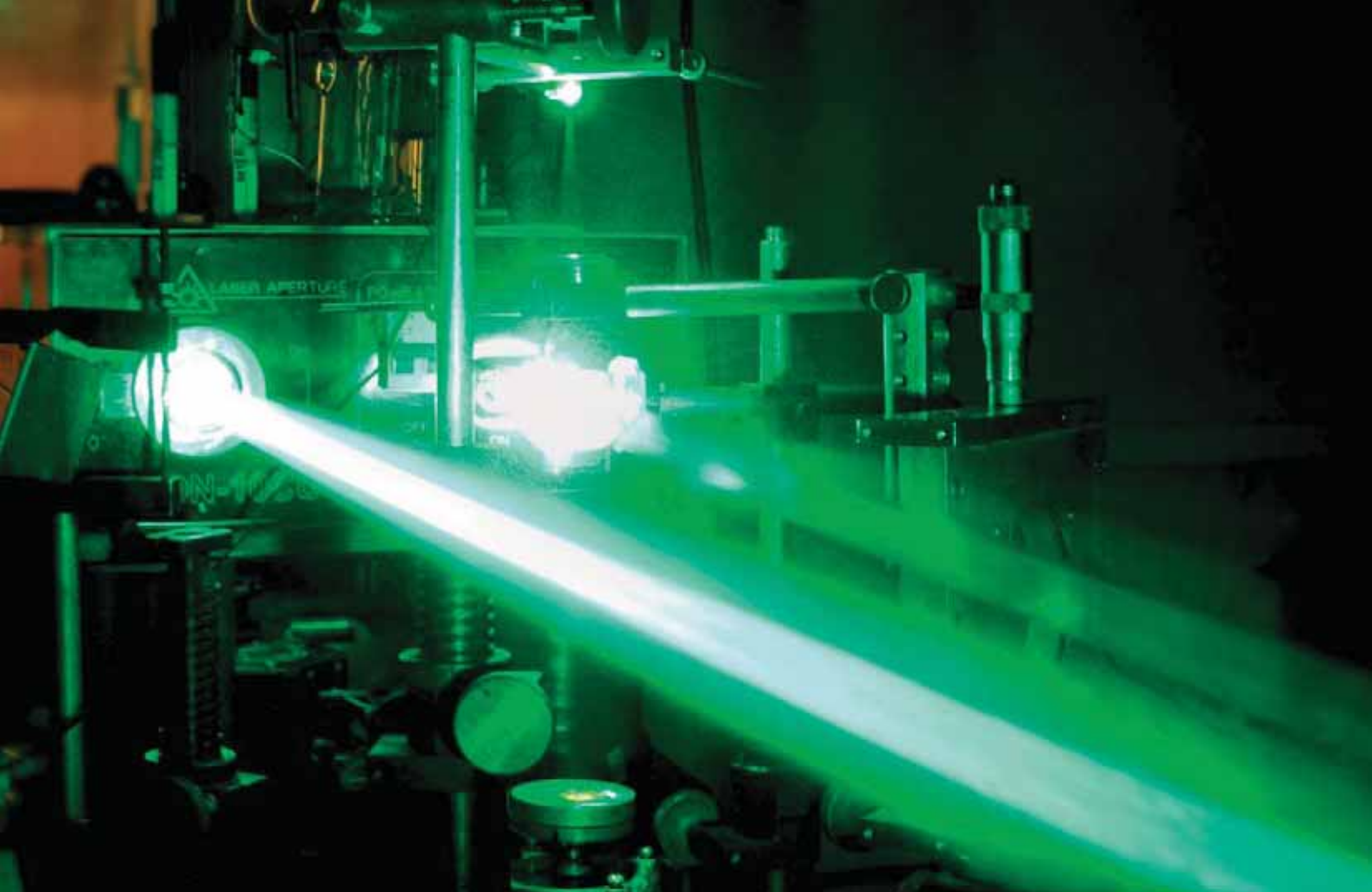


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- Tshabalala, K.G., Cho, S.H., Park, J.K., Pitale, S.S., Kroon, R.E., Swart, H.C. & Ntwaeaborwa, O.M.** 2011. *Luminescence properties of Ce^{3+}/Tb^{3+} co-activated $ZnAl_2O_4$ phosphors*. Poster presented at the Materials Research Society of Korea Symposium (MRS-Korea), Korea. 26-27 May.
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- Tshabalala, M.A., Dejene, B.F. & Swart, H.C.** 2011. *Low temperature synthesis and characterization of ZnO nanoparticles using Polyethylene Glycol*. Poster presented at the 4th South African Conference on Photonic Materials (SACPM 2011), Kariega Game Reserve, Port Elizabeth, South Africa. 2-6 May.
- Tshabalala, M.A., Dejene, F.B. & Swart, H.C.** 2011. *Synthesis and characterization of the ZnO nanoparticles and the polyvinyl pyrrolidone (PVP) encapsulated ZnO nanoparticles*. Proceedings of the 56th Annual Conference of the South African Institute of Physics (SAIP2011), UNISA, Pretoria, South Africa. 12-16 July. pp. 338-342.
- Van Soelen, B. & Meintjes, P.J.** 2011. *Anisotropic scattering from the circumstellar disc in PSR B1259-63*. Poster presented at the High Energy Phenomena in Relativistic Outflows III (HEPRO III), Barcelona Historical Building, Catalonia, Spain. 27 June – 1 July.
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- Wako, A.H., Dejene, F.B. & Swart, H.C.** 2011. *Properties of blue emitting $CaAl_2O_4:Eu^{2+}, Dy^{3+}$ phosphors by optimizing the amount of flux and the*



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of the South African Institute of Physics (SAIP2011), UNISA, Pretoria, South Africa. 12–16 July. pp. 354–359.

Wessels, L.A.L., Swart, H.C. & Terblans, J.J. 2011. *Molekulêre dinamika-simulasie van die vorming van Platinum-nanodeeltjies*. Paper delivered at the 11th Suid-Afrikaanse Akademie vir Wetenskap en Kuns – Student Symposium, Unisa, Pretoria, South Africa. 27–28 October.

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Senior Lecturer: Dr Ted Kroon

Researcher: Ms Lisa Coetzee

QwaQwa Campus

Associate Professors: Prof Francis Dejene

Senior Lecturers: Dr Justice Msomi, Mr Richard Ocaya

Lecturers: Dr Moses Mothudi, Mr Jappie Dolo

“The department is organized into eight research groups, each with its own objectives and specific study area. There is also a satellite department on the QwaQwa Campus.”

– Prof. Jo van As

Department of *Zoology and Entomology*

Overview

The department is organized into eight research groups, each with its own objectives and specific study area. There is also a satellite department on the QwaQwa Campus. The groups do, however, share common goals within the strategic priorities of the Faculty of Natural and Agricultural Sciences and the UFS. Prof. Jo van As, Departmental Chairperson, is also involved in activities of the Cluster for Water Management in Water Scarce Areas at the UFS, whilst Prof. Schalk Louw participates in the Cluster concerning Technologies for Sustainable Crop Industries in Semi-arid Regions.

Aquatic ecology

During 30 March to 8 April 2011 we conducted the second survey to the De Mond Nature Reserve and Heuningnes River. Staff from the reserve assisted us with the fish collection. We examined a number of fish species and collected a variety of fish parasites. Some of the ergasilid parasites that

we collected formed part of an honours project, which was completed at the end of 2011. (Images De Mond 1-4.)

During August 2011 we did a combined fieldtrip to the upper part of the Okavango System in Namibia with staff from KIFI (Kamutjonga Inland Fisheries) and presented a Workshop at the Institute on fish parasites.

We also did follow-up surveys and collected plankton in the floodplains of Nxamaseri and in the flooded Lake Ngami where we also collected fish. At the end of the August surveys we followed the Boteti River and collected plankton in Lake Xua that was flooded for the first time in 40 years. From time to time it is necessary to make use of temporary field laboratories as we have done for the Lake collections.

Students

Josef Möller and Andri Grobbelaar both completed their Master studies and obtained their degrees cum laude.



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Prof. Jo van As

An area of interest of Prof. Jo van As is in Fish Parasitology. He is presently investigating intertidal fish parasites as well as parasites of fish in the Okavango delta (Botswana).

Arachnology

The group consists of Mr Charles Haddad (Lecturer and Researcher) and Mr Jan-Andries Neethling (Honours student).

During January 2011 Mr Haddad accompanied two researchers from the California Academy of Sciences in San Francisco, Dr Charles Griswold and Ms Hannah Wood, on a field trip in the Eastern Cape, KwaZulu-Natal and Free State Provinces. Ms Wood is currently working on her Ph.D. thesis investigating the taxonomy, molecular phylogeny and biology of assassin spiders (*Archaeidae*), which are most diverse in southern Africa and Madagascar. This trip allowed Haddad to collect spiders in parts of the country that have generally been poorly sampled in the past, providing valuable material for molecular studies and locality records for his own Ph.D. study. He intends to submit his Ph.D. for examination early in 2012.

Mr Jan-Andries Neethling completed a study of the plant-dwelling spider biodiversity at the Free State National Botanical Gardens as part of long-term surveys of spider biodiversity in the central Free State. He also conducted an extensive pitfall study on the ground-dwelling arachnids, with emphasis on the effects of lunar phases and rainfall on the activity patterns of trapdoor spiders.

During the course of the year, two congresses were attended by members of the Arachnology group. The 10th Colloquium of the African Arachnological Society was held near Mokgopong (Naboomspruit) in Limpopo and was jointly



Dr Candice Jansen Van Rensburg taking samples at the Bakwena Cave.



Staff of Cape Nature assisting students at the De Mond Nature Reserve.

hosted by the ARC – Plant Protection Research Institute and the Ditsong National Museum of Natural History in Pretoria. Several papers and posters were presented by Mr Haddad and his students. The UFS and National Museum will jointly host the next Colloquium at the Amanzi Private Game Reserve near Brandfort in 2014. Several papers and posters on Arachnology were also presented at the 17th Congress of the Entomological Society of Southern Africa, which was jointly hosted by the UFS and the National Museum on the UFS campus.

Eco-ethology

Two members of the academic staff, Mr Hennie Butler and Ms Lindi Heyns, work within the Eco-ethology research group, actively combining teaching and research. Together with seven postgraduate students, they form a study group that encourages inter-disciplinary research through a combination of laboratory and field science.

The Eco-ethology group pursues basic research in the field of behavioural biology and ecology, but also includes diverse areas such as the anatomy, physiology, natural and evolutionary history, taxonomy, conservation, management and economics of animals. Projects under way by group members mainly focused on applied questions in wildlife management of various antelope species during 2011, but studies were also carried out on fish, felines and small mammals as study animals.

Mr Hennie Butler (Ph.D.) and Ms Zianca Nolté (Hons.) focused on the soil-eating behaviour (enzootic geophagy) of antelopes in semi-arid regions, while Ms Elsabé Coetzee aims to investigate enzootic geophagy occurrence amongst domestic animals. Ms Nadine Jacobs (M.Sc.) investigated behavioural differences between geographical races of the southern sable antelope and Mr Phillip Olivier (M.Sc.) commenced with a study on dominance behaviour associated with different colour variations in springbok populations. Mr Roe Wiid (M.Sc.) researched the extent of problem hyrax populations in urban areas in the southern Free State as well as possible mitigation methods.

Research carried out by Mr Savvas Vrahimis (Ph.D.) and Ms Lindi Heyns (M.Sc.) entailed a combination of behavioural biology and conservation genetics. Mr Vrahimis, associated with the Free State Department of Tourism, Environmental and Economic Affairs, continued to research aspects of the ecology, behaviour and genetic status of black wildebeest, whereas Ms Heyns completed her study on behavioural and genetic aspects of blesbok and bontebok in the Free State.

Ms Andri Erasmus (M.Sc.) conducted fieldwork in Botswana where fish was collected from the Okavango River and examined for parasitic flukes that occur in the eyes and brain. Through behavioural experiments she aims to determine how the parasites influence the behaviour of the host. Concerning carnivores, Ms Michelle van As (M.Sc.) continued to investigate the activity patterns of leopard in Lydenburg.



Prof Jo Van As and postgraduate students at De Mond Nature Reserve.

The annual honours-class excursion to the Sandveld Game Reserve took place during early spring. Nearly every topic on animal behaviour was discussed around an inviting campfire. The students gained proactive skills pertaining to the varied field techniques used to investigate animal behaviour, e.g. instantaneous scan sampling methodology and setting camera traps.

Mr Butler and Ms Zianca Nolté attended the 1st International Conference on Clays and Clay Minerals in Africa and the 2nd International Conference on Geophagia in Southern Africa, held at the Central University of Technology, Bloemfontein from 19 to 21 October 2011 where three oral presentations were delivered. Ms Nadine Jacobs also delivered an oral presentation at the 7th session of the International Wildlife Ranching Symposium (IWRS) held in Kimberley, South Africa, between 10 and 14 October 2011.

Research group: Insects on New Crops Program (INCroP)

1. Research group: Insects on New Crops Program (INCroP)

Prof. S. v.d.M. Louw (Leader)

- Mr C. Haddad (Lecturer; Part time Ph.D. student in Arachnology)

- Mr V. Swart (Junior lecturer; Part time Ph.D. student in Environmental Management)
- Mr De V. Fourie (Ph.D. student - full time)
- Mr B. Muller (M.Sc. student - part time)
- Ms A. Grobler (M.Sc. student - part time)
- Ms L. Theron (M.Sc. student part time)
- Mr R. du Preez (M.Sc. student - full time)

2. Review of activities and highlights

- In February an invited lecture on *The impact of biodiversity* was presented for the UFS Health & Wellness Centre.
- In April Prof. Louw participated in the 3rd Year Entomology field excursion to Hogsback (Eastern Cape), as well as the 3rd Year Zoology field excursion to Potberg and De Hoop (Western Cape).
- Whilst in the Western Cape in April, a visit was paid to the Centre for Invasion Biology (CIB) at the University of Stellenbosch during which collaborative research on soil ecology and soil health was initiated. Collaboration kicked off by hosting a workshop during the 17th Congress of the Entomological Society of Southern Africa (ESSA) at the UFS in July. This will be followed up with a similar workshop in the Western Cape in 2012.
- Throughout the year there was participation in the activities of UFS Academic Cluster 4: Technologies for Sustainable Crop Industries in Semi-arid Regions. Specific expertise was provided under the auspices of the



Staff of KIFI and UFS students attending a parasite workshop.

cluster regarding pest management on new crops and arthropod soil ecology. In terms of soil ecology research seven sites containing a range of cultivated composts and cotton, maize, wheat and amaranth field crops have been sampled in the Free State, North West and Northern Cape Provinces and analyses of mesofaunal species assemblages were conducted. Progress regarding this work was presented as an annual report at a seminar of the cluster in November.

- Co-operative research on navel orangeworm survival on pistachio (with Green Valley Nuts, Prieska) and temporal and spatial composition of arboreal insects along the Omaruru River, Namibia (with Polytech University of Namibia, Windhoek) was continued and both projects were completed.
- In collaboration with the North West Province Department of Agriculture a project was initiated for M.Sc. student R. du Preez. The project involves an investigation into the effect of additives to the soils of amaranth cultivations on soil mesofauna and their interactions. This work is conducted at different sites with soils of different compositions, *i.e.* Potchefstroom (clay) and Taung (sand).
- Prof. Louw was the chairperson of the Organizing Committee of the 17th Congress of the Entomological Society of Southern Africa that was hosted at the UFS in July. Highlights included participation by more than

200 delegates, two first-time workshops that were presented as *Farmers Day* and *Soil Invertebrates and Soil Health*, and three plenary addresses that were presented by eminent speakers from Rhodes University, the University of Stellenbosch and the Netherlands Institute of Ecology in Wageningen. Noteworthy was that staff members and students of the Department delivered 21 presentations.

- Upon invitation the 21st Symposium on Advances in Technology and Soilborne Plant Diseases, hosted at the ARC - Vredenburg Research Centre, Stellenbosch in September, was attended.
- As Executive Committee member of the Arid Zone Ecology Forum (AZEF) Louw attended the 13th Symposium of AZEF in Nieuwoudtville (Northern Cape) in October. A paper on mesofauna soil ecology was also presented.

3. Postgraduate students delivered

- Anel Grobler, M.Sc. in Entomology: *Survival of the navel orangeworm, Amyelois transitella (Lepidoptera: Pyralidae) on pistachio in South Africa* (Louw as Supervisor).
- Louise Theron, M.Sc. in Entomology: *Temporal and spatial composition of arboreal insects along the Omaruru River, Namibia* (Louw as Supervisor).



Prof. Jo van As and Andri Grobbelaar showing some of the plankton that was collected in Lake Ngami, Botswana to the local children.

- Casper Benecke, M.Sc. in Plant Breeding: *The expression and inheritance of resistance to *Acanthoscelides obtectus* (Bruchidae) in South African dry bean cultivars* (Louw as Co-supervisor).
- Falko Buschke, Masters in Environmental Management: *A community analysis of grassland arthropod fauna for the development of the South African Grassland Scoring System (SAGraSS)* (Louw as Co-supervisor).

Integrated pest management and environmental agriculture

Environmental entomology 2011

The group consists of Mr Vaughn Swart (Junior Lecturer); M.Sc. students: Jaco Saaiman and André van Rooyen; and Mr Ian Cloete a 3rd Year B.Sc. Agric. student.

Research, during 2011, involved Mr Saaiman investigating insects as indicators of what species of fungi is present in an orchard, Mr Van Rooyen testing the penetration ability of a pesticide adjuvant to increase the penetration ability of pesticides based on a field trial, and Mr Ian Cloete looked at the arthropod recovery rate and succession following the application of a knock-down agent within pecan nut orchards. The first two projects were in partial fulfilment of the aforementioned students' M.Sc. degrees and the latter was a third year entomology student's year project. A farmer's day workshop was organized by Mr Swart as part of the 17th Congress of the Entomological Society of Southern Africa.

Speakers from various institutions gave both farmers from as far as the Eastern Cape and researchers a better perspective on an array of topics, which included insects and mycotoxins, recent developments in mycotoxins, biological control, tick resistance, nematodes and the controversial GMO's.

Mr Saaiman's aim was to determine whether it is possible to use insects as indicators of what species of fungi is present in an orchard. Funding has been received from The Strategic Cluster 4 for this project. This included the successive collection of *Atelocera raptorica* (Hemiptera: Pentatomidae, powdery stinkbug) within the same pecan orchard. The aim was to determine the succession of fungi occurring on the insects within a pecan orchard through one season and also to identify possible fungal pathogens that might have economical implications. Furthermore to compare the occurrence of fungi in different niches such as soil, air and the phyllosphere with fungi associated with powdery stinkbug. This will highlight the alternative sources besides insects from which fungal pathogens could originate within pecan orchards. This work forms part of an ongoing research project that continues into 2012 and is part of Jaco Saaiman's research for his Master's degree.

Mr Van Rooyen proceeded with trials to determine if a specific adjuvant is capable of shortening the penetration time of pesticides. Previously isolated trials in the laboratory showed that under controlled conditions the adjuvant can improve the penetration of pesticides. During 2011 field trials were conducted. The adjuvant showed slight improvements in the efficacy of the pesticide; however field trials will be

followed up to support evidence of improvement for efficacy of pesticides.

Mr Swart has been associated with SAPPA (South African Pecan Producers Association) since 1998. SAPPA has donated annually for research purposes for 2009, 2010 and 2011. Recent discussion is still being focused around the establishment of a potential statutory levy for research. In addition to this research, pertaining to the false codling moth and carob moth, funding has been provided by Insect Science and BayAgro for a two year project which has already commenced.

During March Mr Swart was approached by Mr Kobus Rossouw, Hoopstad, Free State, South Africa, as a result of a potential stem borer resistance on Bt Maize. Mr Swart was accompanied by Dr Lean van der Westhuizen to investigate the problem. It was reported that the stem borer was found not to be causing any significant damage to maize.

Medical, veterinary, forensic entomology and agricultural entomology

Prof. Theuns van der Linde retired at the end of September 2011.

Nematology

This research group consists of Dr Candice Jansen van Rensburg (Lecturer and Researcher), Ms H. Pretorius (M.Sc.) and Ms Ayesha Mobara (M.Sc.)

Currently research in this group is focused towards plant parasitic and free-living nematodes occurring in the Free State Province, and also a continuing project on the Bakwena Cave in Irene, South Africa. The study group is currently working on nematodes from wetlands, with work being carried out at the Seekoeivlei Nature Reserve, near Memel in the Free State Province. The Seekoeivlei wetland is situated in the north eastern corner of the Free State Province and is the largest on the southern African Highveld. It also has a high conservation priority since it lies in one of the tributaries of the Vaal River which provides water to the highly industrialized and densely populated Gauteng Province. The area supports an assemblage of rare, vulnerable or endangered species of plants and animals. It is also suspected that a wide diversity of nematodes will be found here and thus this project was initiated. Information regarding nematodes from wetlands in South Africa has been understudied for a number of years and Ms Mobara will use information gathered from this study for her M.Sc. dissertation.

Dr Jansen van Rensburg sent Ms Mobara on a two week intensive short course in Nematology at the North West University during the July recess period. This course covered areas such as collection, fixation and identification of plant parasitic nematodes.

In May 2011, Dr Jansen van Rensburg and Ms Mobara attended the Nematological Society of Southern Africa conference at Stellenbosch. Dr Jansen van Rensburg presented a paper on nematodes from the Bakwena Cave, South Africa.

During the year a number of fieldtrips were undertaken to the Bakwena Cave and one preliminary trip in October 2011, to the Seekoeivlei Nature Reserve.

In November 2011, Ms H. Pretorius (née Landman) submitted her M.Sc. dissertation.

Pesticide Resistance Testing and Research Facility consists of Mss Ellie van Dalen (Lecturer & Researcher) Christa du Rand (Professional officer), Annemarie van Heerden (Honours student and laboratory assistant), Sharon Terry, Octavia Motlogeloa and Mr Adri Jordaan (part time M.Sc. students).

Tick resistance development against chemical control and methodology to obtain accurate information on resistance profiles in different areas of South Africa were still our main focus during 2011. One of the test methods, Adult Immersion testing, was re-evaluated as part of the honours project of Ms Annemarie van Heerden and valuable information on the validity of results obtained under certain collection and pre-testing conditions was generated. Collaboration with pharmaceutical companies providing chemical control remedies to address the problem of resistance development was also re-established to be able to continue the challenge of implementing adequate tick control management strategies and the monitoring thereof. For this purpose meetings with Corné Mostert from Virbac, Centurion and Dr Clinton Austen of Bayer, Isando were conducted at the end of May where a few strategies were discussed to encourage producers to also take responsibility in the slowing down and prevention of resistance development against chemical control.

A visit to Dr Christine Maritz of the Genetics Department at the University of Pretoria was made during the last week of November to establish possible collaboration with regards to molecular determination of resistance development and the correlation to field resistance profiles. Possible research projects for 2012 were discussed of which the practical implications will be investigated further during 2012.

Mr Whitey Jordaan, while working at ClinVet International, concluded the writing up of his dissertation on *Species composition and geographical distribution of ixodid ticks (Acari: Ixodidae) in Free State Province, South Africa* which was distributed for evaluation on 30 November. Mss Sharon Terry also working at ClinVet International and Octavia Motlogeloa, working as a Clinical Data Coordinator at Quintiles South Africa, both part time M.Sc. students, did not manage to complete the final draft of their dissertations on the comparative taxonomy of four morphological very similar ticks from the *Rhipicephalus* genus and the management strategies and development of resistance to chemical control by the blue tick *Rhipicephalus decoloratus*, in the Graham's Town Area in time for evaluation, but plan to hand the dissertations in during mid 2012.

M.Sc. –Zoology students

Terry, S. Dissertation: *A Taxonomic description of all stages of four Ixodes (Acari:Ixodidae) tick species.* Supervisor: Horak, I.G. Co-supervisor: Van Dalen, E.M.S.P.

Jordaan, A.J. Dissertation: *Species composition and geographical distribution of ixodid ticks (Acari: Ixodidae) in Free State Province, South Africa.* Supervisor: Horak, I.G. Co-supervisor: Van Dalen, E.M.S.P.

Motlogeloa, B.O.O.O. Dissertation: *Management strategies and development of resistance to chemical control by the blue tick Rhipicephalus decoloratus, in the Graham's Town (South Africa) Area.* Supervisor: Van Dalen, E.M.S.P.

QwaQwa Campus

Staff information

Name of Staff member and Designation	Qualification	Type of Appointment
1. Dr MMO Thekiso Senior Lecturer	Ph.D.	Permanent
2. Dr A. le Roux Senior Lecturer	Ph.D.	Permanent
3. Dr M. Leeto Lecturer	Ph.D.	Permanent
4. Mr J. van As Lecturer	M.Sc.	Permanent
5. Mr E. Bredenhand Lecturer	M.Sc.	Permanent
6. Ms H.J.M. Matete Junior Lecturer	B.Sc. Hons	Permanent
7. Ms M. Van As Junior Lecturer	B.Sc. Hons	Contract
8. Dr M.S. Mtshali Affiliated Researcher	Ph.D.	Contract
9. Dr A.M. Tsoetsi Affiliated Researcher	Ph.D.	Contract
10. Ms M.P. Sithole Officer. Professional Service	B.Tech: Office Management and Technology	Permanent
11. Mr J. Mabena Officer. Professional Service	Nat. Diploma: Vet Technology	Permanent

Entomology workshop 2011 – K. Mtshali

"The beautiful, the ugly, the graceful and bounty." More than half of all the Earth's organisms are insects with over 750 000 described to date, but most, if not all, carry with them a bad image and their good side is overlooked. What most of us don't know is that as diverse as they are, insects each play an ecological role whether or not beneficial to man. "Not all insects are bad", Mr Emile Bredenhand, the organizer and facilitator of the workshop, said. "Come to think of it, honey – that sweet stuff you spread on your toast this morning, the beautiful flowers in your garden and that lovely scent that comes rushing in through your windows in spring,

to mention just a few, can all be attributed to insects, but all of that is often ignored." Mr Bredenhand and Mr Johann van As gave lectures that particularly stressed the importance of insects in parasitology as parasites and vectors of veterinary and medically important diseases, in agriculture as natural pests and pollinators, in forensic sciences, in the recycling of dead organic matter, their role as bio-indicators and bio-control agents and gave a detailed taxonomic classification of insects as well as their roles in other spheres.

The workshop held on the 25th –26th of February 2011 was aimed at attracting undergraduate students to the newly developed Entomology program in the department of Zoology and Entomology as well as to give the 2nd year Entomology students a chance to collect more insects for their projects and to create awareness in management of insects in parks and associated institutions. We were graced with the presence of scientists, conservation interns and their supervisor from Cedara College of Agriculture, from Golden Gate National Park, lecturers, under and postgraduates from the Life Sciences division of UFS QwaQwa. In between the lectures were field exercises where different active and inactive methods of insect collection were demonstrated, such as netting, light trapping, bait trapping, pitfall traps, Malais traps, pan traps etc. Everyone was given a chance to make their own collection which would later be used in pinning and a few would be preserved for future use. The workshop was such a success that later again another one will be held in association with our very good partners the National Zoological Gardens of South Africa, Pretoria Zoo as part of training for their staff.

The 2011 excursions at National Zoological Gardens, Sterkfontein Caves and Maropeng – L. Mabe

On Monday 3rd October 2011, 23 of us, including the final year Zoology students and staff members, took the university bus and headed to Pretoria. We were booked to stay at the National Zoological Gardens (to whom we are more than grateful) for the duration of our stay. On arrival, the students were given a guided tour of the zoo's Centre for Research and Conservation, the Veterinary Hospital and the Animal Kitchen.

The next day we visited the Sterkfontein Caves. There we saw all sorts of displays about how the earth was formed and how life on earth began, what early humans looked like and their evolution into modern humans. We were then given a guided tour of the caves and a bit of history were given on how the caves were discovered, all the fossils that were discovered and/or displayed there as well as the ongoing excavation of another fossil that has been discovered in the caves. We also got to see the lake that runs under the caves which no-one really knows the depth of since no-one is allowed to go diving there anymore due to the unfortunate death of one of the divers from Wits University some years back. The students also got to see and learn about some of the most amazing formations that grow in the caves, the stalagmites and stalactites. We continued our tour at the



The 3rd year evolution excursion at Marupeng and Sterkforntein caves and the National Zoological Gardens

Cradle of Humankind, Maropeng, where we learned more about early life and the evolution of humans. We ended the tour on a high note with a “boat ride” that took us through the different eras of life and showed us the exciting movements of the tectonic plates and erupting volcanoes. This was followed by a string of games and displays on extinction and evolution and a collection of fossils of the early hominids.

The 2011 postgraduate seminar day and year-end party – K. Mtshali

For the first time ever the Department of Zoology & Entomology QwaQwa Campus hosted the postgraduate seminars and year-end function on the 17th of November 2011. This event is usually held at the main campus, where the young scientists of both campuses have to jointly showcase what they have been doing throughout the year for their Honours, Master’s and Doctoral degree projects. This includes

talks on proposed projects and progress reports of research that will be submitted in fulfillment of their degrees. The opening and welcoming speech was given by Mr Bredenhand who together with Ms Sithole, had organized the day.

The day was separated into four sessions with Honours students as chairpersons. Now, we all know how nerve-racking the whole experience of having to defend your work on foreign ground is. At least this time we were at home and we had all the ammunition and had to use it to our advantage.

During the lunch break the Bloemfontein students and staff were shown the departments, laboratories and the museum as most, if not all, have never set foot on our picturesque QwaQwa campus and I must say they were impressed, especially at the quality of work that comes from our not so big a department. It was a great honour for us to host this very successful event. It took a lot of preparation, dedication and effort from both staff and students. The rest of the day was to be wrapped up at the Basotho Cultural Village where the year-end function and honouring of the speakers for the day were to take place. The best Junior (Honours) presenter was Ruaan Schlebusch of the Bloemfontein campus and the best senior (M.Sc. and Ph.D.) award was awarded to Ms Lerato Mabe from our QwaQwa campus.

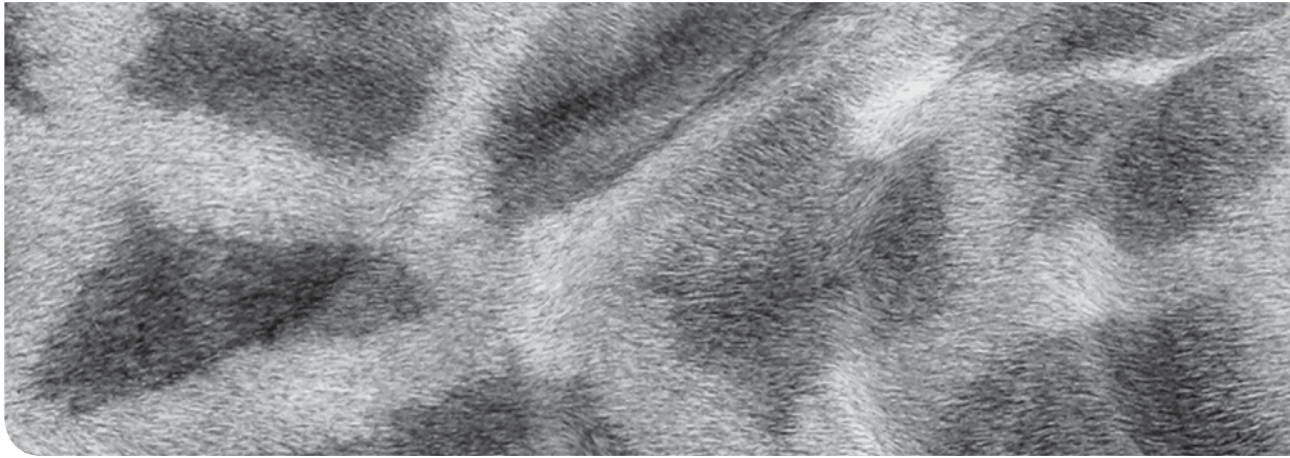
Dr Oriel Thekiso, the host speaker for the day (Departmental Head and Subject Coordinator, QwaQwa Campus) welcomed once again our guests and congratulated the speakers for a job well done and then later gave an insightful presentation on *Trypanosoma* titled: *Development of Loop-mediated isothermal Amplification towards molecular diagnosis of trypanosomosis in the field*. The talk revealed how manipulation of biological samples combined with technology and brilliance could bring about change in underdeveloped countries threatened with the burden of diseases such as trypanosomosis and how to troubleshoot the problem of costly diagnosis into cost effective, specific and rapid diagnosis which can be achieved in the field with the use of just a simple incubator.



Students attending the 2011 Postgraduate Seminar Day and year-end party.

Research Outputs

Department of Zoology and Entomology



Research articles

- Apanaskevich, D.A., Horak, I.G., Matthee, C.A. & Matthee, S.** 2011. A new species of *Ixodes* (Acari: Ixodidae) from South African mammals. *Journal of Parasitology* 97: 389–398.
- Beneke, C., Labuschagne, M.T. & Louw, S.v.d.M.** 2011. Recombinant inbred lines and backcross breeding as methods to develop lines with increased resistance to common bean weevil (*Acanthoscelides obtectus*). *Crop Protection* (In press).
- Botha-Brink, J. & Modesto, S.P.** 2011. A new specimen of the therocephalian synapsid *Olivierosuchus parringtoni* from the Lower Triassic South African Karoo Basin. *Palaeontology* 54: 591–606.
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- Grab, D.J., Nikolskaia, O.V., Inoue, N., Thekiso, O.M.M., Morrison, L., Gibson, W. & Dumler, J.S.** 2011. Using detergent to enhance detection sensitivity of African trypanosomes in human CSF and blood by loop-mediated isothermal amplification (LAMP). *PLoS Neglected Tropical Diseases* 5: e1249.
- Haddad, C.R. & Wesolowska, W.** 2011. New species and new records of jumping spiders from central South Africa (*Araneae: Salticidae*). *African Invertebrates* 52: 51–134.
- Haddad, C.R., Neetling, J.A. & Lyle, R.** 2011. *Spinotrachelas montanus* sp. n., the first Afromontane representative in the genus (*Araneae: Corinnidae*). *African Invertebrates* 52: 345–352.
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Cunningham, M.J. 2011. *Population viability analysis of Austroglanis barnadri in the Cederberg*. WRC Project K8-592 linking conservation of endangered freshwater fishes with river conservation on the Cederberg. Report to the South African Water Research Commission (WRC), Pretoria, South Africa.

Cunningham, M.J. 2011. *Amphibian diversity and conservation in the Cederberg*. WRC Project K8-592 linking Conservation of Endangered Freshwater Fishes with river conservation on the Cederberg. Report to the South African Water Research Commission (WRC), Pretoria, South Africa.

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Buyisile, G.M. & Cunningham, M.J. 2011. *Cape crag lizards (Cordylidae: Pseudocordylus microlepidotus) show extensive gene flow across the Cape floristic region*. Contribution to the 10th Conference of the Herpetological Association of Africa, University of Cape Town, Cape Town, South Africa. 11-14 January.

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Associate Professor: Liesl van As

Extraordinary Professors: Profs. Leon Fourie, Gerhard Prinsloo

Lecturers: Dr Candice Jansen van Rensburg, Messrs Hennie Butler, Charles Haddad, Ms Ellie van Dalen

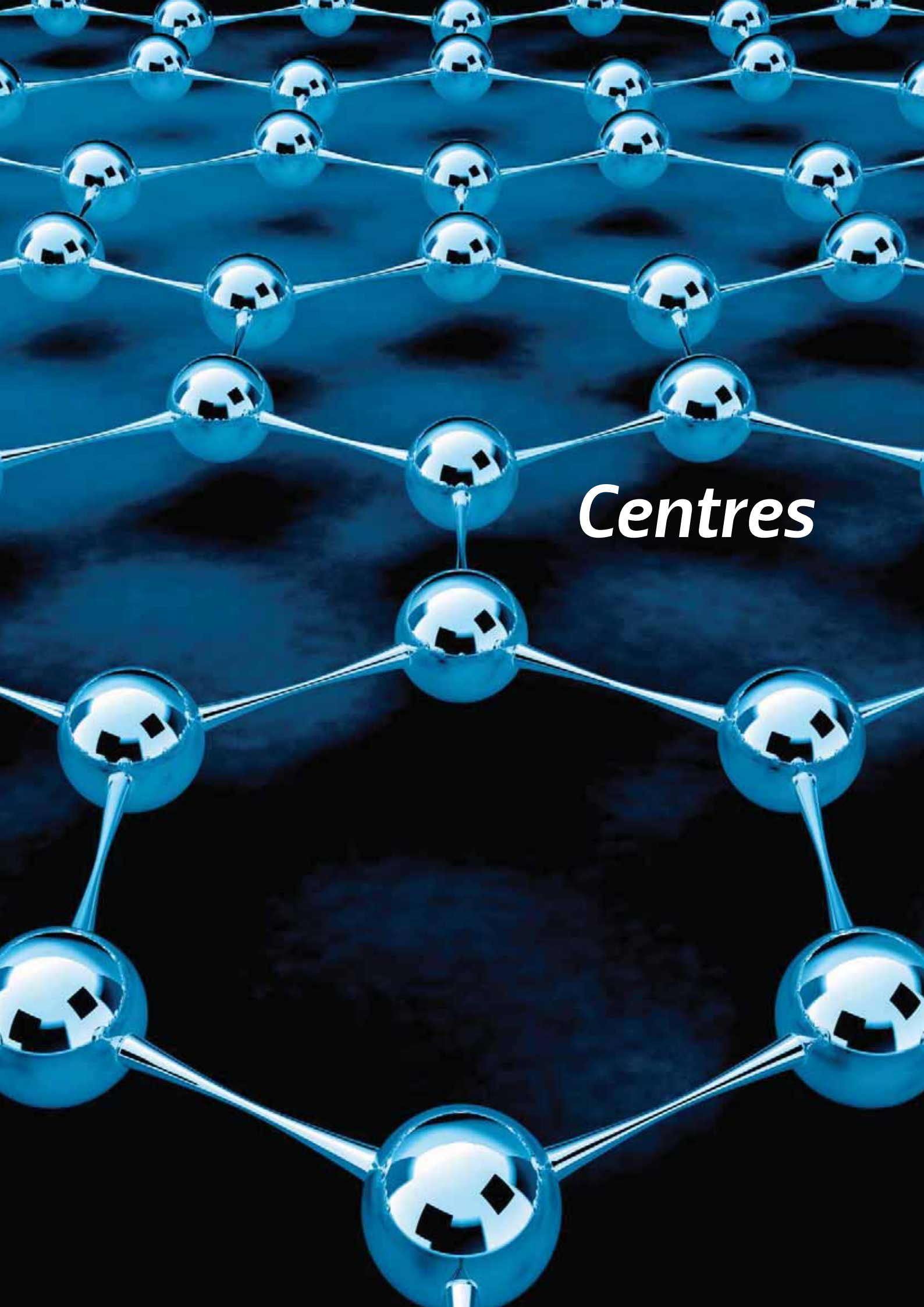
Junior Lecturers: Ms Lindie Heyns, Mr Vaughn Swart

Affiliated Researchers: Profs Dawie Kok, Ivan Horak, Jacob den Heyer, Dr Jennifer Botha Brink, Mr Johan van Niekerk, Mr Ashley Kirk-Spriggs

QwaQwa Campus

Subject Head and senior lecturer: Dr Oriël Thekisoe

Lecturers: Messrs Johann van As, Emille Bredendhand, Ms Hafeleni Matete



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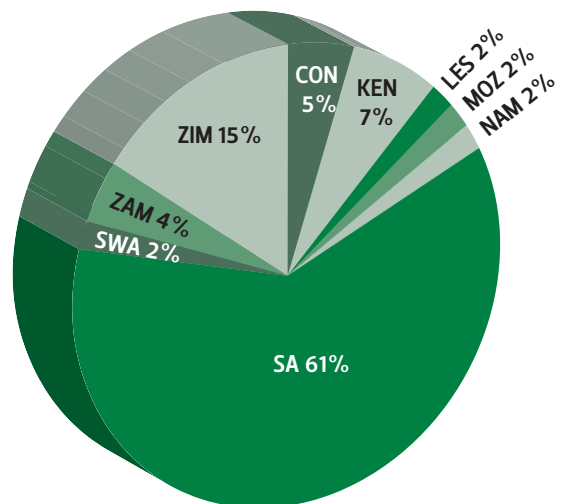
DiMTEC

Overview

Our Master’s Degree in Disaster Management is very popular. Students from all over Africa are being trained by the DiMTEC winning team. The students get more education and knowledge on Disaster Risk Reduction strategies around the world through the lectures delivered by a diverse group of lecturers. Our course structure makes it possible for the professionals in the work field to complete the course in two years. DiMTEC is proud of its achievement over the past 10 years.

The number of people applying for the course has increased from year to year. We welcomed students on the 24th of January 2011, after receiving well over 250 applications for the 2011 year, but only 50 were selected. The selection criteria were very strict due to the limited number of students we can handle, and the candidates with the best academic records and experience were chosen.

The 2011 intake entails students from; Cameroon, Congo Brazzaville, Kenya, Lesotho, South Africa, Swaziland, Zambia and Zimbabwe. The demographics are as shown right:



2011 Intake

Congo (CON)
Kenya (KEN)
Lesotho (LES)

Mozambique (MOZ)
Namibia (NAM)
South Africa (SA)

Swaziland (SWA)
Zambia (ZAM)
Zimbabwe (ZIM)

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Mr Andries Jordaan

Mr Andries Jordaan is proficient in the areas of Disaster Management, Small farmer development, Land Reform, Rural development and Rural finance. He is also involved with QwaQwa commercial emerging farmers.

Vision

To be an internationally recognized centre of excellence in disaster management training, education and research in Africa.

Mission

To provide professionals in disaster management to actively contribute to the disaster risk reduction efforts as constituted in the United Nations' Hyogo Declaration of January 2005.

Main objective

To provide training to postgraduate students and undertake research in disaster management in order to actively contribute to the disaster risk reduction efforts as constituted in the United Nations' Hyogo Declaration of January 2005.

Departmental activities and achievements

The continued partnership between the University of the Free State – Disaster Management Training and Education Centre for Africa (UFS-DiMTEC) and the United Nations University Institute for Environment and Human Security (UNU-EHS) led to a number of activities in 2011.

Disaster management capacity-building in Congo-Brazzaville

From 16 to 27 May 2011 the Disaster Management Training and Education Centre for Africa of the University of the Free



From the left: Ms Jessica Johmann, Mr Bruno Monka and Mr Donald Otsira.

State (UFS-DiMTEC) offered the second contact session of its Master's programme on Disaster Management in Bloemfontein, South Africa. The two Congolese government officials who enrolled in the two-year Master's programme also attended the session. The United Nations University Vice Rectorate in Europe (UNU-ViE) UFS-DiMTEC implemented the French part of the programme and Ms Jessica Johmann, the UNU-ViE representative attended the contact session, in



Block Course participants in class.



Brain storming session with participants.

order to support and assist the students to fully understand the courses by mentoring the students.

As future disaster management experts, it is expected that the Congolese students will be the building blocks of disaster management capacity building in Congo Brazzaville.

Donald Ontsira, Congolese expert from the Ministry of Foreign Affairs and Cooperation, is a Disaster Management Master Student. Mr Ontsira was temporarily appointed as a research assistant at DiMTEC.

The annual Block Course

DiMTEC hosted the sixth Block Course in partnership with the United Nations University from 7th – 18th February 2011. The course was titled “From Vulnerability to Resilience in Disaster Risk Management”. The block course focuses on vulnerability issues. An in-depth study of the vulnerability models within the disaster risk reduction profession is undertaken. Relevant case studies from different corners of the world are reviewed. DiMTEC students and experts from South Africa and beyond participated and were required to come up with a customised, comprehensive disaster vulnerability assessment by the end of the course. A field trip was organised to Heidedal, a residential area that was badly affected by flooding in early January 2011.

The 16 participants were from Cameroon, Kenya, Nigeria, South Africa, Zambia and Zimbabwe. Ms Vilma Hossini from the UNU and Ms Alice Ncube were the coordinators.

Guest researcher from UFS-DiMTEC joined United Nations University (UNU) Bonn team

Ms Kehinde. E. Balogun joined the UNU-VIE and UNU-EHS as a guest researcher on 3rd August, 2011. Her stay lasted three months. Within this month Ms Balogun worked together with UNU-EHS scientists through a mentor/protégé relationship on her Master’s thesis, with the advice of UNU-EHS vulnerability experts. She was also invited to present her thesis to the UNU Young Research Forum. Ms Balogun, in her capacity as a researcher, worked on projects that the organisation was



Ms Kehinde Balogun at the United Nations University in Bonn, Germany.

“My presence at UNU Bonn contributed to the further development of our institutional collaboration and my individual capacity strengthened not only within the University of the Free State, but also South Africa as a whole”

involved in, including a possible collaboration between South Africa and the German government.

She had the opportunity to assist and contribute to the UNU Annual Advisory Forum Meeting, where she met the world leading experts on Risk Reduction pertaining to disaster risk reductions and climate change. In addition, she provided academic support by assisting to draft a textbook for the collaborative Ph.D. block courses that annually takes place in Bonn, Germany and Bloemfontein, South Africa.

UNU fosters growing partnership with the University of the Free State (UFS) in South Africa

The University of the Free State was the first university in Africa to sign a memorandum of understanding (MOU) with the UNU. The MOU between the University of the Free State, Disaster Management Training and Education Centre for Africa (UFS-DiMTEC) and United Nations University Institute for Environment and Human Security (UNU-EHS) was signed on 25 September 2009.

In the light of this collaboration and staff initiative, it was deemed appropriate that the new and current UNU Vice-



From the left: Mr Andries Jordaan, Ms Jessica Johmann, Prof. Neil Heideman, Prof. Jakob Rhyner, Ms Annette Weyers, Prof. Maitland Seaman.

Rector for Europe visited DiMTEC, to further strengthen future collaboration.

A delegation from the United Nations University Vice Rectorate in Europe (UNU-ViE), including Prof. Jakob Rhyner, vice-rector in Europe and Director of the Institute for Environment and Human Security, visited the UFS from 20 to 21 October 2011. Discussions on future collaboration between the two institutions took place. The delegation met with the head of South Africa's national disaster management centre and his team and to deliver a guest lecture on the topic of "Human Security in Africa".

Prof. Rhyner was invited as guest of honour to the year-end celebrations of UFS-DiMTEC. In his opening speech he commended the work that had been carried out by both parties, in the past, and said "*I was looking forward to engage in new activities and intensify ongoing ones*".

Second UNU-FLORES scoping workshop held in Mozambique

From 24 to 25 October 2011, the 2nd International Scoping Workshop on the establishment of the United Nations University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES), Dresden and its envisaged twin institute in Mozambique took place in Maputo, Mozambique.

Mr Andries Jordaan attended in his capacity as a specialist advisor, and scientists from all over the world including, international representatives of UN-Water and other UNU Institutes worldwide, as well as delegates from the host countries Germany and Mozambique continued to lead discussions on the institute's scope and mission, the work plan and research priorities. Prof. Konrad Osterwalder, rector of UNU and under-secretary-general of the United Nations Organization, also attended the workshop.

The 1st International Scoping Workshop took place from 11 to 12 November 2010 in Dresden, Germany.

DiMTEC Strategic Planning Workshop

On the 9th of May 2011, the Disaster Management Training and Education Centre (DiMTEC) welcomed its full-time and part-time members of staff to the **Strategic Planning Workshop** at the Olivia Game Lodge, 35 km outside Bloemfontein. The workshop generated from the idea that individuals affiliated with DiMTEC would liaise with one another in order to evaluate the Master's programme operations and effectively set goals to achieve the department's mission. Various issues were addressed, involving appraisals and gaps in the processes that could be improved. The workshop helped to gain insight on the strengths and weaknesses of DiMTEC which will be addressed in the future. At the end of the workshop, interested individuals were treated to a helicopter ride by the Bloemfontein SANDF.



DiMTEC lecturers at the Olivia game lodge.



DiMTEC lecturers and staff who had a helicopter ride at Olivia Lodge.

Short courses: The Sphere Project

Johannesburg

The Sphere Training was requested by the Ekurhuleni Metropolitan Municipality from DiMTEC. The training took place from 8-10 March 2011 aimed to make the officers aware of the minimum standards in emergency situations. The course involved training of disaster managers and practitioners from the Ekurhuleni Municipality.



Mr A. Jordaan (far left), Ms E. Zulu, Mr B. Banda; Ms O. Chisola (far right), Mr C. Darris, Mr T. N'gandu, Mr B Siachonu.

Botshabelo and Thaba Nchu

The Disaster Management Training and Education Centre for Africa (DiMTEC) at the University of the Free State collaborated with World Vision South Africa to train community members from the 14 -16 November 2011. The community members are leaders and participants in different community projects in Botshabelo and Thaba Nchu. Feedback on training was consistently positive from participants. This training was one of the first for community members to be trained in World Vision South Africa ADPs using the new 2011 Handbook and lead by the TOT facilitators. The training was specifically contextualized for this community and members were allowed to use their language and provide examples relevant to them. Twenty seven people from community based organizations participated (10 males and 17 females). Two participants were development workers employed by World Vision. The participants demonstrated their knowledge of the community and how disasters have been handled in the past and how they envisage handling them better in the future. The training was facilitated by a team of 4, which included 2 colleagues from World Vision and Ms Olivia Kunguma and Ms Alice Ncube from DIMTEC, who were trained as Sphere TOT facilitators in August 2011.

The DiMTEC annual round trip in Southern Africa

The purpose for the visit is to give DiMTEC students support while they embark on their research. As part of the learning process and continuous interaction with students, DiMTEC personnel visited students in SADC states namely Zimbabwe, Botswana, Zambia and Namibia. This provides DiMTEC's academic personnel with more exposure and knowledge of other countries and its environments. It also allows networking with other national disaster management centres, non-governmental organizations and universities to

share and exchange knowledge and experiences and, if the need arises, collaborate.

Zimbabwe

Mr Jordaan met with the vice-Rector of the National University of Science and Technology (NUST) and the dean of the Faculty of Commerce as well as some of the university's lecturers. The director discussed possible collaboration especially now that NUST has opened an Institute of Development Studies.

The trip took the director through OXFAM GB in Harare, Zimbabwe, the University of Chinhoyi and the irrigation schemes in Chinhoyi. Sixteen Zimbabwean students were able to have one-on-one contact with the director and discussed their research.

Zambia

Seven DiMTEC students from different parts of Zambia met with the director of DiMTEC in Lusaka, the capital of Zambia. Thereafter the director proceeded to the Zambia National Agriculture Show, where he met with different people from different parts of the country and region. Mr Jordaan also visited the University of Zambia and had a meeting with the rector of the University of Zambia, Prof. Steven Simukanga. They discussed among other issues future opportunities of collaborative research projects together with Zambian DiMTEC students.

Departmental project

The Disaster Management Training and Education Centre for Africa conducted a *Drought Risk Assessment* for the Department of Agriculture for the Northern Cape Province.

Mr Andries Jordaan, the director of UFS-DiMTEC, was the project leader and worked with the NETGroup (an engineering company). The project involved risk assessment for:

- Flood
- Drought
- Ground
- Water
- Veld Fire

The Northern Cape Province is the first province in South Africa to have such a comprehensive agricultural project. It was recommended that other provinces should follow suit.

Published papers

The book *Unlocking Markets to Smallholders: Lessons from South Africa*. Edited by: Herman D. van Schalkwyk, Gavin C.G. Fraser, Ajuruchukwu Obi and Aad van Tilburg .

The book was published in the Netherlands by Wageningen Academic Publishers, to which Mr Andries Jordaan was a co-writer as well as Prof. Jan Groenewald who contributed to Chapter 8 called “*Unlocking Credit Markets*”.

Short courses

The following Short Courses were presented in 2011:

- Ph.D. Block Course 7th – 18th Feb
- ADRA – Emergency Flood Assessment Course 22 – 24th Feb
- Sphere Project In Ekurhuleni Metropolitan 8th – 10th March
- Introduction To Disaster Management 22 – 24th March

- Geographic Information System at UFS 11th – 15th April
- Sphere Project at Khauhelo ADP 14th – 16th November

DiMTEC 2011 graduations

Autumn graduation: *May Graduation*

The following students graduated with a Postgraduate Diploma in Disaster Management

- LEDIGA, Elizabeth Maselekudi
- MAMOGALE, Mamosegare Hellen
- MATHEBULA, Matlhodi Elizabeth
- ZINDI, Blessing

The following students graduated with a Master's in Disaster Management

- CHIKUMBA, Evans Kennedy Tendai
- DAU, Mudinda Chester
- HANDINA, James
- MOYO, Nicholas
- MUGOGOVHALI, Tshililo Victor
- NDLOVU, Thabo
- NGWENYA, Sifelani
- NKOANA, Ramapulana
- PETERS, Corne
- RABALAO, Rosina, Tabea
- SHAMANO, Nicholas
- STRAUSS, Jeanne-Marie
- TADERERA, Clever
- THOBEJANE, Mmalesaba, Petunia

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Academic staff

Director: Mr Andries Jordaan

Secretary: Ms Annelene Schröder

Research Assistant: Kehinde Balogun

Financial Administrator: Ms Gerdamarie van Coppenhagen

Junior Lecturers:

Short Course Coordinator: Ms Alice Ncube

Master Course Coordinator: Ms Olivia Kunguma

Bursary Manager: Mr Johannes Belle

Research Outputs

Disaster Management Training and Education Centre for Africa (DiMTEC)



Chapter in book

Groenewald, J. & Jordaan, A. 2011. *Unlocking credit markets*. In *Unlocking markets to smallholders: Lessons from South Africa*, edited by H.D. Van Schalkwyk, G.C.G. Fraser, A. Obi and A. Van Tilburg. The Netherlands: Wageningen Academic Publishers. pp. 175-190.

Research reports

Booyesen, H.J., Du Plessis, A., Jordaan, A.D. & Jordaan, A.J. 2011. *Flood risk assessment for the Northern Cape Province, South Africa*. Report commissioned by the Northern Cape Province, South Africa.

Dennis, I. & Jordaan, A.J. 2011. *Ground water risk assessment for the Northern Cape Province, South Africa*. Report commissioned by the Northern Cape Province, South Africa.

Jordaan, A.J., Jordaan, A.D. & Procter, M.N. 2011. *Fire risk assessment for the Northern Cape*. Report commissioned by the Northern Cape Province, South Africa.

Jordaan, A.J., Sakulski, D. & Jordaan, A.D. 2011. *Drought risk assessment for the Northern Cape Province*. Report commissioned by the Northern Cape Province, South Africa.

Conference contributions

Jordaan, A.J. 2011. *Drought risk assessment for the Northern Cape Province*. Paper delivered at the 26th Disaster Management Institution for South Africa (DMISA) Annual Conference: Evolving disaster risk – Challenges and opportunities for resilient communities, Lord Charles Hotel, Somerset West, South Africa. 14-16 September.

Jordaan, A.J. 2011. *The agricultural extension officer and drought risk reduction*. Paper delivered at the Annual Free State Conference for Agricultural Extension Officers, Free State Department of Agriculture, Bloemfontein, South Africa. 17-18 March.

Kunguma, O., Jordaan, A.J. & Bhebhe, D. 2011. *Socio-environmental damage, a looming facet of illegal gold panning: A case study of the illegal gold panners of Gwanda District, Zimbabwe*. Paper delivered at the 26th Disaster Management Institution for South Africa (DMISA) Annual Conference: Evolving disaster risk – Challenges and opportunities for resilient communities, Lord Charles Hotel, Somerset West, South Africa. 14-16 September.

Kunguma, O., Jordaan, A.J. & Redelinghuys, N. 2011. *Gender and access to fresh water: Experiences and coping strategies of rural women in Zimbabwe*. Paper delivered at the 26th Disaster Management Institution for South Africa (DMISA) Annual Conference: Evolving disaster risk – Challenges and opportunities for resilient communities, Lord Charles Hotel, Somerset West, South Africa. 14-16 September.

Kunguma, O., Jordaan, A.J. & Terblanche, L.L. 2011. *Development of a crisis communication plan: Case Study – Frances Baard District Municipality*. Paper delivered at the 26th Disaster Management Institution for South Africa (DMISA) Annual Conference: Evolving disaster risk – Challenges and opportunities for resilient communities, Lord Charles Hotel, Somerset West, South Africa. 14-16 September.

Ncube, A., Jordaan, A.J. & Handina, J. 2011. *An analysis of the efficacy of cash transfer in addressing food insecurity for mutare urban communities of Zimbabwe*. Paper delivered at the 26th Disaster Management Institution for South Africa (DMISA) Annual Conference: Evolving disaster risk – Challenges and opportunities for resilient communities, Lord Charles Hotel, Somerset West, South Africa. 14-16 September.

Sakulski, D.M. & Jordaan, A.J. 2011. *Internet application for disaster risk reduction*. Paper delivered at the 26th Disaster Management Institution for South Africa (DMISA) Annual Conference: Evolving disaster risk – Challenges and opportunities for resilient communities, Lord Charles Hotel, Somerset West, South Africa. 14-16 September.

“Graduates are in demand by large companies, government and nature conservation bodies.”

– Prof. Maitland Seaman

Centre for *Environmental Management*

Overview

The Centre for Environmental Management in the Faculty of Natural and Agricultural Sciences has established an envied niche for itself in South Africa. The niche is based on three intertwined components, namely the Master’s and Doctoral programmes, short courses and a research and contract component.

The Centre is an established Centre of expertise in aquatic ecology that carries out a number of mainly applied projects and provides appropriate services to communities in the central part of South Africa. During 2011, ABSA Bank sponsored funds to support continued research and development in water.

The Master’s programme developed gradually and strongly around Sustainable Development, Project Management, Environmental Assessment and Management Systems, Integrated Environmental Management and Sustainable Development, into which a number of special skills and disciplines are woven.

The Master’s programme enrolled 38 students from 110 applicants in 2011. The intake increases in diversity every

year. In 2011 about 30% of the students were from the Southern African Development Community (SADC) and a few were from the rest of Africa, making this a truly continental programme. The programme stretches over 37 full days of contact time at the Main Campus of the UFS in Bloemfontein, consisting of one session per semester.

The programme is integrated. As the environment presents a very wide field of study, there is a perceived need to produce graduates with a healthy overview of the South African environment. Graduates are in demand by large companies, government and nature conservation bodies.

Circumstances have changed. There is a growing importance in water, conservation is no longer the domain of environmentalists, environmental assessment has become more sophisticated, environmental management systems are required in even the smallest of businesses, sustainability science has become established as its own discipline and Africa needs to move beyond irrational exploitation towards cultural maturity as far as the environment is concerned.



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Prof. Maitland Seaman

Prof. Maitland Seaman has more than 30 years of experience in aquatic research and more than 20 years of experience lecturing in biology, ecology and environmental management. His main interests lie in biodiversity and succession, environmental impact and urban ecology.

Approximately 50 lecturers are involved in the programme, half of whom are contracted from government and the private sector for their specific competencies.

During the April 2011 graduation ceremony, Mr Warwick Wade received the ERM (South Africa) Prize for the Best Master's Student in Environmental Management for 2010 and Mr Falko Buschke received the price for the Best Master's Mini-Dissertation in Environmental Management for 2010.

The Centre has a cooperation agreement with the Catholic University of Louvain in Belgium to conduct research on temporary water ecology. As a result of this agreement cooperation a Ph.D. student, Bram Vanschoenwinkel, from Louvain and a number of graduate students have spent time working at the Centre on studies initiated by the Centre in 2009.

The Centre is developing a methodology to assess the environmental water requirements of non-perennial rivers. The project is funded by the Water Research Commission (WRC) and consists of three phases of which the first two have been completed.

The project has now reached its third phase (WRC K5/1798). It is a continuation of the first WRC K5/1414 project, which focused on developing a communication strategy for the project, identifying knowledge gaps in understanding non-perennial rivers, as well as conducting an evaluation of desktop rapid reserve determinations for the Kuseb, Limpopo and Nyl rivers.

Following that, the WRC K5/1587 project dealt mainly with developing a prototype methodology for determining environmental water requirements for non-perennial rivers. The methodology was then tested on the Seekoei River in the Northern Cape. The outcomes of the trial were promising in that the project team was able to gather more understanding on non-perennial rivers and identify challenges. This contributed to the progress of the project, particularly in testing the method further.

The third part of the project (WRC K5/1798) is now in progress (2009 – 2012) with its aim to test the prototype methodology in a range of non-perennial rivers for general applicability.

Biomonitoring of the ecological status of Free State rivers

The BloemWater contract funding the biomonitoring of the Modder, Riet and Caledon Rivers came to an end in March 2011 so the team at the Centre for Environmental Management decided to continue biomonitoring these rivers with the aid of ABSA to ensure that the long-term (more than 10 years) record be continued, for the benefit of the citizens of Bloemfontein and the southern Free State.

The primary benefits of biomonitoring are in the development of long-term trend data, rather than short-term "snapshots" of conditions in a space and time, thus allowing for more reliable recognition of causal factors for the trend effects and a more efficient remedial recommendation where necessary.



Sampling “base camp” at Site EWR4 at the Seekoei River

Community-service research on Environmental Water Quality: Loch Logan, Bloemfontein’s Tourist Waterfront

Monitoring the condition of the urban impoundment Loch Logan which is the centrepiece of Bloemfontein’s Waterfront and advising on its management is a community service task undertaken by the Centre for Environmental Management. ABSA’s contribution has allowed us to continue this service.

This monitoring and advice is primarily to reassure the stakeholders regarding the condition of this public water body, ensuring that it is aesthetically and functionally acceptable for public use. This impoundment is a focal point for a large proportion of the local urban population so public health and recreational use issues are important.

Blue and Green Drop committee

The Centre for Environmental Management is represented on the Free State Provincial Blue and Green Drop Water Quality Management Committee. Here the Centre is able to give inputs into the water quality issues which have a direct bearing on the well-being of communities.

The intention is that the Centre would be able to assist in readdressing the skills gaps which have been identified by the annual Blue and Green Drop assessments, through offering targeted training courses at the respective levels of local government; municipalities and at district and provincial level.

The Centre for Environmental Management supported the Third Orange River Basin Symposium, which was held in Bloemfontein from 8 – 9 June 2011 at the University of the Free State, under the auspices of the UFS’s Strategic Academic Cluster “**Water Management in Water-scarce Areas**”, with the theme “*The role of water in food security*”.

Kolomela Mine is an iron ore mine in the Postmasburg area, Northern Cape. The Centre was contracted to implement a bio-monitoring programme in 2011 for the mine’s Environmental Management System. The project will continue over 2012 and 2013 to maintain the monitoring protocol. This project will gather very valuable data especially since monitoring has begun before the mine has started production, continue through the transitional phase and is now going into production and can therefore deliver very interesting articles.

Awards

On 20 October 2011 Professor Anthony Turton, Honorary Professor in the Centre for Environmental Management at the UFS was a guest at the Royal Swedish Academy of Sciences in Stockholm. These are the same people that host the Nobel Prize and the event was in the auditorium of the Academy, with a formal dinner under the watchful gaze of Nobel and Linnaeus, two famous Swedish scientists.

The purpose of the event was to celebrate the life-time achievement of Prof. Malin Falkenmark, a famous Swedish



Sampling a borehole at Site EWR1 along the Seekoei River during March 2011

hydrologist. As part of her prize, she was asked to invite scientists that she thought had taken her work to new levels. A total of seven scientists were thus invited, and Professor Turton was the only one from the developing world.

Prof. Turton presented a hypothesis that water crowding, Falkenmark's so-called "Water Barrier", might trigger xenophobic violence or even genocide under certain conditions.

Departmental activities

Staff involvement in projects and conferences in 2011:

Ms Surina Esterhuysen was the recipient of a one month Eurosa scholarship to do research at the Geology Department of the Catholic University of Louvain, Belgium. The objective of the research was to determine the provenance of the quartz in soil samples from Korannaberg, South Africa, to see if quartz from garden and water-filled rock pool samples had the same distribution and characteristics and thus the same provenance(s). Ms Esterhuysen had the opportunity to be introduced to the most recent sedimentological techniques under Prof. Rudy Swennen at the Geology Department of Louvain and also had guidance in terms of the analyses of micro-textures on quartz grains for provenance studies, using scanning electron microscope analyses techniques.

Mr Falko Buschke attended, and presented a poster at the Student Conference on Conservation Science hosted by the University of Cambridge, United Kingdom. The conference

was attended by about 300 delegates from more than 60 countries.

Ms Marthie Kemp attended a workshop prior to the Postgraduate Supervision conference at Stellenbosch on 18 April 2011. The theme of the workshop was: "New supervisors: Making sense of new responsibilities" and was attended by both local and international participants. She also attended a workshop on the evaluation of a thesis or a dissertation in Stellenbosch.

Conferences attended by staff:

Various students and staff at the Centre attended the following conferences and Symposiums during 2011:

- Student Conference on Conservation Science hosted by the University of Cambridge, United Kingdom (March 2011)
- SASAQS conference (26-30 June 2011)
- Orange River Basin Symposium (8 – 9 June 2011)
- XVII Congress of the Entomological Society of Southern Africa (3 – 6 July 2011)
- The South African Communication Association Conference (August 2011)
- The SAMWA Symposium (18 – 21 September 2011)

Community service

The Centre for Environmental Management serves the environmental community and the general public with numerous workshops each year. All the students are employed in environmental management positions, so there is a very direct contact with the community and its needs.





Research articles

Ackermann, R.R., Brink, J.S., Vrahimis, S. & De Klerk, B. 2010. Hybrid wildebeest (*Artiodactyla: Bovidae*) provide further evidence for shared signatures of admixture in mammalian crania. *South African Journal of Science* 106(11/12): 90-94.

Avenant, N.L. 2011. Recent progress in rodent biology and management. *Integrative Zoology* 6: 297-298. (Editorial).

Avenant, N.L. 2011. The potential utility of rodents and other small mammals as indicators of ecosystem integrity of South African grasslands. *Wildlife Research* 38: 626-639.

Buschke, F., Kemp, M., Seaman, M. & Louw, S.vdM. 2011. Intra-annual variation of arthropod-plant interactions and arthropod trophic structure in an endangered grassland in the Free State province, South Africa. *African Journal of Range and Forage Science* 28(2): 57-63.

Buschke, F.T. & Seaman, M.T. 2011. A response: Functional feeding groups as a taxonomic surrogate for a grassland arthropod assemblage. *African Invertebrates* 52: 590-592.

Buschke, F.T. & Seaman, M.T. 2011. Functional feeding groups as a taxonomic surrogate for a grassland arthropod assemblage. *African Invertebrates* 52(1): 217-228.

Codron, D., Hull, J., Brink, J.S., Codron, J., Ward, D. & Clauss, M. 2011. Effect of competition on niche dynamics of syntopic grazing ungulates: contrasting the predictions of habitat selection models using stable isotope analysis. *Evolutionary Ecology Research* 13: 217-235.

Grobler, J.P., Rushworth, I., Brink, S.J., Bloomer, P., Kotze, A., Reilly, B. & Vrahimis, S. 2011. Management of hybridization in an endemic species: decision making in the face of imperfect information in the case of the black wildebeest - *Connochaetes gnou*. *European Journal of Wildlife Research* 57(5): 997-1006.

Lewis, P., Brink, J.S., Kennedy, A. & Campbell, T. 2011. Examination of the Florisbad microvertebrates. *South African Journal of Science* 107(7/8): 64-67.

Manegold, A. & Brink, J.S. 2011. Descriptions and palaeoecological implications of bird remains from the Middle Pleistocene of Florisbad, South Africa. *Palaeontologische Zeitschrift* 85: 19-32.

Manegold, A. & Brink, J.S. 2011. A chat (*Saxicolinae, Muscipidae*) from the mid-Holocene of Florisbad, South Africa. *Ostrich* 82(1): 57-63.

Toerien, D.F. & Seaman, M.T. 2011. Ecology, water and enterprise development in rural South African towns. *Water SA* 37(1): 47-56.

Vanschoenwinkel, B., Mergeay, J., Pincheel, T., Waterkeyn, A., Vandewaerde, H., Seaman, M.T. & Brendonck, L. 2011. Long distance dispersal of zooplankton endemic to isolated mountaintops: An example of an ecological process operating on an evolutionary time scale. *PLoS ONE* 6(11): e26730.

Research reports

Avenant, N.L. 2011. *Small mammal report: Biodiversity monitoring for Kolomela Mine*. Report to Kumba Iron Ore, Kolomela Mine Property, Northern Cape Province. Report prepared by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa.

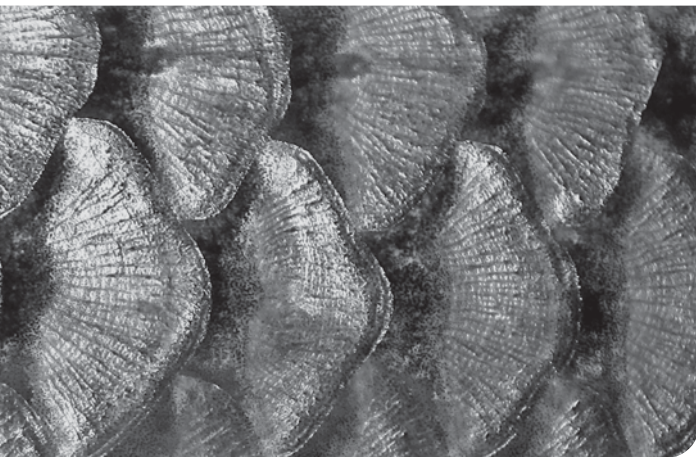
Breen, C.M., Crafford, J.G., Mitchell, S.A. & Roux, D.J. 2011. *The review, re-conceptualization and re-design of the shared rivers initiative*. Project K8/964. Final report to the South African Water Research Commission (WRC), Pretoria, South Africa.

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“The centre aims to undertake systematic small farmer training, tackle local development issues and enrich the curriculum in terms of research and training at the UFS on a simultaneous basis.”

– Dr Léan van der Westhuizen

Lengau Agricultural Development Centre

Overview

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 utilizing its academic capacity and facilities to face the challenges of sustainable agriculture in the region, country and continent.

Human resource development is being realized in all sectors of the economy, but a particular need exists within the agricultural sector, since black farmers were excluded from participating in mainstream agriculture for many decades. Prospective black farmers engaged in subsistence farming on communal land had limited access to the commercial sector. The development and growth from subsistence to commercial farming is difficult in a highly competitive sector. It requires innovative skills and knowledge and diverse inputs to be successful.

One of the three experimental farms of the UFS is 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 are used for animal and crop production and alternative natural and agricultural skills development opportunities in value-adding and marketing.

The UFS, Mangaung Local Municipality, Free State Provincial Department of Agriculture and National African Farmers Union embraced the programme as partners in agricultural transformation. A Memorandum of Understanding was signed by the Mangaung Local Municipality, National African Farmers Union and the University of the Free State in December 2004 agreed to compile a Cooperate Agreement for local and provincial governance and funding of the initiative. The Council of the Mangaung Local Municipality approved a contribution of R5 million or R750,000 annually in 2005 to establish and upgrade the training facilities at the Lengau Agricultural Development Centre. The estimated duration of the cooperation was set on 30 years. Unfortunately due to no financial deliveries until 2011 by the Mangaung Local Municipality, the cooperate agreement between the parties was cancelled in 2011. However, the facilities at Lengau Development Centre were upgraded



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Dr Léan van der Westhuizen

Dr Léan van der Westhuizen specialises in Insect Physiology, Insect Biochemistry, Economical and Applied Entomology.

and utilized 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, ordinary and advanced food gardening. The centre also serves as a centre for education of under- and postgraduates, mentors, farmers and black entrepreneurs in many aspects of livestock, crop farming and agri business. Almost R6.5 million was invested by the University of the Free State over the past seven years to upgrade and manage the facility.

Activities

The centre aims to undertake systematic small farmer training, tackle local development issues and enrich the curriculum in terms of research and training at the UFS on a simultaneous basis. Some of the agricultural know-how and skills training are in the form of:

- Using the facilities as an apprenticeship for prospective farmers, with a mentorship and support system in place to facilitate “learning by doing” before moving on to a commercial farm. Prospective trainee farmers will select a programme in beef cattle farming, dairy farming, small stock farming, pig farming, poultry farming and vegetable production.
- Providing skills training for agricultural entrepreneurs, farm workers, young people wanting to make a livelihood

in the agricultural sector, farmers in the farmer trainee programme and recently settled farmers. This is done by short courses at the centre, a mobile training capacity to serve municipalities in the Free State Province, educational tours to key centres relevant to ongoing projects and designing and soliciting accreditation of appropriate learnership courses.

- Support to emergent farmers/entrepreneurs through livestock auctions every Friday at the centre, linkages to input suppliers and markets, aftercare of newly settled farmers and start-up entrepreneurs. The centre provides appropriate infrastructure on municipal land for small-scale farming entrepreneurs. The centre enhances lobbying capacity by establishing commodity groups with linkages to regional and national farmer organizations. Assistance is also given to process applications to the Land Redistribution for Agricultural Development (LRAD) programme.
- An outreach programme through partnerships to extend the clientele through a “hub-and-spokes” framework to different parts of the country.

The rental agreement was entered into with BKB Louwid Auctioneers during 2008 to conduct weekly livestock auctions for the Bloemfontein area at the Lengau Development Centre. This agreement was terminated in the beginning of 2011 and another rental contract was negotiated with Maluka Auctioneers. Unfortunately Maluka Auctioneers did not adhere to the original agreement and the contract was cancelled in August 2011.



One of the 120 square metre vegetable gardens at Lengau Agri Centre.

The Lengau Agricultural Development Centre being part of the University of the Free State was not allowed earlier to operate as an accredited training centre at educational levels lower than grade 12. The Centre entered into a cooperate agreement with Umnga Farmers Training Group during 2011 and is now regarded as an accredited training centre for any training at levels lower than grade 12. The Centre in collaboration with Umnga Farmers Training Group applied at AgriSETA for two learnerships and 240 skills development short learning programmes. The training will be offered during 2012 in all provinces.

In conjunction with the Free State Provincial Department of Agriculture, 2 farmers' days were held at the centre and 4 farmers' days in the country where farmers were skilled in vaccination, branding, dehorning, castration and tick control. They also received training and advice in breeding and bull selection for the improvement of livestock. More than 1 000 head of cattle were handled and an average of 11 farmers attended the sessions.

Six hydroponic units were erected since 2007 at the centre. The hydroponic units and approximately halve a hectare of open garden space are used to train 6 trainees in vegetable production skills at the centre.

Two people were trained in broiler production skills at the centre. These trainees made a success of the trials in broiler production of 250 birds per cycle achieving a mortality rate of less than 5% and slaughter mass of more than 2 kg per

bird at average. The production cost per dressed broiler was at average R11.52 per kg.

Two trainee stock farmers were successfully allocated land and another two were granted funding for land in 2011. These farmers are mentored on a regular basis in collaboration with the Free State Department of Agriculture.



Accommodation quarters for students participating in Extension internship.



EIGHT month old SA Angus bull calf bred at Lengau Agri Centre in 2011.

Furthermore, two entrepreneurs are utilizing the eucalyptus (bloekom) trees at the Lengau Development centre as an opportunity for fire-wood in the local community. The first samples of fire-bricks were produced from wastepaper and the marketing of the products is currently investigated by the Students in Free Enterprise (SIFE) of the Faculty of Economic and Management Sciences.

An audit of sustainability of the projects at the centre was done early in 2010. Afterwards a decision was taken to change the service fee of the beneficiaries from a previous 100% subsidy and zero cost to a minimal service fee for electricity and water supply to the projects. Since a number of beneficiaries reflected an opinion of no sustainability, it was also decided that the beneficiaries will sign a contract with the University in 2011 and retraining of them and weekly reports of each project will be compulsory. The new dispensation was implemented from 1 January 2011. Retraining in production and marketing skills of the vegetable and pig producers were intensified in 2011 and highly significant progress in production and financial turnover was achieved by these trainee farmers. The vegetable farmers increased their production four times and established a weekly fresh market at the South Campus of the UFS. The successful weaning of piglets increased from approximately 3.5 weaners per sow to 6.7. The number of farrowing cycles

per annum increased from less than one to 1.8 annually of 28 reproductive sows.

Thirty eight Pest Control Operators wrote their qualifying examination papers of the South African Crop Life and Animal Health Association at eight sessions at the centre.

Community service

Ms Doretha Jacobs of the Department of Microbial, Biochemistry and Food Biotechnology trained 11 beneficiaries in sewing skills. A variety of products were produced and either taken home or marketed in the community. Thirty two Consumer Science students applied their knowledge and skills in this project for community service learning purposes.

In an attempt to enhance agricultural extension skills development of undergraduates, an internship will be implemented during 2012 at the Lengau Agri Centre. The students will be allowed to utilize the trainee farmers and agricultural enterprises to collect production and marketing data, analyse and reflect amongst students and towards farmers. Accommodation facilities were erected during 2011 on the premises to house eight students during weekends for this purpose. An internship in Agricultural and Humanity Social Extension will be evaluated and adapted to perfection in 2012.



Some beneficiaries of Lengau Agri Centre at a training session.

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“The transmission electron microscope is now equipped with an X-ray analyser (EDS) to examine nano particles in ultra-thin sections to determine elemental composition of any type of sample.”

– Prof. Pieter van Wyk

Centre for *Microscopy*

Overview

A survey was done in 2009 and 2010 among current and potential new users and 74% of the users indicated that they would prefer not to handle equipment and microscopes themselves and that they would prefer to be supported by an operator on a full time basis. This support function was implemented in 2011. A position for a permanent staff member as laboratory manager was created to fulfill this support function. On 1 November 2011 Ms Hanlie Grobler was appointed in this position. This support aspect at the Centre will therefore be fully implemented in 2012.

Output at the Centre has since 2010 been focused on the output by researchers and students in respect of publications, conference attendance and degrees obtained where microscopy formed part of their studies. Since skilled staff members started to support users of microscopes the time of usage of the microscopes has not been directly related to the aptitude of users. Many users only use the microscopes sporadically and therefore they fail to remember many aspects of the correct handling of the equipment. This problem has now been eliminated by the

support given to users. In this way the department also saves research funding as time is not wasted by long training sessions or by inexperienced users of equipment. A number of users now also use the “pay-as-you-go” management aspect at the centre. By this novel approach data is now supplied by centre personnel with little input from the user especially at the microscopes. Researchers at the QwaQwa campus as well as researchers from the Stellenbosch University used this support service in 2011.

The time of usage of the apparatus and laboratories by researchers still remains an indicator of research support to departments in the Faculty of Natural and Agricultural Sciences and external institutions. In 2011 the running time of the scanning electron microscope (SEM) was 411 hours, of the transmission electron microscope (TEM) 82 hours and of the confocal laser microscope (CLSM) 55 hours. The average usage of each microscope the last four years for the SEM was 530 hours, the TEM 64 hours and the CLSM 57 hours annually. The SEM usage is lower than the average and is ascribed to the fact that departments of Chemistry



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Prof. Pieter van Wyk

Prof. Pieter van Wyk's area of expertise is in Mycology, Cytology, Ultrastructure and Ascospore shape.

(QwaQwa) and Geology (2009) bought scanning electron microscopes for their specific needs and therefore they do not use the facilities at the centre. The centre supported 39 researchers with a total of 975 hours in 2011 in comparison with 37 researchers and 965 total hours in 2010.

Research aspects and some general activities

The customary demonstrations in material preparation and handling of equipment was presented to the honours students of the departments of Zoology and Entomology (DRK/ENT614); Geology (GLG636); Genetics (GEN 686); Microbial, Biochemical and Food Biotechnology (MKB/BOC614) and Plant Sciences (PWS614). A separate demonstration was given to the honours students of the Department of Medical

Microbiology and Virology (MKM601). The second year students of the Department of Zoology and Entomology and the Department of Plant Sciences attended an introductory lecture on microscopy.

Prof. Anthony Afolayan, Director: Central Analytical Laboratory (Leader: Phytomedicine Research Center) of the University of Fort Hare visited the Centre for Microscopy. The reason for Prof. Afolayan's visit was to attend a training session presented by Prof. Pieter van Wyk for students doing research on nanoparticles with a scanning electron microscope. Prof. Afolayan wants to align the service of their analytical electron microscope laboratory at Fort Hare to follow a similar approach as that of the Centre for Microscopy. Prof. Afolayan was impressed by the self-assured style of students when doing research with the microscopes, due to the dedicated training and support they receive.

Prof. Pieter van Wyk, director of the Centre for Microscopy, explains to Dr Chantel Swart (post-doctoral student with Prof. Lodewyk Kock, Lipid Biotechnology) and their honours student, Khumisho Dithebe, the operation of the new microtome purchased in 2011.



Table 1

Department	Usage hours		
	CLSM	SEM	TEM
Cardiothoracic Surgery	-	2	-
Chemistry	-	6	43
Consumer Sciences	-	3	-
Genetics	-	24	-
Microbial, Biochemical and Food Biotechnology	24	41	10
Physics	-	104	9
Plant Sciences	3	45	-
Zoology and Entomology	1	55	-
Centre (image processing, support, training)	29	127	18
External researchers/projects:			
Stellenbosch University	-	4	2

Internal researchers and students of the faculty form the core of users. Personnel and students (39) of the following departments thus utilised the facilities at the Centre (rounded down usage times). See Table 1.

Maintenance aspects

The X-ray analyser of the Shimadzu SEM has broken down. The warranty has expired and the X-ray detector must be replaced. The cost of replacement would be more or less the same as a new analyser (approximately R600 000). It is considered to be replaced with another more reliable brand. The total internal maintenance of the microscopes by Prof. Van Wyk accumulated at 87 hours and the estimated saving cost is nearly R32 000 (calculated at external rates of companies doing similar maintenance on microscopes).

New apparatus

Apparatus purchased as long ago as 1967 and still in use, is now obsolete, very difficult to handle and the maintenance not cost effective. One apparatus replaced at a cost of R1 million is an ultramicrotome used to prepare biological material for transmission electron microscopy. Material can be cut between 10-100 nanometer thickness at an area size of 0,1 x 0,1 mm. The modern computer controlled Leica Ultracut 7 microtome cut the material automatically. Results which previously took at least a month to obtain can now be available within a week. Accompanying the microtome is also an additional automatic preparation trimming unit to form the 0,1 x 0,1 mm area to cut within five minutes. It took more than an hour of extensive cutting with the older microtome to reach the same level of accuracy.

The transmission electron microscope is now equipped with an X-ray analyser (EDS) to examine nano particles in ultra-thin sections to determine elemental composition of any



Prof. Anthony Afolayan (right), Director: Central Analytical Laboratory (Leader: Phytomedicine Research Centre) of the University of Fort Hare paid a visit to the Centre for Microscopy, here with post graduate students of the UFS doing research with the scanning electron microscope.

type of sample. The apparatus was purchased at a cost of R750 000. Image analysis software was also purchased especially to improve scanning and laser confocal images. This software can improve the focus and especially the resolution of images to such an extent that structures are revealed which could not be seen on the original image. A specific confocal microscope that will obtain similar results can cost at least R3 million. Prof. Van Wyk donated the money via his NRF incentive allocation of R40 000 for 2011 to the Centre. The current entity of the centre supplied the remaining R18 000 for this software.

Research articles

Božanić, D.K., Dimitrijević-Branković, S., Bibić, N., Luyt, A.S. & Djoković, V. 2011. Silver nanoparticles encapsulated in glycogen biopolymer: Morphology, optical and antimicrobial properties. *Carbohydrate Polymers* 83: 883-890.

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Kock, J.L.F. & Swart, C.W. 2011. A new nanotechnology for novel cell based assays. *Journal of Bioequivalence & Bioavailability* 3(7): 26.

Mngomezulu, M.E., Luyt, A.S. & Krupa, I. 2011. Structure and properties of phase-change materials based on HDPE, hard Fischer-Tropsch paraffin wax and wood flour. *Polymer Composites* 32: 1155-1163.

Mokhothu, T.H., Guduri, B.R. & Luyt, A.S. 2011. Kenaf fibre reinforced co-polyester biocomposites. *Polymer Composites* 32: 2001-2009.

Ncango, D.M., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F. 2011. Non-steroidal anti-inflammatory drugs (NSAIDs) inhibit growth of yeast pathogens. *African Journal of Microbiology Research* 5: 1123-1125.

Swart, C.W. 2011. Development of a bio-assay to screen for anti-mitochondrial drugs. *Journal of Microbial and Biochemical Technology* (Open Access) 3(6): 64.

Swart, C.W., Van Wyk, P.W.J., Pohl, C.H., Kriel, W.M. & Kock, J.L.F. 2011. The influence of mitochondrial inhibitors on the life cycle of *Phytophthora*. *African Journal of Microbiology Research* 5: 3175-3180.

Conference contributions

Ells, R., Kock, J.L.F., Albertyn, J., Van Wyk, P.W.J. & Pohl, C.H. 2011. Interactions of *Candida* species with sciadonic acid treated epithelial cells *in vitro*. Poster presented at Immunology of Fungal Infections - Gordon Research Conference (GRC), Hotel Galvez, Galveston, USA. 16-21 January.

Jansen, A.C., Boucher, C.E., Coetsee, E., Kock, J.L.F., Van Wyk, P.W.J., Swart, H.C. & Bragg, R.R. 2011. Morphological changes in *Staphylococcus aureus* cells caused by treatment with didecyldimethylammonium chloride. Poster presented at the 17th Biennial Congress of the South African Society for Microbiology (SASM), University of the Western Cape, Cape Town, South Africa. 6-9 November.

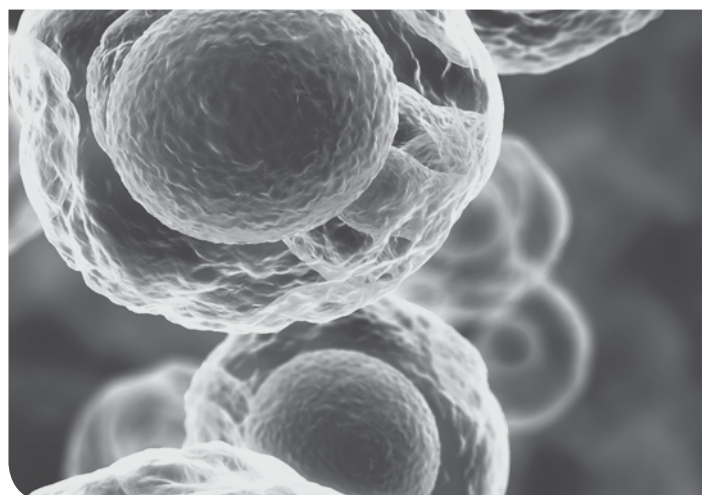
Kock, J.L.F. & Swart, C.W. 2011. A new nanotechnology for novel cell based assays. Invited keynote address delivered at the International Conference and Exhibition on Pharmaceutical Regulatory Affairs, Baltimore, USA. 6-7 September.

Kock, J.L.F. & Swart, C.W. 2011. Nano³A: A new cell systems nanotechnology approach to drug discovery. Paper delivered at the 2nd World Congress on Biotechnology: Biotechnology-2011, Philadelphia, USA. 29 November - 1 December.

Kock, J.L.F., Swart, C.W., Pohl, C.W., Ncango, D.M., Swart, H.C., Coetsee, E. & Van Wyk, P.W.J. 2011. A new imaging nanotechnology for mycology. Paper delivered at the 16th Congress of European Mycologists, Halkidiki, Porto Carras Sithonia Chalkidiki, Greece. 18-23 September.

Kock, J.L.F., Swart, C.W., Swart, H.C., Coetsee, E., Pohl, C.H. & Van Wyk, P.W.J. 2011. A new imaging nanotechnology for drug development. Paper delivered at the BIT's 2nd Annual International Conference of Medicem 2011: Master Drug Discovery Chemistry, Beijing International Convention Center, China. 9-11 August.

Kock, J.L.F., Swart, C.W., Swart, H.C., Coetsee, E., Pohl, C.H. & Van Wyk, P.W.J. 2011. A new nanotechnology for biology. Paper delivered at the 4th World Congress of Industrial Biotechnology (IBIO-2011), World Expo Center, Dalian, China. 25-30 April.



Maartens, M.M.J., Swart, H.C., Coetsee, E., Swart, C.W., Van Wyk, P.W.J., Swarts, J.C., Pohl, C.H., Ncango, D.M. & Kock, J.L.F. 2011. Lipomyces: Indicator of novel antifungals. Poster presented at the 4th Congress of European Microbiologists: The Federation of European Microbiological Societies (FEMS 2011), Geneva, Switzerland, 26-30 June.

Mochane, M.J. & Luyt, A.S. 2011. Preparation and characterization of polymer encapsulated paraffin wax to be used as a phase change material for energy storage. Poster presented at the 11th Annual UNESCO/IUPAC Workshop and Conference on Functional Polymeric Materials and Composites, Stellenbosch, South Africa. 26-29 April.

Mochane, M.J. & Luyt, A.S. 2011. Preparation and characterization of polymer encapsulated paraffin wax to be used as a phase change material for energy storage. Poster presented at the 11th International Conference on Frontiers of Polymers and Advanced Materials (ICFPAM 2011), University of Pretoria, Pretoria, South Africa. 22-27 May.

Mofokeng, J.P., Luyt, A.S. & Kovács, J. 2011. Comparison of injection moulded, natural fibre reinforced composites with PP and PLA as matrices. Poster presented at the POLYCHAR 19 World Forum on Advanced Materials, Kathmandu, Nepal. 20-24 March.

Mofokeng, J.P., Luyt, A.S., Kovács, J. & Tábi, T. 2011. Comparison of injection moulded, natural fibre reinforced composites with PP and PLA as matrices. Poster presented at the 11th Annual UNESCO/IUPAC Workshop and Conference on Functional Polymeric Materials and Composites, Stellenbosch, South Africa. 26-29 April.

Mofokeng, J.P., Luyt, A.S., Kovács, J. & Tábi, T. 2011. Comparison of injection moulded, natural fiber reinforced composites with PP and PLA as matrices. Poster presented at the 11th International Conference on Frontiers of Polymers and Advanced Materials (ICFPAM 2011), University of Pretoria, Pretoria, South Africa. 22-27 May.

Mokhothu, T.H., Guduri, B.R. & Luyt, A.S. 2011. Preparation and characterisation of natural fibre/co-polyester biocomposites. Poster presented at the 11th Annual UNESCO/IUPAC Workshop and Conference on Functional Polymeric Materials and Composites, Stellenbosch, South Africa. 26-29 April.

Moretti, S., Boucher, C.E. & Bragg, R.R. 2011. The study of *Mycoplasma gallisepticum* in Southern Africa. Poster presented at the 17th Biennial Congress of the South African Society for Microbiology (SASM), University of the Western Cape, Cape Town, South Africa. 6-9 November.

Ncango, D.M., Pohl, C.H., Van Wyk, P.W.J., Swart, C.W. & Kock, J.L.F. 2011. *Novel antifungal indicators uncovered in yeast*. Poster presented at the 4th Congress of European Microbiologists: The Federation of European Microbiological Societies (FEMS 2011), Geneva, Switzerland. 26-30 June.

Ndlovu, S.S., Luyt, A.S. & Van Reenen, A.J. 2011. *Effect of using degraded LDPE as a compatibilizer in wood polyolefin composites*. Poster presented at the 11th Annual UNESCO/IUPAC Workshop and Conference on Functional Polymeric Materials and Composites, Stellenbosch, South Africa. 26-29 April.

Ndlovu, S.S., Luyt, A.S. & Van Reenen, A.J. 2011. *Effect of using degraded LDPE as a compatibilizer in wood polyolefin composites*. Poster presented at 11th International Conference on Frontiers of Polymers and Advanced Materials (ICFPAM 2011), University of Pretoria, Pretoria, South Africa. 22-27 May.

Olivier, A., Swart, H.C., Coetsee, E., Swart, C.W., Van Wyk, P.W.J., Schoombie, S., Pohl, C.H. & Kock, J.L.F. 2011. *NanoSAM investigates smart spore movement*. Poster presented at the 17th Biennial Congress of the South African Society for Microbiology (SASM), University of the Western Cape, Cape Town, South Africa. 6-9 November.

Olivier, A.P.S., Swart, H.C., Coetsee, E., Swart, C.W., Van Wyk, P.W.J., Schoombie, S.W., Pohl, C.H. & Kock, J.L.F. 2011. *NanoSAM investigates smart spore movement*. Poster presented at the 4th Congress of European Microbiologists: The Federation of European Microbiological Societies (FEMS 2011), Geneva, Switzerland. 26-30 June.

Sebolai, O.M., Pohl, C.H., Botes, P.J., Swart, C.W., Van Wyk, P.W.J. & Kock, J.L.F. 2011. *Association of 3-hydroxy oxylipins with capsules of Cryptococcus neoformans*. Poster presented at 4th Congress of European Microbiologists: The Federation of European Microbiological Societies (FEMS 2011), Geneva, Switzerland. 26-30 June.

Sebolai, O.M., Pohl, C.H., Botes, P.J., Van Wyk, P.W.J. & Kock, J.L.F. 2011. *Acetylsalicylic acid: A possible prophylactic agent against Cryptococcus neoformans*. Poster presented at the 8th International Conference on Cryptococcus and Cryptococcosis (ICCC), Charleston, South Carolina, USA. 1-5 May.

Sebolai, O.M., Pohl, C.H., Botes, P.J., Van Wyk, P.W.J. & Kock, J.L.F. 2011. *Association of 3-hydroxy oxylipins with capsules of*

Cryptococcus neoformans. Poster presented at the 8th International Conference on Cryptococcus and Cryptococcosis (ICCC), Charleston, South Carolina, USA. 1-5 May.

Swart, C.W. & Kock, J.L.F. 2011. *Yeast "Contraceptives" also Novel Drugs*. Paper delivered at the BIT's 2nd Annual International Conference of Medicchem 2011: Master Drug Discovery Chemistry, Beijing International Convention Center, China. 9-11 August.

Swart, C.W. & Kock, J.L.F. 2011. *Development of a bio-assay to screen for anti-mitochondrial drugs*. Paper delivered at the 2nd World Congress on Biotechnology: Biotechnology-2011, Philadelphia, USA. 29 November - 1 December.

Swart, C.W., Swart, H.C., Coetsee, E., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F. 2011. *A novel nanotechnology to assess 3-D Architecture and Element Composition of Yeasts*. Paper delivered at the 17th Biennial Congress of the South African Society for Microbiology (SASM), University of the Western Cape, Cape Town, South Africa. 6-9 November.

Swart, C.W., Swart, H.C., Coetsee, E., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F. 2011. *A novel nanotechnology for yeast*. Poster presented at the 4th Congress of European Microbiologists: The Federation of European Microbiological Societies (FEMS 2011), Geneva, Switzerland. 26-30 June.

Thibane, V.S., Kock, J.L.F., Ells, R., Van Wyk, P.W.J. & Pohl, C.H. 2011. *Marine polyunsaturated fatty acids inhibit biofilm formation of Candida albicans and Candida dubliniensis*. Poster presented at the 4th Congress of European Microbiologists: The Federation of European Microbiological Societies (FEMS 2011), Geneva, Switzerland. 26-30 June.

Van As, L.L. 2011. *Hyperparasites of hypersymbionts?* Poster presented at the Joint Conference of the Zoological Society of Southern Africa (ZSSA) and the Parasitological Society of Southern Africa (PARSA), Stellenbosch University, Stellenbosch, South Africa. 10-13 July.

Van As, L.L. & Van As, J.G. 2011. *Protist-Crustacean-Fish hyperepibiosis*. Paper delivered at the 8th International Symposium on Fish Parasites (ISFP), Viña del Mar, Chile. 26-30 September.

Van Wyk, P.W.J. 2011. *Image enhancement software (deconvolution) revealing hidden microbial structures*. Paper delivered at the 49th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2011), CSIR Convention Centre for Nano-Structured Materials, Pretoria, South Africa. 5-9 December.

Contact Details

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“Aligned by the 2010 international and local institutional review report, the centre established close ties and co-operation with the who’s who of Agricultural Extension in the world.”

– Prof. Izak Groenewald

Centre for *Sustainable Agriculture, Rural Development and Extension*

Overview

The Centre for Sustainable Agriculture, Rural Development and Extension (CENSARDE) at the University of the Free State (UFS) is designed to accommodate postgraduate students who are working full-time, while furthering their studies by means of distance education. The courses on offer afford students the opportunity to acquire multi-disciplinary skills and knowledge in sustainable agricultural practices. The Centre is proud of its students and their achievements.

Prof. Izak Groenewald is the director of CENSARDE. The contribution from Mr Johan van Niekerk and Mr Kevin Whitfield, the centre’s research associates, in guiding the students in their research efforts, is one of the reasons for the Centre’s success in terms of the increased student throughput rate. The Centre also has Professors Extraordinary in Profs Edward Nesamvuni, Alice Pell, Frans Swanepoel and Monty Jones. Prof. Aldo Stroebel is a senior research fellow of the Centre.

CENSARDE’s research is focused on the value-adding chain, agribusiness management, rural development as well as crop and livestock management. It aims to contribute towards the development and maintenance of sustainable production systems.

Students entering this programme come from all spheres of life, although they all share the common goal of learning more about the science of sustainability in agricultural production. Most of the students are in the full-time employment of the Department of Agriculture and the Agricultural Research Council (ARC). Some are commercial, part-time or small-scale farmers, while others are employed by banks, agribusinesses and consultancies. International students account for about 35% of the students.

The course content is scrutinised by local and international partners annually to ensure local applicability, relevancy and also to remain internationally sound.



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Prof. Izak Groenewald

Prof. Izak Groenewald's area of expertise lies in nutrition and lick supplementation for ruminants on natural pastures; animal production systems; and sustainable agricultural practices, extension and rural development.

Activities and achievements

In 2011, 70 students enrolled for the first year of the Master's programme. In the same academic year, 30 students graduated with a Master's degree in Sustainable Agriculture (MSA) and two Ph.D.s were awarded to Douglas Nkosi (ARC Pretoria) and Gabriel Hangara (NGO in Namibia).

This was the culmination of many months of hard work for these graduates who study part-time while working full-time. This brings the total number of MSA degrees awarded to 284 since our inception in 1994. CENSARDE has a proud

track record of its graduates who leave the programme well equipped to address the challenges of the workplace. This is an important contribution since modern-day agriculture is practiced in a constantly changing environment with many constraints and challenges. Students develop technological, managerial and thinking skills that are embedded in the programme. Two exceptional Master's graduates were honoured during the faculty's prize giving function for their merit achievements within the programme. They were Mr D. Kotze from Namibia and Ms P. Molapo from Lesotho.



Intake of 2011 when 70 students were enrolled for the Master's programme.



Two PhDs were awarded to Douglas Nkosi (ARC Pretoria) (left) and Gabriel Hangara (NGO in Namibia) (right) with their promoter Prof Izak Groenewald.



Two staff members . Mr Kevin Whitfield (left) and Dr Johan van Niekerk (second from the left) of the Centre during an ADSARD training session at Tsolo Agricultural College in the Eastern Cape.

Locally, CENSARDE's personnel continued training extensionists from the Eastern Cape Department of Agriculture for their second semester of the Advanced Diploma in Sustainable Agriculture and Rural Development (ADSARD). This qualification aims to meet the needs of the Agricultural Extension and Advisory Service to assist their workforce in attaining a further qualification. Part of the plan is for extension officers with diplomas (NQF level 6) to be able to achieve an advanced diploma (NQF level 7) and facilitate mobility for advanced qualifications. This is driven by the National Extension Recovery Plan of the Government and supported by the Norms and Standards Requirement pertaining to Extensionists.

The Department of Agriculture in Limpopo Province contracted CENSARDE to offer training to their employees in project management. A special short learning programme *Project Management for Sustainable Development in Agriculture* was compiled. This was offered in four sessions of one week each to 30 attendees per session. This interaction resulted in numerous advantages for the centre, faculty and university through the acquisition of two new Ph.D. applicants, 5 new Master's students and external study leaders for research projects.

CENSARDE also held a breakaway session during the 3rd Orange River Basin Symposium. The breakaway session was titled *The role of extension for sustainable water utilization*.



The Centre offered a Project Management short course for Sustainable Development in Agriculture in Polokwane.



PhD candidate from the centre Dr Douglas Nkosi received the Davis Uys shield for the best research paper from the SA Society of Animal Science during year under review.

Visit at the Global Forum for Rural Advisory Services (GIFRAS), Switzerland. Prof. Izak Groenewald (left), Dr Kristen Davis, president of GIFRAS in centre and Dr Johan van Niekerk second from right.



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Presentations were given by Messrs Johan van Niekerk (Ph.D. research findings), Andrew Tilsley (a local small-scale organic vegetable producer), J-lo Sejosengoe (Centre's student and deputy-director of ABZ Development who does work for the Royal Bafokeng Nation) and P.J. Olivier (Glen Agricultural College).

Personnel from the Centre were also involved in various conferences around the country. Prof. Groenewald attended the South African Society for Animal Science (SASAS) conference in Stellenbosch where a paper was delivered and a Ph.D candidate from the centre, Dr Douglas Nkosi, received the Davis Uys shield for the best research paper within the society during the year under review.

Prof. Groenewald, Johan van Niekerk and Kevin Whitfield also attended the 45th Annual Conference of the South African Society for Agricultural Extension (SASAE) in Kimberley, where Kevin Whitfield, Johan van Niekerk and Francois Marais presented their paper on new developments in agricultural extension from around the world. The centre undertook to take a leading role in revitalizing the Free State branch of SASAE.

Furhermore, Johan van Niekerk attended the Southern Africa Land Reform and Sustainable Agricultural Transformation Outlook during 27 – 29 July 2011 in Durban and the Sustainable Agriculture Development and Food Security Workshop during 29 – 31 August 2011 in Johannesburg. Numerous regional workshops were facilitated between our students and external study leaders to enhance tuition and research.

Whilst Prof. Groenewald remains on the editorial board of the internationally accredited scientific *Journal for Sustainable Agriculture*, he is also regularly invited to workshops and study groups because of his expertise in phosphate supplementation for free-grazing ruminants.

International activities

CENSARDE was again involved in several international linkages:

Prof. Groenewald accompanied eight students of UFS to Virginia Polytechnic Institute and State University (VT) in the USA. This student exchange programme between the universities started in 1998 and is the longest and most influential programme of its kind at the UFS. Students study at

VT for the full second semester of their third study year and do so without prolonging their total study period of the degree.

Prof. Groenewald and Johan van Niekerk attended a World Conference 2011, *Sustainable Value Chain: Agriculture for Food Security and Economic Development* during July in Windhoek, Namibia. Approximately 220 delegates from all parts of the world attended this occasion. Contacts made here initiated a reciprocal visit to the Global Forum for Rural Advisory Services (GFRAS) with headquarters in Switzerland as well as the Food and Agricultural Organization (FAO) in Rome. During the same visit, staff from this centre had meetings with Dr Hans Schupbach from Agridea and Lukas Rediger and Andreas Rusch from Strickhof, both connected to the Swizz Extension Services on extension systems in Switzerland.

Kevin Whitfield travelled to Nairobi, Kenya to attend the African Forum for Agricultural Advisory Services (AFAAS) country flora workshop, the GFRAS workshop and the International Extension Conference. At the conference, he presented his paper on pluralism in extension.

Aligned by the 2010 international institutional review report, the centre established close ties and co-operation with the who's who of Agricultural Extension in the world namely Dr Laurens Klerks and Prof. Cees Leeuwis of Wageningen University, Prof. Burton Swanson from the University of Illinois, Prof. Luc De Haese from Ghent University, Magdalena Blum, chairing the office of Knowledge Exchange, Research and Extension at the FAO in Rome, Dr Kristen Davis, director of GFRAS, Switzerland. Locally Dr Elliot Zwane, president of SASAE, and Prof. Fanie Terblanche from Pretoria University are close collaborators of the centre.

Research

CENSARDE is set to increase the number of publications from its personnel and students in the coming year. The Centre gives thanks and recognition to the management of the UFS and Faculty, the professors extraordinary and research fellows and its own staff members for their continued support and commitment to CENSARDE.

Research Outputs

Centre for Sustainable Agriculture, Rural Development and Extension



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Research articles

Hangara, G.N., Teweldemedhen, Y.M. & Groenewald, I.B. 2011. Major constraints for cattle productivity and managerial efficiency in communal areas of Omaheke Region, Namibia. *International Journal of Sustainable Agriculture* 36: 102-112.

Hangara, G.N., Teweldemedhin, M. & Groenewald, I.B. 2011. Measuring factors that can influence cattle supply response to the market in Namibia: Case study from Omaheke communal farmers. *Journal of Agricultural Extension and Rural Development* 3(8): 141-146.

Scholtz, A.J., Cloete, S.W.P., Du Toit, E., Van Wyk, J.B. & Van der Linde, T.C.deK. 2011. A survey of the prevalence of blowfly strike and the control measures used in the Rùens area of the Western Cape Province of South Africa. *Journal of the South African Veterinary Association* 82(2): 107-115.

Van Niekerk, J.A., Stroebel, A., Swanepoel, F.J.C. & Whitfield, K.P. 2011. Towards redesigning the Agricultural Extension Service in South Africa: Views and proposals of smallholder Farmers in the Eastern Cape Province. *South African Journal of Agricultural Extension* 39(2): 1-10.

Conference contributions

Scholtz, A.J., Cloete, S.W.P., Cloete, J.J.E., Kruger, A.C.M., Van Wyk, J.B. & Van der Linde, T.C.deK. 2011. *Genetic parameters for breech strike indicator traits and yearling production traits in merinos.* Paper delivered at the 19th Conference of the Association for the Advancement of Animal Breeding and Genetics (AAABG), University of Western Australia, Perth, Australia. 19-21 July.



Visit to Food and Agricultural Organization (FAO) in Rome, Prof. Izak Groenewald, Dr Magdalena Blum heading the Agricultural Extension initiative from FAO and Dr Johan van Niekerk



Dr Elliott Zwane, president of SASAE, Prof Burton Swanson from University of Illinois and Kevin Whitfield from the Centre attending the African Forum for Agricultural Advisory Services (AFAAS) in Nairobi, Kenya

Whitfield, K.P., Groenewald, I.B. & Van Niekerk, J.A. 2011. *Public-private extension approaches: A case study of the Eastern Cape's citrus industry*. Paper delivered at the Innovations in Extension and Advisory Services International Conference; Linking Knowledge to Policy and Action for Food and Livelihoods, Nairobi, Kenya. 15-18 November.

Whitfield, K.P., Marais, F.J. & Van Niekerk, J.A. 2011. *International developments in Agricultural Extension*. Proceedings of the 45th Annual Conference of the South African Society for Agricultural Extension: The Role of Agricultural Extension in Rural Development, Tabernakel Auditorium, Kimberley, South Africa. 30 May – 2 June.

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Research Associate: Mr Johan van Niekerk and Mr Kevin Whitfield

Experimental Farm



“Paradys Experimental Farm, situated 14 km from the main campus of the University of the Free State, has shown progress during the past year, in all of its five branches.”

– Mr Jannie Myburgh

Experimental Farm Paradys

Overview

Paradys Experimental Farm, situated 14 km from the main campus of the University of the Free State, has shown progress during the past year, in all of its five branches. The experimental farm proves itself annually as a good agricultural enterprise, where students can experience the practical aspects of their study and where they can learn new farming skills.

Every year prospective students and their parents are welcomed on the experimental farm after which excursions to all the production branches on the farm are undertaken. In this way good relationships are established among fellow students, with parents and students soon feeling welcome at the University of the Free State. At the beginning of this year many parents and students participated in this ceremony. On this day the dedication of the Faculty to agricultural training was motivated and during workshops parents were given the opportunity to meet lecturers of the Faculty and ask critical questions.

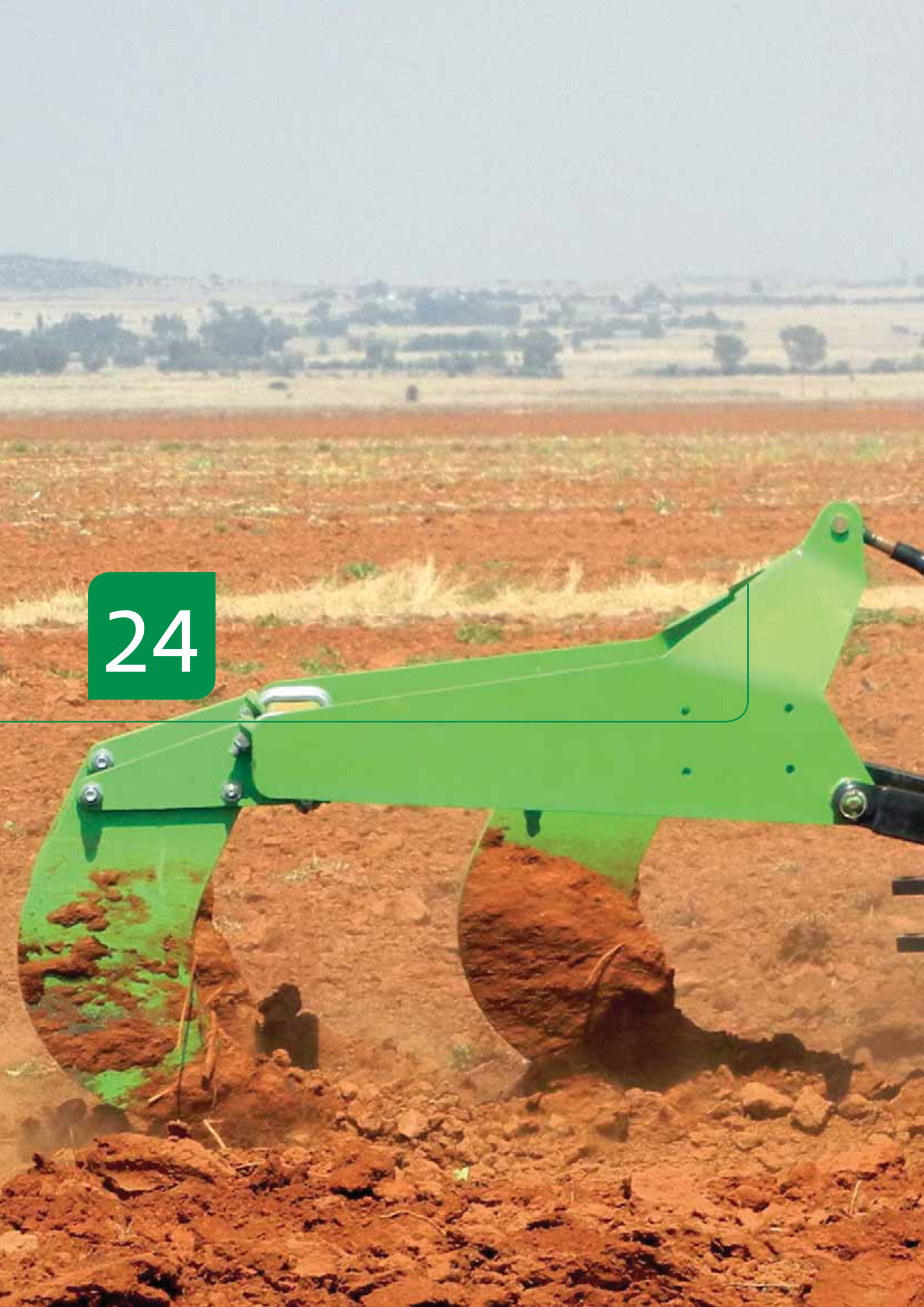
Paradys Experimental Farm accommodated 5 students during 2011 in internship programmes that formed part of

the farm management tasks. These students then had the opportunity to apply the theory of their different fields of study. Students were exposed to how aspects are addressed in practice and the challenges facing the agricultural sector. The internship was also designed in such a way to give continuity to the management on the farm, with senior students acting as mentors in the different fields. In 2011 postgraduate students from Botswana and Nigeria also participated in poultry research and further studies are to be undertaken in 2012.

During 2011/2012 the aim of the experimental farm remained to establish and maintain sustainable farming practices on the farm, the main goal being to simulate the South African agricultural industry and to bring students in the various fields into contact with all the latest agricultural trends.

Structural changes were introduced in the different farming entities to achieve this goal, with the improvement of certain unsustainable enterprises now receiving attention as economy of scale is also applicable on the farm.

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Mr Jannie Myburgh

Mnr. Jannie Myburgh, manager of the Paradys Experimental Farm for the past five years, has extensive experience in Agricultural Production Management. He has a B.Sc. degree in Agriculture with Economics and Agronomy as his main focus areas.

These improvements on the farm are aimed at making a contribution to the local rural communities, as well as increasing the training opportunities for students. The vision is to create a modern experimental farm that is operated on a commercial basis, equipped with the best technology and that will comply with all the guidelines of sustainability. These processes are in an advanced stage of implementation and will be completed within the next two years. Further growth is subsequently anticipated after set goals have been achieved by the farm and its management team.

In 2011 approximately 360 agricultural students had the opportunity of participating in practical workshops presented on the experimental farm. The experimental farm therefore offers an opportunity in particular to students who were not raised on a farm, so as to understand how an agricultural enterprise functions and in this way helping to further their studies in a practical way.

An annual veterinary congress was presented on the farm in June 2011 by the late Dr Luis Schwalbach. International and national veterinarians participated in a wide range of specialised workshops to revive their skills and to learn the latest techniques. The workshops covered several specialised fields, and were well attended, a wide range of topics being covered, such as laparoscopic techniques, sonography, surgical procedures and the treatment of animal's hooves.

The contribution of the experimental farm to the agricultural sector and rural communities also had an impact during the

past year. Several agricultural products were launched in the market and demonstrated by means of workshops and congresses. So, for instance, a new range of tractors for the South African market was introduced (the Claas Talos range), and practical demonstrations were made. Participants from all the agricultural sectors attended the day.

Emerging and small scale farmers have gained and transferred knowledge. Interaction has been facilitated to help these emerging farmers to liaise with commercial farmers who could share their experiences. The agronomy section of the experimental farm also presented a one day tillage workshop where different tillage practices were demonstrated and the efficiency of new ground working implements was tested. The focus of the day was on ground-cultivating implements and economic tilling practices to preserve the soil moisture.

A significant contribution was made by the Animal Science section when the Red Meat Producers Organization (RPO) had a DVD made, in cooperation with the experimental farm, Bloemfontein-Veeprodukte (animal products) and *Veeplaas* (magazine) regarding the dehorning practices, branding and tattooing of animals. These programmes have been made available to all the RPO members so as to train themselves and their staff.

Further presentations were made by Pfizer and Bloemfontein-Veeprodukte to farmers with the focus being on post-mortem examinations. Novartis introduced



Agrico introduced new Claas Talos tractors on a farmers' day in September 2011



An animal is treated at the annual veterinary congress which was presented on the farm in June 2011 by the late Dr Luis Schwalbach. International and national veterinarians participated in a wide range of specialised workshops to revive their skills and to learn the latest techniques. The purpose of this day is to engage farmers and their workers. Here is a demonstration on how to dehorn animals.

the latest parasite control remedy for sheep, with the experimental farm helping in providing the necessary facilities.

The management team of the experimental farm is in agreement that staff development forms an important part of any business and therefore special attention is given to the training of the unskilled labourers on the farm. Programmes have been incorporated where labourers are trained to obtain a grade 10-level qualification, after which they can participate more meaningfully in programmes in their particular disciplines.

Cultivated lands

Paradys experimental farm received a new tractor with an output of 135Kw in 2011. This was made possible via an agreement of cooperation with McCormick, which has been used to till the fields of the experimental farm for a considerable time. The technology of this tractor led to extra training for the drivers and students. The training was provided for 6 staff members of the experimental farm, as well as 3 participating students. The new tractor was a big leap into the future of precision technology with Ronin SA donating a complete straight row apparatus to the farm.

This infrastructure gave the farm the opportunity to treat the fields with lime for the 2011 season and to follow more modern tilling practices. The equipment also provided students with the opportunity to learn more about the principles of precision farming and how to implement these practices. Value was added with the application of fertilizer at different depths before the planting season. Weed control could also be done more effectively.

The daily management was supervised by Mr M. Molomo, a 4th year student.

Dairy

The total dairy herd of the experimental farm consists of 130 cows of which 110 are Jerseys and the rest Holsteins. At present 55 of the cows are in milk, and they produce on average 23 l per cow per day. Of the herd 20% are dry cows,



The laparoscopic technique demonstrated to veterinarians attending the congress.

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while the rest are in different stages of growth and being raised to increase the dairy herd. The dairy is one of the entities where economy of scale play a significant role, the aim being to buy cows and increase the total cow herd in milk to 200, thus giving the dairy an opportunity to benefit from the scale benefit that exists in the market. There are no bulls in the herd, only AI (artificial insemination) is being used.

During the past year the dairy has been upgraded and a new Waikato milking machine was implemented, with the support of an Afikim computer system. In total there are 12 milking points, each equipped with electronic meters and pulsators. The Afikim system can collect approximately 30 data sources from each cow in the herd twice a day. This includes everything from body weight to the energy consumption of the animal. Accurate data from this system is then used daily to take management decisions. This data bank has also been upgraded for future use in research. The dairy has thus undergone a significant transformation to be in step with the latest dairy environment and technology. The progress of the dairy is of the utmost importance to the sustainability of the experimental farm. Although the herd is not very big, it is being managed effectively.

Mr M. Smit, a 4th year student, takes care of the day to day management of the herd and milking parlour.

Sheep enterprise

The flock of the experimental farm consists of 60 mutton ewes and they are used primarily for AI (artificial insemination) courses that are presented annually on the farm. The flock is subjected to strict selection criteria in order to enhance the genetic potential of the flock. The sheep graze mainly on cultivated pastures and are mated once a year. Although there is the potential for more than one breeding season, currently there are certain feeding limitations. Animals with higher genetic potential are bred using laparoscopy, while the rest are all in an AI (artificial insemination) programme. All ewes are synchronized to lamb at the same time. When the lambing season starts, all ewes are put in lambing pens and fed until the lambs are three days old (to help with the bonding of the lamb with the dam). No lambs were lost at lambing during the last lambing season.

Mr J. Barnard, an Honours student, is responsible for the day to day management of this flock.



Afrikaner stud herd just after the oats had been cut.



Afrikaner cow with 8 descendants.

Beef cattle enterprise

The stud Afrikaner herd consists of 102 cows, of which 80% calved in 2011. Of the whole herd that calved, 32 animals did not comply with the selection criteria and will be culled. (These are animals that have not conceived for two consecutive mating seasons in the past 5 years.) In some cases it was found that some of these animals did not adapt to the experimental farm conditions (coming from other areas). This Afrikaner herd was established as part of a cooperation scheme with a group of cattle farmers involved. The breeding programme has the aim of only the best bulls being selected and used for mating.

The herd has made good genetic progress since its origin 6 years ago and the health and body condition of the animals are very good. During the last calving season 82 calves were weaned, with all the heifers being raised to increase the size of the herd. Heifers are not selected at present, and stricter selection criteria of the cows will only begin when the number of Afrikaner stud cows reaches 100. The chairman of this breeding scheme, Prof. F. Nesor, as well as a student, Mr J. Barnard, supervises in decision making on a continuous basis regarding the breeding programme of the herd. Mr J. Barnard also manages the herd on a daily basis.



A one day tillage workshop where different tillage practices were demonstrated and the efficiency of new ground working implements was tested, was held in August. The focus of the day was on ground-cultivating implements and economic tilling practices to preserve the soil moisture.

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Administrative Manager: Amanda Smith

Student assistants: Manie Smit, Johan Barnard, Johnny Molomo

Farm workers: Mss Anna Sebyonyane, Elisa Sebyonyane, Messrs Thabo Khubeka, Isaac Nkotshane, Daniel Somi, Paulus Somi, Samuel Motswari, Samuel Kheswa, Petrus Ramatekoane, Petrus Moribela, Stephen Bavuma, Richard Mxhaka, Ernst Maqala, Johannes Sebyonyane

Security officers: Messrs Azael Khoele, Zacharia Makopo.

Institute



“We strive to identify market needs, research these and provide a service.”

– Dr Danie Vermeulen

Institute for Groundwater Studies (IGS)

Overview

In a year where “shale gas” and “fracking” in the Karoo became headlines, the IGS was at the forefront with expert information on the topic of hydraulic fracturing – the process used to release gas from the shale. During July 2011 Dr Danie Vermeulen and Prof. Gideon Steyl went on an extensive tour through Pennsylvania with the purpose of studying shale gas activities. This was followed by various research reports, radio talks, articles in newspapers and magazines as well as a contribution by Prof. Gerrit van Tonder on SABC2’s *Fokus*.

Vision

To be the preeminent groundwater institution in Africa for academic training and relevant research.

Mission

- 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.
- To serve the community through students, research and actions that will empower stakeholders to manage groundwater sustainability.

Personnel matters

The Institute for Groundwater Studies (IGS) was founded in 1974 and is currently under the leadership of Dr Danie Vermeulen as acting director. He is assisted by Prof. Gerrit van Tonder, Prof. Gideon van Tonder from Chemistry, Dr Francois Fourie and Prof. Kai Witthüser, who is an affiliate associate professor.

The former director, Dr Ingrid Dennis, resigned at the end of the first semester 2011 to take up a position as professor at the North West University in Potchefstroom. Dr Francois Fourie was employed as researcher in the position left vacant by Dr Rainier Dennis who also took up a position at the North West University.

Postgraduate student numbers

Student numbers at the IGS are increasing every year, with 35 new enrolments for the B.Sc. Honours in Geohydrology, 40 for the M.Sc. and 9 who registered for the Ph.D. Nineteen students received IGS bursaries, among whom a few foreign students.



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Dr Danie Vermeulen

Dr Danie Vermeulen has extensive experience in the mining sector and specialises in groundwater in mining, especially the coal industry and shale gas projects in the Karoo. Current projects include recharge and acid mine drainage in the different mining regions.

Activities and achievements

On 18 September, Prof. Gerrit van Tonder and Dr Johan Look from the Geology Department took part in a SABC2 discussion on the programme *Fokus*. The occurrence of shale gas in the Karoo was discussed and the problems associated with hydraulic fracturing were debated. The managing director of Shell South Africa with four members of their technical staff visited the IGS for a presentation and discussion on the topic *Shale gas exploration in the Karoo: The project, process and Shell's commitments to South Africa*. This event was attended by 34 people, which included two members of the Treasure Karoo Action Group, one from the Karoo Development Foundation and a Karoo farm owner.

After a study tour through Pennsylvania in July 2011, Dr Vermeulen was invited to speak to a group of people from Petro SA in Cape Town on 19 August 2011, on the topic of hydraulic-fracturing in the Karoo. He was also invited to present a lecture on 23 November 2011 for the GSSA at the Origins Centre Lecture Series at the University of the Witwatersrand in Johannesburg. The topic of this lecture was *Fracking: A USA and SA perspective*. Another lecture was on *Coalmine waters*, presented on invitation to the WRC and the DMR in Pretoria on 1 December 2011.

Prof. Van Tonder published four articles on the topic of fracking in the *Landbouweekblad* and Dr Vermeulen also participated in an article in the *Landbouweekblad*. Dr Vermeulen also contributed to articles in *Moneyweb*,

Business Live, *Sunday Times* and *The Star*. Dr Vermeulen further contributed to a series of talks on hydro-fracturing on *Talk Radio 702* as well as on RSG and SAFM.

Dr Danie Vermeulen is an executive council member of the International Mine Water Association (IMWA) and also serves as official reviewer for the *Minewater and Environment* journal. He is a council member for the Fossil Fuel Foundation of South Africa and serves on the editorial board of *Water SA*. He is also a steering committee member on seven different projects from the Water Research Council (WRC).

The annual Winter School for the honours students is always a highlight for the students. This year the students were taken on a four-day field trip to Lephalale in the Limpopo Province to visit coal and platinum mines where they observed the interaction between geology, mining and groundwater flow in mines in Limpopo and on tailings dams in Welkom.

Dr Danie Vermeulen and Prof. Gerrit van Tonder presented a Groundwater Field School for the Groundwater Division of South Africa in Bloemfontein during March 2011.

Mr Julian Conrad, geohydrologist from GEOSS in Somerset West, presented a short course in Arc-GIS to postgraduate students at the IGS during March 2011.

Dr Danie Vermeulen attended three courses in countries abroad during March 2011, namely a *PHREEQC* course with



Dr Danie Vermeulen at a shale gas production site.



Geohydrology Honours class during the winter school field trip.

National and international collaboration

Dr Tony Appelo, well-known hydrochemical academic from Amsterdam in the Netherlands; a FEFLOW training course (including contaminant transport) in Berlin, Germany, and the development of a *Box Model in Mine Dewatering* in Essen, Germany.

The head chemist at the IGS laboratory, Ms Lore-Mari Deysel, attended a two-day course in May 2011 on Intelligent Lean Laboratories, which was presented by the Marcus Evans Company. Ms Elna de Necker and Ms Henrihet Human attended a three-day workshop during August 2011 on Uncertainty of Measurement. This course was presented by Prof. Willem de Beer from Vision Enlight in Johannesburg.

Dr Francois Fourie presented a short course on geophysics to the Department of Water Affairs in Nelspruit during November 2011.

In terms of collaboration we need to first mention the international collaboration that has been established between the IGS and the University of Minnesota. As part of this collaboration with the University of Minnesota, Dr Vermeulen was invited to present a groundwater course during July 2011 at the annual field school of their Geology Department. He was accompanied by Prof. Gideon Steyl. This was followed by a visit from **Prof. Joe Magner**, Research Professor at the Department of Bioproducts and Biosystems Engineering, College of Food, Agricultural & Natural Food Resource Sciences (CFANS) at the University of Minnesota. He presented a week long short course during October 2011 on Introduction to Watershed Assessment of River Stability and Sediment Supply (WARSSS) to our postgraduate students.



Dr Danie Vermeulen at the back; Prof. Gideon Steyl second from left; Dr Tony Appelo (right).

Prof. Paul Hsieh, geology survey scientist from the USA, visited the IGS during March 2011 to assist with the Water Research Council (WRC) project on scaling of aquifer parameters. He is well-known as the man who saved the Gulf of Mexico during the oil spill crisis... using a single picture from a mobile phone. "One scientist took a cell phone picture of pressure readings and e-mailed it to a government researcher in California for advice. Just using that cell phone photo, Paul Hsieh, a US Geological Survey scientist, created a model to explain what was happening under the cap and how – despite low pressure readings – there was no leak. He was convinced the containment cap wouldn't blow."

Our university signed a memorandum of understanding with the DHI (SA) Water Environment Health – South Africa (Pty) Ltd, trading as DHI (SA) in September 2011.

DHI (SA) is a specialised hydrological and hydraulic company with proprietary rights to certain hydrological and hydraulic software. DHI (SA) has agreed to make this software available to our university for training and academic research. IGS trains students in hydraulics and/or hydrology and wants to utilise the software as part of its training programmes. The IGS also aims to have the water modelling capacity of its staff and students improved, and to have a close working relationship established with DHI (SA).

A short course on Integrated Hydrologic Modelling using MIKE SHE software was also presented at the IGS by Mr Douglas Graham, Senior Engineer at DHI in Denmark.

Community engagement projects

The Health & Wellness Centre of the UFS invited Prof. Gerrit van Tonder to present a lunch-hour lecture to their

personnel on 1 March 2011. Prof. Paul Hsieh from the USA accompanied Prof. Van Tonder to this lecture on environmentally-friendly gardening.

Prof. Gerrit van Tonder and Mr Pacome Ahokhossi, Ph.D. student at IGS, were involved in finding water, and successfully drilling a borehole which produces a strong supply of water for the Paradys Experimental Farm.

The IGS Lab is an academic/commercial laboratory, but as part of community engagement they sometimes test water for community members at no charge. One instance was for Mr Petso Mokhatla, coordinator of the Centre of Excellence in the Department of Agricultural Economics, who contacted the laboratory to test water for one of their anchor projects: the Lebebe Dairy project on the Lechaibele Farm near Jagersfontein. Another example was when sewage water was tested for use on a strawberry project in QwaQwa.



Prof. Gideon Steyl at the hydrogeology field site of the University of Minnesota.

Research Outputs

Institute for Groundwater Studies



Research articles

Akoachere, R.A. & Van Tonder, G.J. 2011. The trigger-tube: A new apparatus and method for mixing solutes for injection tests in boreholes. *Water SA* 37(2): 139–146.

Van Wyk, E., Van Tonder, G.J. & Vermeulen, P.D. 2011. Characteristics of local groundwater recharge cycles in South African semi-arid hard rock terrains – rainwater input. *Water SA* 37(2): 147–154.

Vermeulen, D. & Verwey, P.H. 2011. Influence of irrigation on the level, salinity and flow of groundwater at Vaalharts Irrigation Scheme. *Water SA* 37(2): 155–164.

Conference contributions

Burger, M. & Vermeulen, P.D. 2011. *The groundwater interaction of a deeper lying gold mine and a shallower lying coal mine through the presence of naturally occurring as well as induced preferential flow paths.* Proceedings of the 11th Congress of the International Mine Water Association (IMWA): Mine Water – Managing the Challenges, Aachen, Germany. 4–11 September. p. 15.

Freese, C., Lorentz, S.A., Le Roux, P.A.L., Van Tol, J.J. & Vermeulen, P.D. 2011. *A description and quantification of hillslope hydrological processes in the NECF, Weatherley Catchment.* Paper delivered at the 15th SANCIAHS National Hydrology Symposium: Science and Practice for Sustainable Water Resources Management, Rhodes University, Grahamstown, South Africa. 12–14 September.

Vermeulen, P.D. 2011. *Decant – What are we leaving behind?* Paper delivered at the South African Coulliery Environmental Practitioners Association (SACEPA) Conference, Secunda, South Africa. 26 January.

Vermeulen, P.D. 2011. *Groundwater differences between Mpumalanga Coalfield and Waterberg Coalfield.* Paper delivered at the International Conference on Groundwater: Our Source of Security in an Uncertain Future, and the Biennial Conference of the Groundwater Division (GWD), CSIR International Convention Centre, Pretoria, South Africa. 19–21 September.

Vermeulen, P.D. 2011. *Groundwater in coal mining – Factual issues.* Paper delivered at the Sustainable Management of Acid Mine Drainage Conference, Reserve Bank Conference Centre, Pretoria, South Africa. 30–31 May.

Vermeulen, P.D. 2011. *Hydraulic fracturing in the Karoo basin.* Paper delivered at the 16th Southern African Coal Science and Technology Conference: Clean Coal to Clean Energy, Fossil Fuel Foundation (FFF): Wanderers Club, Johannesburg, South Africa. 1–2 November.

Vermeulen, P.D. 2011. *Mining and water management in the Water(less)berg.* Paper delivered at the Symposium on Sustainable

Water 2030: A Mining Perspective, Water Institute of Southern Africa, CSIR International Convention Centre, Pretoria, South Africa. 3–4 October.

Vermeulen, P.D. 2011. *Views on hydraulic fracturing of Marcellus Shale, Pennsylvania.* Paper delivered at the Workshop of the Water Research Commission, the Petroleum Agency of South Africa and the Department of Water Affairs (WRC-PASA-DWA), Pretoria, South Africa. 30 August.

Vermeulen, P.D. 2011. *Views on hydraulic fracturing of Marcellus Shale, Pennsylvania.* Paper delivered at the International Conference on Groundwater: Our Source of Security in an Uncertain Future, and the Biennial Conference of the Groundwater Division (GWD), CSIR International Convention Centre, Pretoria, South Africa. 19–21 September.

Vermeulen, P.D. 2011. *Views on hydraulic fracturing of Marcellus Shale, Pennsylvania.* Paper delivered at the 16th Southern African Coal Science and Technology Conference: Clean Coal to Clean Energy, Fossil Fuel Foundation (FFF): Wanderers Club, Johannesburg, South Africa. 1–2 November.

Vermeulen, P.D. & Burger, M. 2011. *Groundwater interaction between a deep coal mine and a deeper lying gold mine.* Paper delivered at the International Conference on Groundwater: Our Source of Security in an Uncertain Future, and the Biennial Conference of the Groundwater Division (GWD), CSIR International Convention Centre, Pretoria, South Africa. 19–21 September.

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Prof. Joe Magner with his wife, Veronica.



South African delegates at the IMWA Conference in Aachen, with Dr Danie Vermeulen with the big smile in the middle.



From the left: Prof. Neil Heideman, Dean of the Faculty of Natural and Agricultural Sciences, Mr Andrew Pott, Director of DHI (SA) and Mr Douglas Graham from DHI in Denmark.

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Researchers: Dr Francois Fourie, Mr Eelco Lukas

Affiliate Associate Professor: Prof. Kai Witthüser

Affiliate Professor: Prof. John Nieber

Affiliate Researchers: Prof. Jopie Botha, Prof. Gideon Steyl,
 Dr Johan van der Merwe

Laboratory staff: Ms Lore-Mari Deysel, Ms Elna de Necker,
 Ms Henrihet Human, Ms Ennie NciNci

Workshops



“The Electronics Division has yet again experienced a very busy year and has successfully repaired a range of expensive equipment. New apparatus was successfully developed and completed.”

– Mr Adriaan Hugo

Workshop *Electronics*

Overview

The Electronics Division has yet again experienced a very busy year and has successfully repaired a range of expensive equipment. New apparatus was successfully developed and completed.

The estimated saving for the Faculty of Natural Sciences for the past year is R3 528 000.00. This amount is calculated by taking the actual amount of working hours multiplied by R600.00. When looking at the amount and the complexity of the projects done, this amount could easily be doubled if the work had been outsourced. Money is also generated through the publication of instruments that were developed by us like A PRESSURIZED Ar-FILLED ANNEALING SYSTEM published by the department of Physics.

Work activities

A total of 446 work requisitions were received the past year, representing 648 apparatuses. Of this number 29 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 tables 2 and 3.

Of a possible 5 926 working hours 5 873 were actively used. Expressed as a percentage the active usage is calculated at 99%. The possible hours were calculated at 7, 25 hours per day per person present.

Table 1 lists 34 departments and divisions, which made use of the services of the Division of Electronics. This is shown in 1 (Department); 2 (Total time spent); 3 (Percentage of Total).



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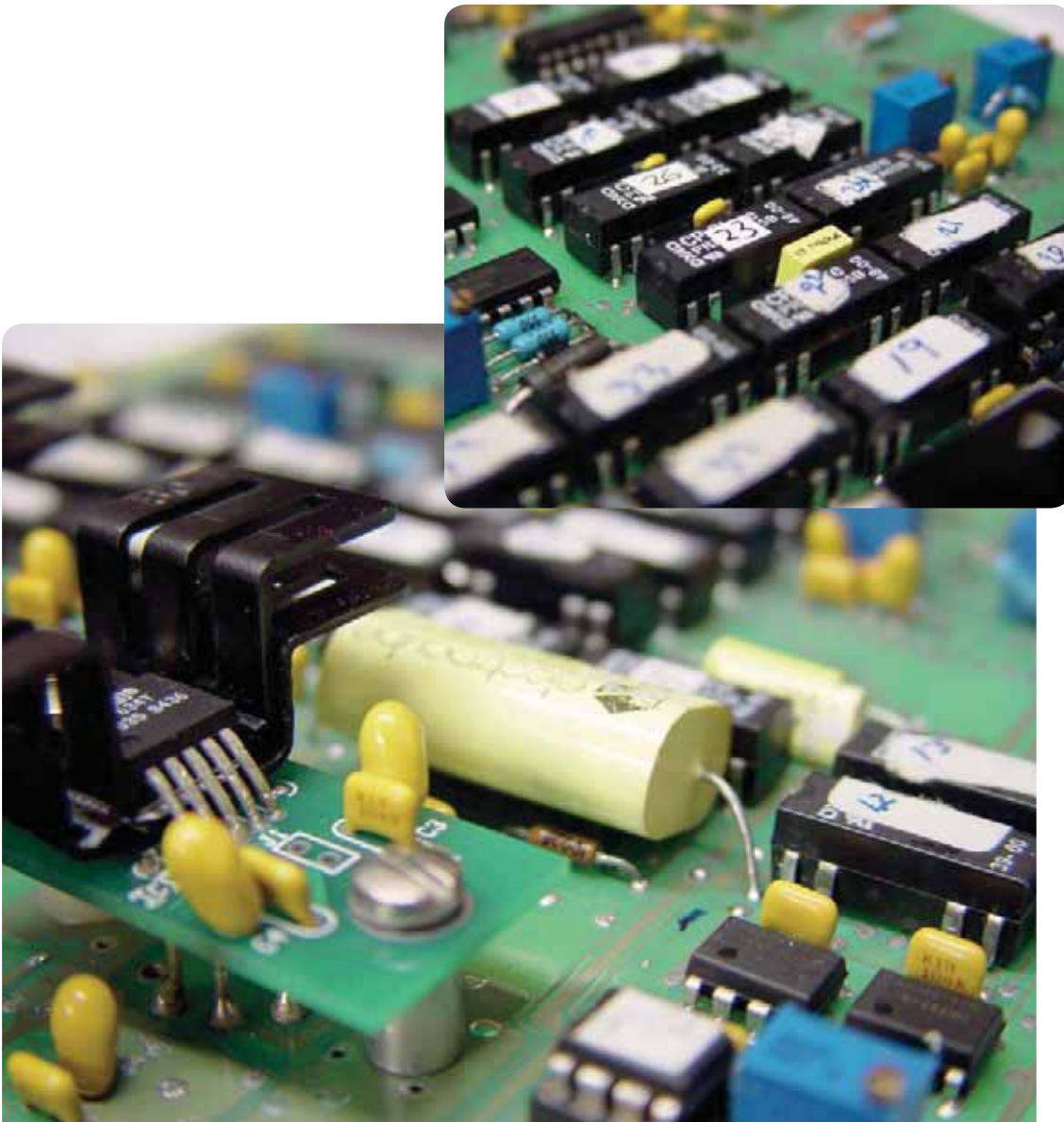
Mr Adriaan Hugo

Mr Adriaan Hugo studied Electric Engineering, Light Current, at the former Technikon (now the CUT). He was appointed as head of the Electronics Workshop in 1989.

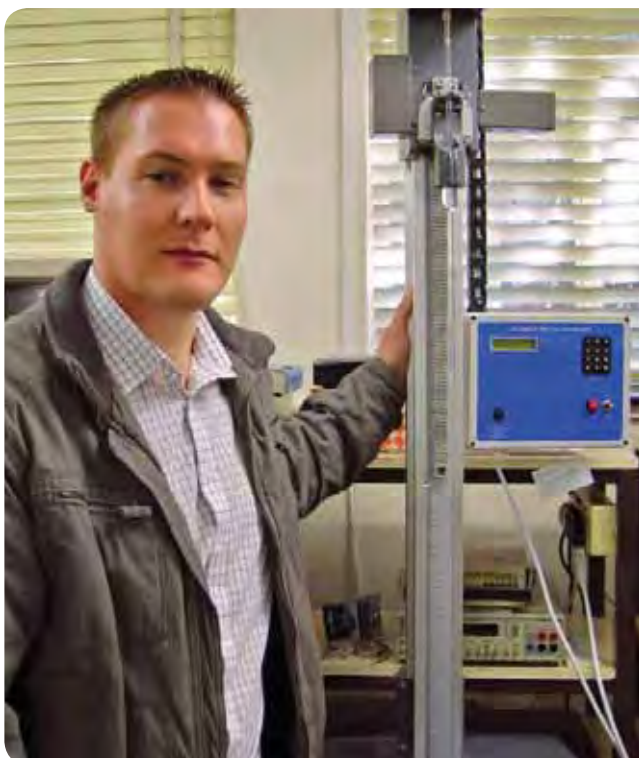
Table 1

Department	Total time spent	Percentage
Physics	972,00	16,55%
Chemistry	911,00	15,51%
Biotechnology	901,00	15,34%
Soil, Crop and Climate Sciences	650,00	11,07%
Internal Administration	312,00	5,31%
Plant Sciences	312,00	5,31%
Animal Wildlife and Grassland Sciences	281,00	4,78%
Architecture	257,00	4,38%
Electronics	201,00	3,42%
Geology	176,00	3,00%
Institute for Groundwater Studies	166,00	2,83%
Outside Work	149,00	2,54%
Zoology and Entomology	136,00	2,32%
Urban and Regional Planning	118,00	2,01%
Computer Sciences and Informatics	78,00	1,33%
Basic Medical Sciences	36,00	0,61%
Anatomy	33,00	0,56%
Centre for Microscopy	27,00	0,46%
Medical Physics	22,00	0,37%
National Control Laboratory	21,00	0,36%
Centre for Environmental Management	18,00	0,31%
Exercise and Sport Science	17,00	0,29%

Department	Total time spent	Percentage
Haematology	13,00	0,22%
Genetics	12,00	0,20%
Experimental Farms	12,00	0,20%
Physical Recourses	9,00	0,15%
Medical Microbiology	6,00	0,10%
Animal Research Centre	4,00	0,07%
Physiotherapy	4,00	0,07%
Drama	2,00	0,03%
Humanities	2,00	0,03%
Instrumentation	1,00	0,02%
Total	5873,00	100,00%



This is an example of a circuit in disrepair and for which no circuit diagramme exists. The electronics Workshop will measure the circuit and the components to rebuild it at a better price than the original.



Mark Jonson standing next to an apparatus that was built in the Instrumentation Workshop. This apparatus can automatically take high precision samples of solutions. It can be programmed to take samples at different depths.

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Table 2
Completed Projects

Department	Apparatus
Biotechnology	2 x –80 Freezers Alarms 1 x Autoclave Controller 1 x Access Control 1 x Camera System 1 x Generator 1 x Radio Alarm System
Physics	15 x Power Supplies 3 x Light Path Controllers 1 x SMS Pressure Alarm System 1 x Amplifier
Soil, Crop and Climate Sciences	1 x Ground Service Heat Controller 1 x Block Temperature Controller 1 x Radio Communication coupling
Plant Sciences	5 x Glass Houses 1 x Access Control
Chemistry	3 x Access Control 2 x UV units
Urban and Regional Planning	6 x Access Control 6 x Camera System
Institute for Groundwater Studies	2 x Access Control 1 x Fraction Collector
Architecture	8 x Access Control
Computer Sciences and Informatics	4 x Spot Light Controller
Zoology and Entomology	3 x Access Control
Basic Medical Sciences	2 x Timer

Tabel 3

Unfinished Projects

Department	Apparatus
Physics	1 x Alarm Access Control System

Time spent on the different faculties:

Natural and Agricultural Sciences	5550,00	94,50%
Other	323,00	5,50%

A total of 1 471 hours was spent on development, 4 076 hours on maintenance and 326 hours on administration.

Expressed as a percentage it is as follow:

Maintenance	65,23%
Development	28,04%
Administration	6,73%

Staff matters

Mr Chad Lowe has resigned from his post at the University to emigrate to Australia. I thanked him for his good work and wished him all the best for his future.

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Control Technicians: Mr I. Basson, Mr H. J. Roodt, Mr C. Lowe

“The aim of the Instrumentation Workshop is to manufacture equipment for academic staff that assist them in their research.”

– Mr Japie Myburgh

Instrumentation Workshop

Overview

The aim of the Instrumentation Workshop is to manufacture equipment for academic staff that assists them in their research. Among others, we manufacture pipette stands, containers for test tubes bottles, laboratory trolleys, stands for cadavers in Anatomy and we service and repair pumps.

Furthermore we design and manufacture stainless steel bailers for the Institute for Groundwater Studies, filaments and heaters for the Department of Physics used with high-evaporation apparatus. We also service and repair scales and microscopes.

We mainly support the Faculty of Natural and Agricultural Sciences.

Time spent on different Faculties:

Natural and Agricultural Science	86.6%
Other	14.6%

Faculty of Natural and Agricultural Science

Department	Hours
Chemistry	601
Zoology and Entomology	132
Electronics	226
Physics and Astronomy	537
Geology	35
Institute for Groundwater Studies	527
Instrumentation maintenance	160
Internal Administration	200
Microbial, Biochemical & Food Biotechnology	658
Plant Science	554
Soil, Crop and Climate Science	335
Animal, Wildlife and Grassland Science	115
National Control Laboratory	77
Biokinetics	75
Total	4232

A welder wearing a blue protective suit is working on a metal piece. A large burst of bright sparks is visible, and a blue light effect is present. The welder is holding a tool, possibly a torch or a welding electrode, near the metal. The background is dark, and the overall scene is illuminated by the blue light and the bright sparks.

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Mr Japie Myburgh

Mr Japie Myburgh started his career as an apprentice at the Instrumentation Workshop 30 years ago. He was promoted to Assistant Head of the Workshop and 7 years ago he became the Section Head of the Workshop. He is a skilled toolmaker.

Health science

Department	Hours
Haematology	192
Cardiothoracic Surgery	361
Total	553

External work

Department	Hours
Various institutions	159



Dividing sheet holders for the Chemistry Department are manufactured at a fraction of the cost of the imported model.



Apparatus manufactured from a diagramme brought from a congress by a congress participant. The apparatus simulates the high pressure under which certain organisms stay alive in mine water.

Activities

Department	Apparatus
Chemistry	<ul style="list-style-type: none"> Service: vacuum pumps. Manufacture: trailers that connect one device to another, stands for ultra violet lamps and gas filters, pressure "bombs" with different sized taps.
Zoology	<ul style="list-style-type: none"> Manufacture: snares for insects Service and repair: shake machines
Physics	<ul style="list-style-type: none"> Service and replace: roof cable for Walter telescope. Mount: model in Perspex holder. Manufacture: several view pieces for cameras.
Institute for Groundwater Studies	<ul style="list-style-type: none"> Design and manufacture: split mould. Design and manufacture: collectors for samples. Service and repair: vacuum pumps.
Microbiology	<ul style="list-style-type: none"> Repair: shake machine. Manufacture: Perspex and aluminium Effendorf holders, Pipette stands, test tube shelves. Change and repair: test tube washers. Design and manufacture: power generator for research in mines.
Botany	<ul style="list-style-type: none"> Manufacture: adiation shields for plants in greenhouses, a slide to pull behind a motorcycle to collect different plant seeds, a threshing machine.
Agriculture	<ul style="list-style-type: none"> Manufacture: pvc containers and scales for soil samples, 10 becvol poles 2.5 meter long. Repair: fans in cabinets, freeze drier.
Geology	<ul style="list-style-type: none"> Manufacture: locked cabinet for crystals and precious stones.
Electronics	<ul style="list-style-type: none"> Manufacture: differently sized boxes and forms for electronic parts.
Nursing	<ul style="list-style-type: none"> Repair: 11 manikins.
Computer Science	<ul style="list-style-type: none"> Design and manufacture: x-y-z table for eye coordination tests.
Other departments	<ul style="list-style-type: none"> Repair and service: vacuum pumps. Manufacture: Perspex pipette shelves at 30% of the supplier's price. Service: microscopes and balances.



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Academic *staff*

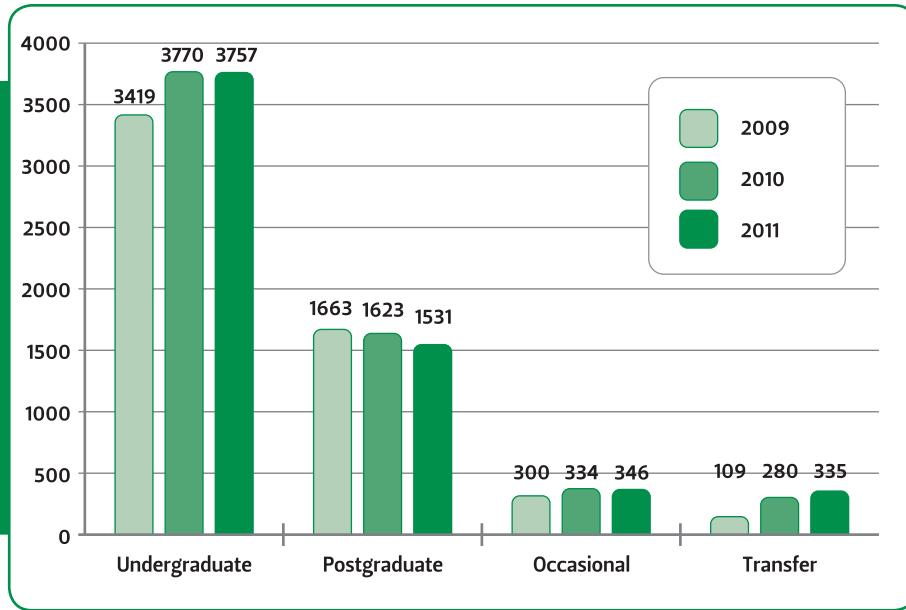
Section Head: J.S. Myburgh
Assistent Head: J. Erasmus
Control Technician: P.D.S. Botes
Control Technician: J.P.W Rautenbach
Technical assistant: G. Tshwene
Technical assistant: E. Hlazo

Statistical **Data**



Students

Comparison for the Faculty of Natural and Agricultural Sciences: 2009-2011



	2009	2010	2011
Undergraduate	3419	3770	3757
Postgraduate	1663	1623	1531
Occasional	300	334	346
Transfer	102	280	335

Student figures: 2009-2011

	Female					Male					Total				
	Black	Coloured	Asian	White	Total	Black	Coloured	Asian	White	Total	Black	Coloured	Asian	White	Total
2009															
Undergraduate	980	34	14	463	1491	898	27	19	813	1757	1878	61	33	1276	3248
Postgraduate	304	13	21	267	605	495	20	25	469	1009	799	33	46	736	1614
Occasional	116	2	0	16	134	124	1	0	20	145	240	3	0	36	279
Total	1400	49	35	746	2230	1517	48	44	1302	2911	2917	97	79	2048	5141
2010															
Undergraduate	1121	31	16	503	1617	1048	38	20	828	1934	2169	69	36	1331	3605
Postgraduate	365	14	15	288	682	533	25	19	483	1060	898	39	34	771	1742
Occasional	128	5	1	15	149	128	2	1	26	157	256	7	2	41	306
Total	1614	50	32	806	2502	1709	65	40	1337	3151	3323	115	72	2143	5653
2011															
Undergraduate	1164	36	15	492	1707	1014	41	22	761	1838	2178	77	37	1253	3545
Postgraduate	376	19	15	312	722	502	24	17	497	1040	878	43	32	809	1762
Occasional	132	1	1	15	149	127	3	4	32	166	259	4	5	47	315
Total	1672	56	31	819	2578	1643	68	43	1290	3044	3315	124	74	2109	5622

International students

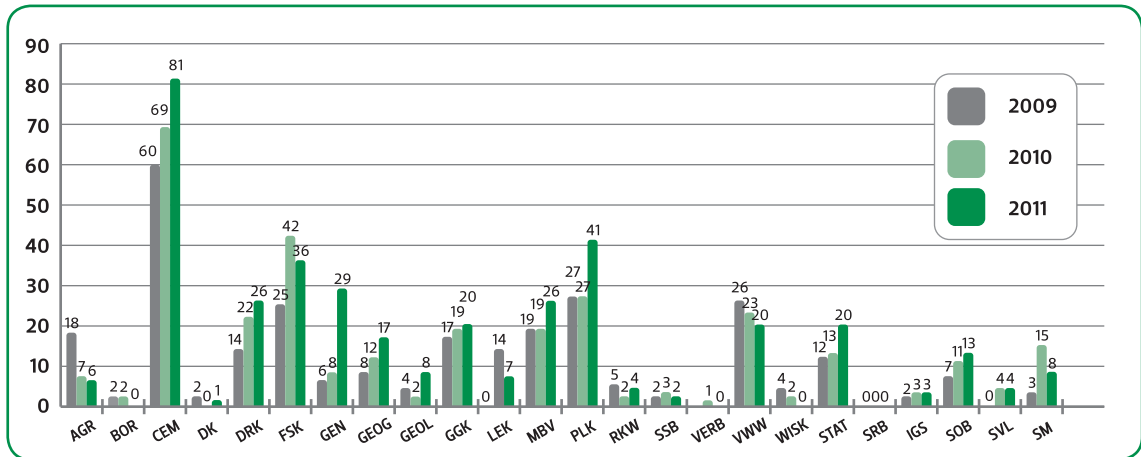
	2009	2010	2011
Asian countries	0	22	0
Australia and Oceania countries	19	0	0
Bangladesh	0	0	1
Belgium	0	0	1
Botswana	28	28	24
Cameroon	0	0	12
China	0	0	12
Congo	0	0	4
Democratic Republic of Congo	0	2	0
Egypt	0	0	1
Eritrea	0	0	4
Ethiopia	0	0	4
European countries	14	9	5
Gabon	0	0	1
Ghana	0	0	3
India	0	0	1
Kenya	0	0	15
Lesotho	155	198	188
Malawi	5	3	4

	2009	2010	2011
Mauritius	0	4	4
Mozambique	8	2	2
Namibia	83	88	99
Nigeria	23	0	18
North American countries	7	2	0
Other African countries	58	83	0
Pakistan	0	0	2
Republic of Korea	0	0	1
Rwanda	0	0	1
Sri Lanka	0	0	1
Sudan	4	0	4
Swaziland	0	6	10
Taiwan	0	0	1
Uganda	0	0	4
United Republic of Tanzania	0	0	2
United States of America	0	0	5
Zambia	0	13	7
Zimbabwe	73	83	69
Total	477	543	510

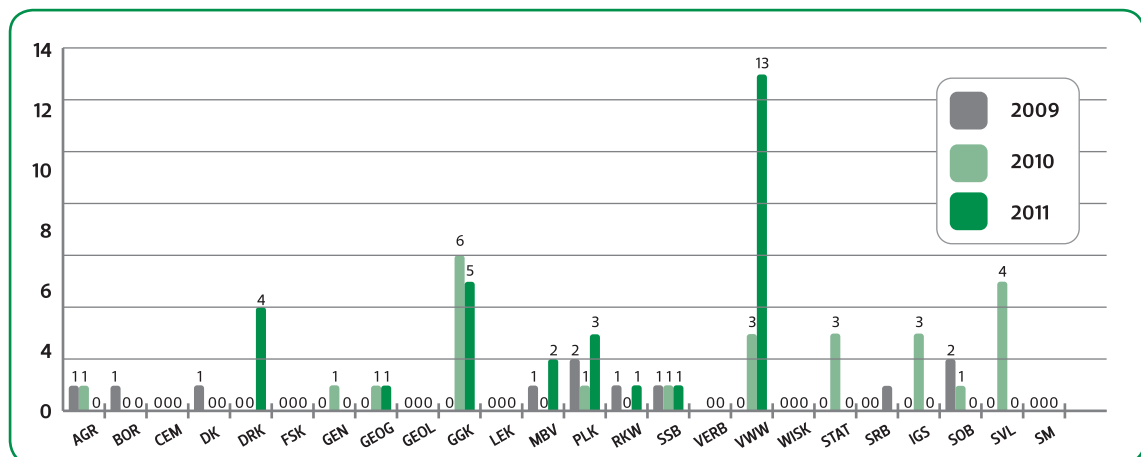
List of abbreviations

- | | | |
|---|---|---|
| ARG – Department of Architecture | RKW – Department of Computer Science and Informatics | SRB – Disaster Management Training and Education Centre for Africa (DiMTECH) |
| BOR – Department of Quantity Surveying and Construction Management | SM – Centre for Microscopy | SSB – Department of Mathematical Statistics and Actuarial Science |
| CEM – Department of Chemistry | SOB – Centre for Environmental Management | SVL – Centre for Sustainable Agriculture, Rural Development and Extension |
| DK – Dean’s office | WISK – Department of Mathematics and Applied Mathematics | VERB – Consumer Science |
| DRK – Department of Zoology and Entomology | FSK – Department of Physics | VWW – Department of Animal, Wildlife and Grassland Sciences |
| LEK – Department of Agricultural Economics | GEN – Department of Genetics | |
| MBV – Department of Microbial, Chemical and Food Biotechnology | GEOG – Department of Geography | |
| PLK – Department of Plant Sciences | GGK – Department of Soil, Crop and Climate Sciences | |
| | IGS – Institute for Groundwater Studies | |

Accredited articles (2009–2011)

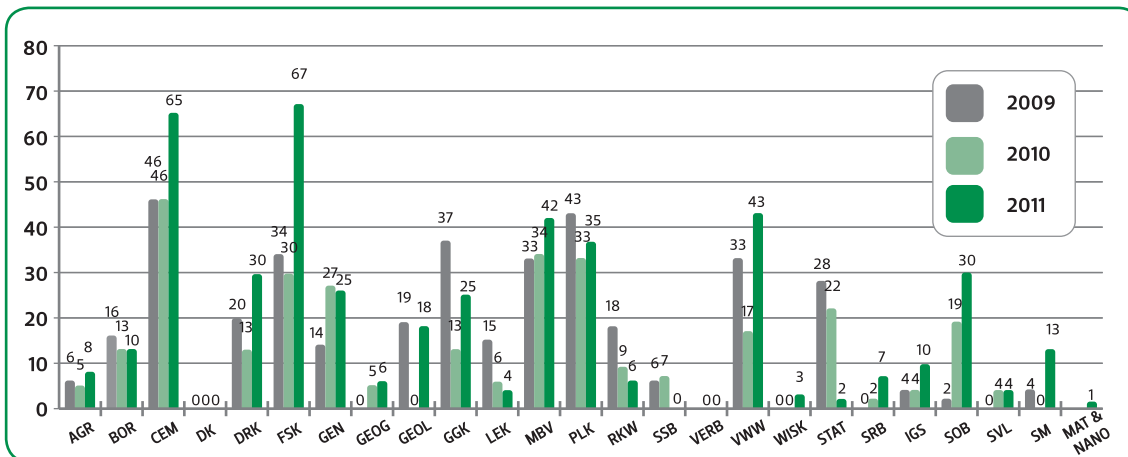


Books (2009–2011)

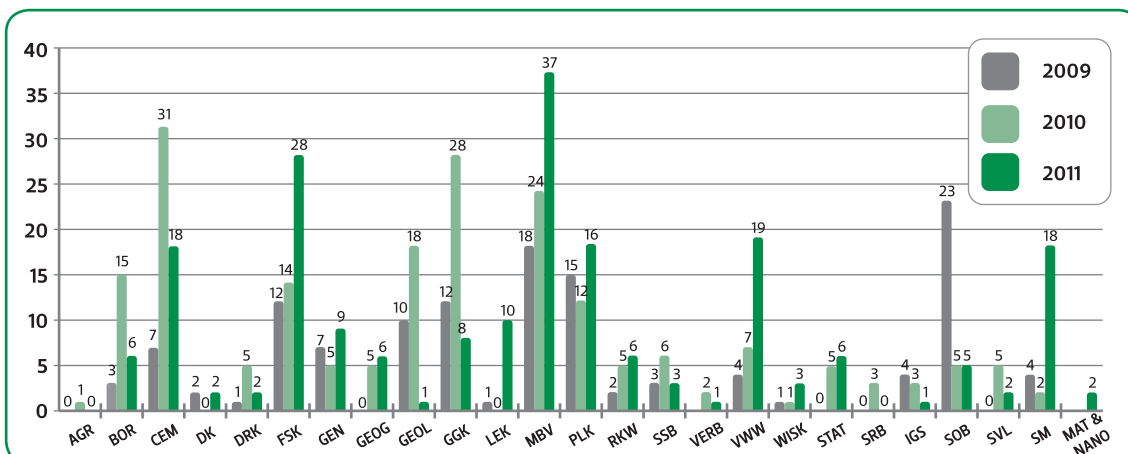




Local conferences (2009-2011)



International conferences (2009-2011)





Glossary



A

AAPA	American Association of Physical Anthropologists	AHI	Afrikaanse Handelsinstituut
AAS	Atomic Absorption Spectroscopy	AI	artificial insemination
ABR	Advanced Biomolecular Research (Cluster)	AM	Advanced Materials
ACSIN	International conference on Atomically Controlled Surfaces, Interfaces and Nanostructures.	AMI	Advanced Metals Initiative
Adh	Alcohol dehydrogenases	APSIM	Agricultural Production Systems Simulator
ADSARD	Advanced Diploma in Sustainable Agriculture and Rural Development	ARC	Agricultural Research Council
AEASA	Agricultural Economics Association of South Africa	ArcGIS	A geographic information system developed by Esri
AFAAS	African Forum for Agricultural Advisory Services	ARCOM	Association of Researchers in Construction Management
AFIR	Actuarial Approach for Financial Risks	ASM	American Society for Microbiology
AgriSETA	The Agricultural Sector Education Training Authority	ASOCSA	Association of Schools of Construction in Southern Africa
		ASSAf	Academy of Science of South Africa
		ASTIN	Actuarial studies in Non-life Insurance
		AZEF	Arid Zone Ecology Forum

B

BC	British Columbia	BGRI	Borlaug Global Rust Initiative
BECVOL	Biomass Estimation from Canopy VOLUME	BIT	Bachelor of Information Technology

C

CALMet	CALibrators and METrology (the main action's field of Calmet company)	CHESD	Centre for Higher Education Studies and Development (South Africa).
CANSA	Cancer Association of South Africa	CIB	Centre for Invasion Biology
CAPEs	Community Agrometeorology Participatory Extension Service	CIDB	Construction Industry Development Board
CASA	computer assisted sperm analysis	CIH	Chartered Institute of Housing
CAT	Computer Applications Technology	CIOB	a)Chartered Institute of Building (UK) b) SA
CATSA	Catalysis Society of South Africa	CIP	Clean in Place (sanitizers)
CCAA	Climate Change Adaptation in Africa	CLSM	Confocal laser microscope
CENSARDE	The Centre for Sustainable Agriculture, Rural Development and Extension	COE	Centre of Excellence
CEO	Chief Executive Officer	CSI	Computers and Structures Incorporated
CFANS	College of Food, Agricultural & Natural Food Resource Sciences	CSIR	Council for Scientific and Industrial Research
		CUL	Catholic University of Louvain

D

DAFF	The Department of Agriculture, Forestry and Fisheries	DMISA	Disaster Management Institution for South Africa
DCO	Deep Carbon Observatory	DMR	Department of Mineral Resources
DETEA	Free State Department of Economic Development, Tourism and Environmental Affairs	DSC	Differential Scanning Calorimetry
DHI(SA)	Water Environment Health – South Africa (Pty) Ltd (trading as DHI (SA)	DSS	Decision support system
DIMTEC	Disaster Management Training and Education Centre	DST	Department of Science and Technology
		DUT	Durban University of Technology

E

EBVs	Breeding value estimations	ERM	Environmental Resource Management
ECA	European Crystallographic Association	ESSA	Entomological Society of Southern Africa
ECEM	European Conference on Eye Movement	EuCheMS	International Conference on Organometallic Chemistry
ECIS	European Conference of Information Systems	EWT	Endangered Wildlife Trust

F

FA	Focus areas	FEFLOW	Finite Element Subsurface Flow Systems (groundwater studies)
FAO	Food and Agriculture Organization of the United Nations	FEMS	Congress of European Microbiologists
FASEB	Federation of American Societies for Experimental Biology	FMP	Facilities Management Programme

G

GEOSS	Global Earth Observation System of Systems	GPS	Global positioning systems
GFRAS	Global Forum for Rural Advisory Services	GRF	German Research Foundation
GFZ	Geoforschungszentrum	GSSA	Geological Society of South Africa
GISSA	Geo-Information Society of South Africa	GWK	Griekwaland-Wes-Koöperasie
GMO	Genetically Modified Organism	GXE	Genotype x environment

H

HEDS	Higher Education Data Sharing	HELTASA	Higher Education Learning and Teaching Association in Southern Africa
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I

IAU	International Astronomical Union	INQWA	International Union for Quaternary Research
IBREAM SA	Institute for the Breeding of Rare and Endangered African Mammals	INRA	Public mission-oriented scientific institute for agricultural research (France)
ICEC	International Cost Engineering Council	IOCD	International Organization for Chemical Sciences in Development
ICID	International Commission on Irrigation and Drainage	IOCG	Iron-oxide-copper-gold
ICNANO	International Conference on Nanomaterials & Nanotechnology	IPF	Institute of Polymer Research
ICPOES	Inductively Coupled Plasma Optical Emission Spectroscopy	IPMP	Intensive Project Management Programme
ICT	Information and Communications Technology	IRWH	In-field rainwater harvesting
IDC	Industrial Development Corporation	ISA	International Studies Association
IFAMA	International Food and Agribusiness Management Association	ISBN	International Standard Book Number
IFHE	International Federation for Home Economics	ISCW	Institute for Soil, Climate and Water
IFMA	International Farm Management Association	ISRS	International Symposium on Radiopharmaceutical Sciences
IGS	Institute for Groundwater Studies	IT	Information Technology
IMC	International Mathematics Competition	ITSA	Information Technology Student Association
IMWA	International Mine Water Association	IUCN	International Union for Conservation of Nature
INQUA	International Union for Quaternary Research	IUCr	International Union of Crystallography
		IUPAC	International Union of Pure and Applied Chemistry

IVC	In vitro culture	IVM	In vitro maturation
IVEP	In vitro embryo production	IWRS	International Wildlife Ranching Symposium
IVF	In vitro fertilization		

K

KIFI	Kamutjonga Inland Fisheries	KOLKOM	Kolloquium über Kombinatorik (Colloquium on Combinatorics)
KIST	Korea Institute of Science and Technology	KZ-NIA	KwaZulu-Natal Institute for Architecture

L

LED	Local economic development	LRAD	Land Redistribution for Agricultural Development programme
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M

MISBE	Management and Innovation for a Sustainable Built Environment Conference	MS	Mass Spectrometry
MMR	Mathematical Methods in Reliability	MSA	Master's degree in Sustainable Agriculture
MNS	Materials and Nanosciences Research (Cluster)	MUCPP	Mangaung /University Community Partnership Program
MOU	Memorandum of understanding	MURP	Master of Urban and Regional Planning

N

NanoSAM	Nano Scanning Auger Microscope	NQF	National Qualifications Framework
NAS	Network-attached storage	NRF	National Research Foundation
NECSA	South African Nuclear Energy Corporation	NSTF	National Science and Technology Forum
NGO	Non-governmental organization	NTeMBI	Nuclear Technologies in Medicine and the Biosciences
NMMU	Nelson Mandela Metropolitan University	NWGA	National Wool Grower's Association
NMR	nuclear magnetic resonance	NZG	National Zoological Gardens
NNSCF	New nano surface characterization facilities		

O

OVK	Oos-Vrystaat-Koöperasie
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P

PA	Precision agriculture	PHREEQC	A geochemical model
PAAZAB	African Association of Zoos and Aquaria	PI research	Pi Research is a world-wide leader in automotive electronics.
PASA	Petroleum Agency of South Africa	PISA	Photonic Institute of South Africa
PAST	Palaeontological Scientific Trust	PLK	Po Leung Kuk
PCT	Patent Cooperation Treaty	PRT	Protein Research Trust
PEGG	Primate Ecology and Genetics Group		

Q

QT	Quantification theory
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R

RICS	Royal Institution of Chartered Surveyors (UK)
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S

SAAFECs	South African Association of Family Ecology and Consumer Sciences	SAASTA	The South African Agency for Science and Technology Advancement
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SAB	South African Breweries	SAPOA	South African Property Owners Association
SABI	South African Biosystematics Initiative	SAPPA	South African Pecan Producers Association
SACI	South African Chemical Institute	SAPWAT	South African Procedure for estimating irrigation WATER requirements
SACLA	Southern African Computer Lecturer's Association	SASA	South African Statistical Association
SACPCMP	South African Council for the Project and Construction Management Professions	SASAE	South African Society for Agricultural Extension
SACPVP	South African Council for the Property Valuers Profession	SASAqS	Southern African Society of Aquatic Scientists
SACQSP	South African Council for the Quantity Surveying Profession	SASAS	South African Society for Animal Science
SACVP	South African Council for the Property Valuation Profession	SASM	South African Society for Microbiology
SADC	Southern African Development Community	SAVAH/CIHA	South African Visual Arts Historians / Comité International d'Histoire de l'Art
SAFEFE	South African Foundation for Economic and Financial Education	SAWISE	South African Women in Science and Engineering
SAFOI	South African Fryer Oil Initiative	SAWMA	Southern African Wildlife Management Association
SAGA	South African Geological Association	SE-HPLC	Size Exclusion High Performance Liquid Chromatography
SAGraSS	South African Grassland Scoring System	SEM	Scanning electron microscope
SAHF	Southern African Housing Foundation	Senwes	Sentraalwes-koöperasie
SAIA	South African Institute of Architects	SGA	Society for Geology Applied to Ore Deposits
SAICSIT	South African Institute for Computer Scientists and Information Technologists	SIFE	Students in Free Enterprise
SAMO	South African Mathematics Olympiad	SKA	Square kilometre array
SAMS-AMS	Joint international congress of the South African and American Mathematical Societies.	SMME	Small, Medium and Micro Enterprises
SAPI	South African Planning Institute	SNIPS	System and network monitoring software
		SRIG	Strategic Research Infrastructure Grants

T

TEM	Transmission electron microscope	TOF SIMS	Time-of-Flight Secondary Ion Mass Spectrometry
TGA	Thermal Gravimetric Analysis	TOPS	Threatened Or Protected Species
THRIP	Technology and Human Resources for Industry Programme	TOT	Training of Trainers

U

UCLA	University of California, Los Angeles	UNESCO MIRCEN	United Nations Educational Scientific and Cultural Organisation Microbial Resources Center
UCT	University of Cape Town	UNU-EHS	United Nations University Institute for Environment and Human Security
UFS	University of the Free State	UNU-FLORES	United Nations University Institute for Integrated Management of Material Fluxes and of Resources
UFS-DiMTEC	Disaster Management Training and Education Centre for Africa of the University of the Free State	UNU-ViE	The United Nations University Vice Rectorate in Europe
UIA	Union of International Architects	UP	University of Pretoria
UIC	United International College	USA	United States of America
UJ	University of Johannesburg	USGS	United States Geological Survey
UKZN	University of KwaZulu-Natal	UWC	United World Colleges
Umnga	Farmers group development & training Services		University of the Western Cape
UNESCO	United Nations Educational Scientific and Cultural Organisation		

UWM University of Wisconsin-Milwaukee

V

VAO Vanillyl-alcohol oxidases VKB Vrystaat Koöperasie Beperk

W

WARSSS Introduction to Watershed Assessment of River Stability and Sediment Supply WRC Water Research Council
WGT Winter Grain Trust WWU Westphalian Wilhelm's University , Muenster
WRB World Reference Base

X

XPS X-ray photon spectroscope XRD Panalytical X-ray diffractometer

Z

ZSSA Zoological Society of Southern Africa



“It always seems impossible until it’s done.”

– **Nelson Mandela**

We do not inherit the earth from our ancestors, we borrow it from our children.

– **Native American Proverb**

“Only when I saw the Earth from space, in all its ineffable beauty and fragility, did I realize that humankind’s most urgent task is to cherish and preserve it for future generations.”

– **Sigmund Jahn**
German Cosmonaut

“Earth provides enough to satisfy every man’s need, but not every man’s greed.”

– **Mahatma Gandhi**
Father of India

