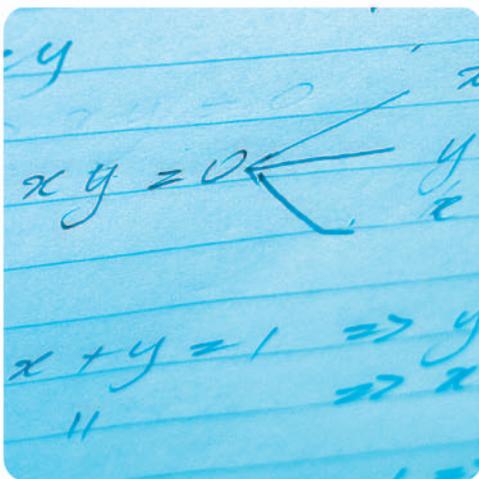


Faculty of Natural and Agricultural Sciences

Report 2008



Faculty of

**Natural and
Agricultural Sciences**

Report 2008

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Contents

Contents	iii
Preface	1
Faculty news	3
Departments:	
Agricultural Sciences	07
- Agricultural Economics	08
- Animal, Wildlife and Grassland Sciences	13
- Plant Sciences	20
- Soil, Crop and Climate Sciences	29
Building Sciences	37
- Architecture	38
- Quantity Surveying and Construction Management	42
- Urban and Regional Planning	46
Natural Sciences	49
- Chemistry	50
- Computer Science and Informatics	61
- Genetics	64
- Geography	68
- Geology	71
- Mathematical Statistics and Actuarial Science	77
- Mathematics and Applied Mathematics	80
- Microbial, Biochemical and Food Biotechnology	82
- Physics	94
- Plant Sciences	20
- Zoology and Entomology	99
Centres	109
- Disaster Management Training and Education Centre for Africa (DIMTEC)	110
- Environmental Management	113
- Lengau Agricultural Development Centre	117
- Microscopy	120
- Sustainable Agriculture and Rural Development	125
Experimental Farm	129
- Paradys Experimental Farm	130
Institute	133
- Groundwater Studies	134
Statistical data	137
Glossary	141

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Preface

From the Dean's Office

In 2008 the Faculty of Natural and Agricultural Sciences once again lived up to its vision to be acknowledged as a faculty that is at the forefront of the practice of natural and agricultural science where the highest levels of quality and credibility are reflected.

During the year the faculty not only remained one of the leaders in training and career development in the natural and agricultural sciences, but it also made a concerted effort to enlarge its international footprint and to establish itself internationally. This is evident in the visits of staff from the faculty to universities such as the USA-based University of Minnesota and Virginia Polytechnic Institute and State University (Virginia Tech) and the extension of international agreements between the University of the Free State (UFS) and these institutions. The faculty also had the privilege of hosting a high-level delegation from the University of Minnesota on the Main Campus in Bloemfontein in August 2008.

The turmoil in the international markets firstly led to very high oil prices, which spilt over to the grain markets and high food prices. This, in turn, led to high inflation levels and therefore high interest rates. Eventually the exchange rate also deteriorated against the major currencies. In the latter part of the year the whole situation was turned upside down with the collapse of the financial markets. The faculty did not escape this and the price of equipment for which orders were placed sky rocketed. Innovative skills had to be applied to remain on track with our equipment strategy.

Although 2008 was an exceptionally difficult year for the UFS and the institution had to bear the brunt of the Reitz video and the reaction of the national and international community, the faculty still managed to perform and expand its core business.

The faculty offers multi-disciplinary and holistic courses to send skilled and capable students into the South African workplace and to empower the labour force. Our general and extended programmes are continuously assessed and improved in order to improve our throughput rates and quality of teaching.

The staff at the faculty worked tirelessly this year to broaden our product offering and to provide our students with the best quality teaching in the country. I applaud their efforts of expanding capacity, developing programmes and strengthening re-



Prof. Herman van Schalkwyk.

lationships both within and outside the faculty and the university.

I also want to applaud the staff and students of the faculty with their achievements this year – whether it is on a personal level, in their capacity as staff member of their respective department/centre or for the faculty. To mention a few:

- Ms Estelle Heideman HIV/Aids coordinator of the Lengau Agricultural Development Centre, received a bursary to participate in a leadership programme in the United States of America (USA), which trains female leaders in South Africa who contribute to the prevention of HIV at a local, regional and national level;
- In the Department of Agricultural Economics, Prof. Johan Willemse, known for his contribution towards agriculture, was appointed on the non-executive board of Absa;

Staff in the dean's office



The staff working in the dean's office are, from the left, front: Ms Stefanie Naborn, Manager: Marketing and Liaison, Ms René Bloem, Secretary, Prof. Neil Heideman, Vice-Dean: Faculty of Natural and Agricultural Sciences; back: Mr Clasie Claassen, Assistant Administrative Officer, Mr Johan Kruger, Faculty Manager, Ms Lorinda Rust, Secretary, and Ms Mitzie Cloete, Typist/Clerical Assistant.

- Prof. James du Preez, Departmental Chair of the Department Microbial, Biochemical and Food Biotechnology, received the silver medal for exceptional published research awarded at the biennial conference of the South African Society for Microbiology hosted in Graham's Town. It was only the seventh time since 1986 that the medal was awarded;
- A study of the UFS about how the change in the packaging of DNA with cellular development is influenced by the expression of genes, in which Prof. Hugh Patterson played a leading role, was published in a leading peer-reviewed scientific journal *Proceeding of the National Academy of Sciences* of the USA (PNAS). The PNAS journal has an impact factor of 10, which means that studies published in this journal are referred to by ten other scientific studies within the scope of two years;
- Prof. Riaan Luyt, professor in Chemistry and head of the Natural Sciences Programme at the Qwaqwa Campus, received an honorary medal from the Polymer Institute of the Slovak Academy of Sciences during a conference hosted in the High Tatras mountains of Slovakia;
- Prof. Maryke Labuschagne from the Department of Plant Sciences was the recipient of the National Science and Technology Forum's (NSTF) research capacity-development award. A team consisting of Prof. Jan van der Westhuizen and Dr Susan Bonnet from the Department of Chemistry, Prof. Kenneth Swart and Prof. Thinus van der Merwe from FARMOVS-PAREXEL also

received the innovation award for an outstanding contribution to science, engineering and technology by either an individual or a team over the last ten years from the NSTF;

- Prof. Maryke Labuschagne received a second prestigious national award for her research when the 2008 Cereal Science and Technology - SA's (CST-SA) Award for research and development was awarded to her; and
- Prof. Ivan Horak, extraordinary professor at the university's Department of Zoology and Entomology, became the third person in the history of the UFS to receive the D.Sc. degree.

In closing I would like to thank the faculty's lecturing staff for their support and enthusiasm during the past year. However, none of these achievements would have been possible without the interest and hard work of the administrative staff.

During 2008 we have all worked together to live up to the faculty's motto: "There is no substitute for excellence!" This report covers the activities of the faculty in 2008. It is a reflection of a year's commitment from a team of highly skilled academic and support staff.

Prof. Herman van Schalkwyk
Dean: Faculty of Natural and Agricultural Sciences
University of the Free State

Faculty news

Successful visit from delegation of the University of Minnesota

A senior delegation from the University of Minnesota in the United States of America (USA) paid a very successful visit to the University of the Free State (UFS) in May 2008 to explore ways of strengthening already existing ties between the two institutions.

Teacher training, capacity building in health sciences and student preparedness were among the areas of cooperation that were investigated, within the context of the Strategic Academic Cluster initiative of the UFS. Poverty reduction strategies were also a strong focus area.

The Faculty of Natural and Agricultural Sciences has had a cooperation agreement with the University of Minnesota's Department of Applied Economics since 2002 and the exchange of staff



During the visit are, from the left: Prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS, Prof. Robert Jones, Senior Vice-President: System Academic Administration at the University of Minnesota, Dr Meredith Quiad, Associate Vice-President and Dean: International Programmes, University of Minnesota, Prof. Teuns Verschoor, Acting Rector of the UFS and Prof. Ezekiel Moraka, Vice-Rector: Student Affairs at the UFS.

has been taking place on a regular basis. This agreement will be expanded and both institutions are now exploring the possibility of

applying it across faculties. Both institutions have committed seed funding to formalise the cooperation agreement.

50 years of Agriculture celebrated



The faculty celebrated 50 years of the teaching of agriculture at the UFS in November 2008. Part of the celebrations was a seminar with the theme "Challenges in a changing agricultural environment". Some of the guest speakers are, from the left: Mr Corwyn Botha, Chairman: Agri Business Chamber and Managing Director of the Cape Agri Group, Mr Motsepe Matlala, President of NAFU, Mr Hans van der Merwe, Executive Head: Agri SA, Prof. Herman van Schalkwyk: Dean: Faculty of Natural and Agricultural Sciences at the UFS, and Mr Sugar Ramakarane, Head: Department of Agriculture, Free State Province.

Winners of NSTF awards assist with recruitment of students



Here are, from the left: Dr Martin Ntwaeaborwa, senior lecturer at the Department of Physics and finalist in the category for black researchers, Prof. Kenneth Swart, FARMOVS-PAREXEL, Prof. Maryke Labuschagne, head of Plant Breeding at the UFS's Department of Plant Sciences and female recipient of the award for the development of research capacity over the past five to ten years, and Prof. Jan van der Westhuizen, Department of Chemistry at the UFS; front: Ms Kedibone Aphane, MRC. Prof. Swart and Prof. Van der Westhuizen were the leaders of the team who received the award for the development of innovation by a corporate organisation or institution.

Representatives of the South African Medical Research Council (MRC) visited the UFS to recruit students who want to study in the fields of sci-

ence, engineering and technology. To assist with the recruitment, the winners of awards made by the National Science and Technology Forum (NSTF) earlier this year,

made presentations to create an interest amongst students. The UFS had four finalists of whom two were the winners in their respective categories.

Young scientists learn what faculty can offer



Young science lovers gathered in Sasolburg for the annual Sasol TechnoX in August 2008. The faculty's exhibition captured the learners' attention through an interactive representation of the application fields of science. Delegates from the Departments of Mathematics and Applied Mathematics, Chemistry, Zoology and Entomology, as well as UFS Marketing stood ready to answer the questions of the 20 832 learners who attended the event. Pictured here is Theo Viljoen, M.Sc. student in Forensic Entomology, sharing interesting facts regarding insects with learners.

Two UFS academics appointed on the Land Bank Board



Prof. Herman van Schalkwyk (left), Dean: Faculty of Natural and Agricultural Sciences, and Mr Theo Potgieter from the UFS School of Management were appointed on the Land Bank Board in March 2008. Prof. van Schalkwyk was appointed as Director and Deputy Chairperson and Mr Potgieter as Director of the Board. The appointments were made by the Minister of Agriculture and Land Affairs, Ms Lulu Xingwana, and are effective for a period of four years.

UFS extends exchange agreement with USA university



Here are, from the left, front: Dr SK de Datta, Vice-Rector: International Affairs, VT, Prof. Herman van Schalkwyk, Dean of the Faculty of Natural and Agricultural Sciences, UFS, Dr Martin Ntwaeaborwa, senior lecturer at the Department of Physics, UFS; back: Prof. Jim McKenna, Department of Crop, Soil and Environmental Affairs, VT, Prof. Izak Groenewald, Director of the Centre for Sustainable Agriculture and Rural Development at the UFS and responsible for the faculty's international liaison, Dr Michael Bertelsen, VT's international office, Dr Aldo Stroebel, Head: Internationalisation at the UFS and Dr Liesel Herselman, senior lecturer at the Department of Plant Sciences, UFS.

A delegation from the faculty visited the Virginia Tech University (VT) in the USA in June 2008 to confirm and extend the existing student exchange agreements between the two institutions.

During the visit the agreement, which started in 1997, was extended for the next five years. More than 150 students from both institutions have already taken part in this exchange agreement and it is the most successful student exchange agreement that VT is involved in. Although agricultural students from the UFS initially took part in the agreement, it was extended to other departments in the faculty and also to the rest of the UFS.

Itjoriseng Project launched



The faculty launched the Itjoriseng Project on the Main Campus in Bloemfontein in March 2008. The aim of the project is to improve the skills of teachers in the subjects Mathematics and Physical Science for Grades 10–12. "Itjoriseng" is the Sotho word for "sharpen yourself". At the launch were, from the left: Mr Mzamo Jacobs, Director: Curriculum Development for Further Education and Training, Free State Department of Education, Mr Johan Kruger, Faculty Manager, Ms Elna Marais, Chief Education Specialist: Curriculum Development, Free State Department of Education, and Prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS.

2007 Faculty report launched



The faculty once again produced another report in which the various departments and centres highlighted their activities for 2007. The report was so well received that a second edition had to be printed. Here are some of the departmental chairpersons during the launch of the report in June 2008.

Departments in the

Agricultural Sciences



Department of

Agricultural Economics

“The department has developed into one of the leading departments of agricultural economics in South Africa” - Prof. Johan Willemse.



Prof. Johan Willemse.

Overview

The Department of Agricultural Economics originated in 1958 and celebrated its 50th anniversary in 2008. The department has developed into one of the leading departments of agricultural economics in South Africa and possibly even in Africa, attracting many students from countries such as Nigeria, Botswana, Ethiopia and Eritrea.

During 2008, 14 undergraduate and 28 postgraduate international students were registered in agricultural economics courses. A total of 17 Ph.D. students, 23 master's and 37 honours students were registered in 2008. Two lecturers, Drs Pieter Taljaard and Bennie

Grové, as well as two Ph.D. students graduated in April 2008. Mr Ferdie Botha, a senior student, obtained his master's degree with distinction at the September 2008 graduation ceremony.

The Agricultural Economics Association of South Africa (AEASA) held its 46th annual conference in Windhoek from 23-26 September 2008 with the theme “Rethinking agriculture and rural development in Southern Africa”. Seventeen students and staff attended the conference where they presented eight papers and three posters. During this conference Mr F Maré won the prize for the best student essay and Mr AO Ogundeji received

second prize in the best poster category.

Prof Giel Viljoen was the co-recipient of the Douw Greef Award from the “Suid-Afrikaanse Akademie vir Wetenskap en Kuns”, together with Dr Herman Booysen from Net Group S.A. and Prof Gawie de Villiers. The prize was awarded for an article published in the March 2007 edition of *Die Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie*.

Five students from the department and Prof. Herman van Schalkwyk, Dean of the Faculty of Natural and Agricultural Sciences at the University of the Free State (UFS) attended the International Food and Agribusiness Management Association's (IAMA) conference in Monterrey, California, United States of America (USA) from 14-17 June 2008, where they presented papers.

Prof. Johan Willemse, Departmental Chairperson, Dr Pieter Taljaard, Dr Wimpie Nell, Mr David Spies and Miss Lize Terblanche, amongst others, are often invited as guest speakers to various farmers' days presented in the Free State and other provinces.

The quarterly Agricultural Market Outlook workshops held on the Main Campus by Prof. Willemse were well attended by Agri businesses and farmers from all over South Africa. Guest speakers who made presentations at these workshops were Mr Louis Bekker, Multi-Manager from Barnard Jacobs Mellet Holdings,

and representatives from Suidwes Landbou amongst others.

A Safex course was held on the Main Campus in November 2008 with 25 delegates attending. The course covered aspects of futures trading, presenting a perspective on the main elements of the supply and demand of commodities.

The department has a strong focus on water research which is mainly funded by the Water Research Commission. Dr Bennie Grové has established himself as one of the leading experts in the field of water use optimisation and decision support through research that he and his team have done for the Water Research Commission (WRC) over a period of ten years. They contributed to the successful completion of two WRC funded projects in 2008. These projects were in connection with:

- integrating and upgrading of SAPWAT and PLANWAT to create a powerful and user-friendly irrigation water planning tool; and
- market risk, water management and the multiplier effects of irrigation agriculture with reference to the Northern Cape Province.

Two new WRC projects were also started. These projects are in connection with:

- the development and testing of an integrated set of models to evaluate the financial/economic



Three academics from the department were awarded the Douw Greeff Prize from the Suid-Afrikaanse Akademie vir Wetenskap en Kuns. The prize is awarded to a research or summary article of high scientific quality that was published in the SA Tydskrif vir Natuurwetenskap en Tegnologie during the year preceding the prize. Here are Dr Herman Booysen (left) and Prof. Giel Viljoen. The other member of the team, Prof. Gawie de Villiers, was absent when the photo was taken.

- impact of curtailment decisions on three participant farm case study areas in the Crocodile Catchment; and
- technology transfer on the technical aspects and cost-estimating procedures of surface and drip irrigation systems.

Dr Grové's research team also started fieldwork on another WRC funded project that focuses on the contribution of water use to agricultural value chains and on

how emerging farmers can be sustainably integrated into these value chains. The research is conducted with Mr Henry Jordaan (lecturer and Ph.D. candidate) and Mr Marvin Khaile (M.Sc. student) in Eksteenskui, a farming community of about 100 farmers along the banks of the Orange River which export raisins under the Fair Trade agreement.

The strong focus of the department on water research was also visible in its representation at the 3rd biannual symposium of the South African Commission on Irrigation and Drainage (SANCID) that was held at Club Mykonos in Langebaan, Western Cape. Six papers were presented at the symposium by staff and students of the department.

Dr Grové was also invited to participate in an international planning workshop in Dakar, Senegal, to establish an African Growth and Development Policy Modelling Consortium.

The second SADC/PRINT Short Course in Livestock Marketing and Trade was presented during April 2008 and, according to feedback from participants, it was rated an enormous success. Participants were unanimous in expressing



Dr Pieter Taljaard from the department with some of the SADC participants in the 2nd Short Course in Livestock Marketing and Trade, presented during April 2008. Delegates from Tanzania, Malawi, Swaziland, Namibia, Zambia, Zimbabwe, Botswana, Lesotho, Mauritius and Madagascar attended the course.



From the left are: Dr Patricia Elder, Vice-President of the National Council on Economic Education (NCEE), Prof. Klopper Oosthuizen from the department and Director: South African Foundation for Economic and Financial Education (SAFEFE), and Ms Winkie Direko, Member of Parliament and Chairperson of SAFEFE.



During a visit to the University of Minnesota in the United States of America are, from the left: Dr Michael van Wyk, Department of Curriculum Studies at the UFS, Prof. Klopper Oosthuizen from the department, Prof. Claudia Parliament, University of Minnesota, and Prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences.

their appreciation to the UFS and the Southern African Development Community (SADC) for affording them the opportunity to attend the course with all expenses covered by SADC/PRINT. The course is accredited by the UFS and is highly recommended by the SADC and some government departments. International visitors from the SADC Head Office in Gaborone, Botswana included Dr Welbourne

Madzima, Dr Pascal Bonnet, Mr Gerard Oosterwijk, Dr Berhanu Bedane and Dr Gift Wanda.

Both Dr Pieter Taljaard and Mr David Spies are currently involved with national institutions, namely the Red Meat Producers Organisation (RPO), the National Agricultural Marketing Council (NAMC), Cape Wools SA, the National Wool Growers' Association (NWGA), the South African Feedlot Association (SAFA), the Red Meat Abattoirs Association (RMAA), and the South African Wildlife Management Association (SAWMA), and on an international level with Agri Benchmark, the SADC, and the Organisation for Economic Cooperation and Development (OECD).

The Centre for Agricultural Management continued with its courses for commercial farmers, namely financial planning and management and strategic management in agriculture.

The centre was appointed by the National Department of Agriculture as a Centre of Excellence. The main aim of the initiative is to facilitate excellence model training, which is aimed at improving the skills of developing farmers and farming businesses. The excellence model aims to assist farmers in identifying gaps in business skills. These gaps will be addressed by means of short courses, and will help to close the gap between the first and fourth economies.

The centre was officially launched on 7 May 2008. Training started with 25 facilitators who then facilitated the model to 45 farmers in the Free State province. The UFS, as coordinator of the SMME Excellence Model, the Free State Department of Agriculture, the private sector, municipalities, small enterprise development agencies, and non-governmental organisations will be working together to enhance excellence in agricultural businesses in the Free State.

Another very successful project of the centre is the vermiculture and vermicomposting course. In November 2008 a course was presented by Mr Charl Pienaar from GoodBugs in Paarl, at the

Mangaung-University of the Free State Community Partnership Programme (MUCPP). It was attended by 50 people, including farmers and home gardeners. Two people from the Free State Residential Care Centre for mentally challenged adults in Bloemfontein also attend the course and a worm farming system was then handed over to them. The worm farm at the MUCPP has grown in such a way that people from across the country buy red worms (*Eisenia fetida*) at the farm to use as compost in vegetable gardens.

Prof. Klopper Oosthuizen and Ms Ina Combrinck are involved in six international programmes with the USA-based National Council on Economic Education (NCEE), namely NCEE Train the Trainer, NCEE Train the Teacher, NCEE Train the Writer, the NCEE alumni US Study Tour, NCEE Education Leaders' Study Tour and the US Teachers' exchange programme.

The fourth group of 53 trainers, consisting of subject advisors in economics and management sciences as well as lecturers from four universities, completed their Train the Trainer training in June 2008 in Durban. All nine provinces and four universities were represented in the fifth group of 52 trainers. The training was conducted by outstanding professors from four international universities, namely the University of Minnesota, Florida State University, Colorado State University in the USA and National Technical University of Kharkiv, Ukraine.

Prof. Claudia Parliament worked with Prof. Oosthuizen during the first five months of the year on a strategic positioning of the South African Foundation for Economic and Financial Education (SAFEFE) in the country. Prof. Meghan Millae and Prof. Jon Rezek, both from the Mississippi State University, USA were part of abovementioned team. The three visitors were involved in the teaching and learning programme of the faculty and department. The visitors also presented guest lectures at the university's Centre for Higher Education Studies and Development (CHESD). The basis for their collaboration was to

develop a stronger relationship between the UFS and the Department of Education in the advancement of economic education.

SAFEFE was involved in three community service projects, namely the second Economics Olympiad in the Free State, and teacher professional development in the Eastern Cape and the Free State. The Economics Olympiad was conducted in collaboration with the NCEE, the Free State Department of Education and service learning at the UFS. About 1 500 learners and 377 teachers in 259 Free State elementary schools participated. The competition consisted of four rounds.

The memorandum of agreement between the department and Department of Applied Economics at the University of Minnesota, USA was renewed for another six years and has become the instrument to develop greater institutional collaboration between the two universities.

Following a visit to the UFS by representatives of the University of Minnesota in August 2008, the university's International Office arranged a visit to the University of Minnesota in December 2008 as the beginning of a possible ten-year project to make teaching and community service more effective. ■

Research outputs

Research articles

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Conference contributions

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Staff

Professors: Profs Klopper Oosthuizen, Giel Viljoen

Professors Extraordinary: Profs Jan Groenewald, Kit le Clus

Associate Professors: Prof. Johan Willemse

Affiliated Associate Professors: Profs André Jooste, Daan Louw, Zerihun Alemu

Senior Lecturers: Drs Wimpie Nell, Kobus van Staden, Godfrey Kundhlande, Pieter Taljaard, Bennie Grové

Lecturers: Mr Henry Jordaan, Mss Lize Terblanche, Nicky Matthews, Leandre du Preez

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Senior Officer: Ms Marie Engelbrecht

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presented at the 46th Annual Conference of the Agricultural Economics Association of South Africa (AEASA): Rethinking Agriculture and Rural Development in Southern Africa, Safari Lodge, Windhoek, Namibia. 23-26 September.

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Taljaard, P.R. & Jooste, A. 2008. *A South African beef farm story.* Paper presented at the Agri-benchmark Beef Conference, Brazilia, Brazil. 23-29 June.

Taljaard, P.R. & Spies, D.C. 2008. *Prysmarges van rooivleis.* Paper presented at the Annual Congress of the North West Red Meat Producers Organization, Vryburg, South Africa. 15 April.

Department of

Animal, Wildlife and Grassland Sciences

“We want to deliver scientists and innovative agriculturalists who can serve the industry” - Prof. Johan Greyling.

Overview

The Department of Animal, Wildlife and Grassland Sciences is the most specialised group servicing the farm animal industry in South Africa. The department focuses on the breeding, nutrition, physiological manipulation, conservation and utilisation of natural resources and management of a variety of livestock species (cattle, sheep, goats, pigs, poultry) in production systems ranging from intensive to extensive and from communal to small scale to large commercial units.

Fields of study in animal nutrition include the fundamental principles of digestion and metabolism in ruminants and monogastrics, with the evaluation of fodder in terms of digestibility and the protein and energy requirements of animals during different physiological stages. The practical aspects of evaluating breeding merit, selection goals, breeding systems and selection methods are researched together with the manipulation of reproductive techniques to accelerate genetic progress. The conservation of the natural resources or ecosystems forms the basis of animal production and the restoration of degraded vegetation and sustainable wildlife management is therefore an integral part of this whole animal production chain.

The main objective of the department is the delivery of scientists and innovative agriculturalists who can serve the industry, while concentrating on relevant applied research and performing commu-



Prof. Johan Greyling.



nity service. The increase in animal production while maintaining the quality and sustaining the natural resources, remains of prime importance.

From the department's research outputs it is evident that it has an active research programme with specialisation in the different disciplines. Funding, which is limited and often lacking, is generated from external national institutions. The National Research Foundation (NRF) remains the most reliable sponsor with additional funds also being generated by Cape Mohair and Wool, the National Wool Growers' Association (NWGA), Meadow Feeds, Voermol Feeds, central research funds of the Uni-

versity of the Free State (UFS), the National Lucerne Organisation, Nutrifeds, Supreme Chickens and Pfizer (including contract research and sponsorships).

Some of the research highlights include the following:

In the discipline of Grassland Science and Nature Conservation several critical factors are being addressed. Restoration ecology and the restoration of degraded veld and the sustainable utilisation of the pasture ecosystems in the semi-arid grasslands in terms of production, water usage, efficient ground temperatures, organic material and root studies are among these. The effect of fire on the grassland ecosystem and



Students and farmers are trained in the artificial insemination of cattle.

the dynamics of problem plants are also being investigated. Many Karoo plants are spread over a large area of South Africa yet there is currently little information regarding the dynamics of production, adaptability and distribution capabilities of certain tasty and dominant Karoo bushes. The reaction of the plant growth following different defoliation intensities and frequencies under different ground water conditions is also being investigated. Furthermore, the habitat preferences and diet selection of the eland and the feeding ecology of other herbivore game species in areas ranging from the Western Cape, Central Free State and Limpopo Province are being recorded. Studies on the ecological effect of tree thinning on different savanna ecosystems are also being evaluated.

In the discipline of Animal Nutrition, poultry research is very active and contract research has been concluded for Nutri Feeds and Supreme Poultry. The aim is to determine the effect of different dietary lysine and energy levels on production parameters, as well as carcass characteristics in different

genetic strains of broilers. The effect of different lipid sources and inclusion levels on production parameters and carcass composition of broiler cockerels, as well as the oxidative and sensory characteristics of broiler meat cuts were also investigated. Further studies were executed to determine the effect of different dietary ionophores and inclusion levels in feedlot sheep finisher diets on certain production parameters and carcass characteristics. The potential of *Opuntia* (prickly pear) as a feed supplement or silage has also been evaluated in terms of growth performance, digestibility and carcass characteristics in sheep. This is a typical example of the quest for alternative feed sources in farm animals. The chemical and digestibility characteristics of lucerne hay graded according to quality have been comprehensively determined by analytical procedures. The variation that occurs in energy and protein composition emphasises the need for a rapid and accurate quality evaluation system for lucerne hay and predicting animal performance (e.g. milk yield, Average Daily Gain (ADG), etc.). The inclusion of 15-20% Neutral Detergent Fibre (NDF) from Medics hay and 13-21% NDF from eragrostis hay supplemented in the finishing diets of lambs was also evaluated. Here the dry matter and metabolizable energy intake was measured and compared. The effect of the physical form of maize grain in a lamb finishing diet was similarly tested in terms of its playing a role in digestibility.

In the discipline of Animal Physiology, research on multiple ovulation (superovulation) using various techniques during different seasons and embryo transfer in goats, received much attention. A colleague, Dr Khoboso Lehloenya, obtained his Ph.D. degree in this field. The use of in vitro embryo production (sheep and cattle) as an alternative to generate embryos was undertaken. The cryopreservation of sperm (cattle, sheep, pigs) plus the use of anti-oxidants in the preservation process to increase sperm viability after thawing is also being investigated. The aim here is

to increase the conception rate in different farm species following Artificial Insemination (AI) with frozen semen or embryos. The effect of anabolic steroid treatment on the reproduction performance of buck and rams is another aspect that is currently being investigated. The possible negative feedback of steroid treatment on testis development and spermatogenesis could negate its use.

Regarding animal breeding in sheep, cattle and also ostriches, the genotype by environmental interaction for milk and wool production, ADG, etc. is being investigated. With the use of animal breeding models the information from traditional breeding value estimation is combined with molecular genetic information to provide more accurate breeding value estimations of the animals. Methods to combine data of different production traits are being analysed.

To illustrate the productivity of the department in terms of research, Animal and Grassland Scientists attended the 10th World Conference on Animal Production (WCAP) in Cape Town with a total of 44 presentations. Prof. Johan Greyling was awarded the silver medal for his contribution

Student practical in Grassland Sciences conducted on the university's Main Campus in Bloemfontein.





Attending the World Congress of Animal Production (WCAP) in Cape Town are, from the left, standing: Prof. Japie van Wyk, Dr Luis Schwalbach, Prof. Frikkie Nesor, Messrs Foch de Witt, Mike Fair (all from the department), and Prof. Izak Groenewald, Director: Centre for Sustainable Agriculture and Rural Development at the UFS; seated: Prof. Johan Greyling, Departmental Chairperson, Mr Ockert Einkamerer, and Mr Thapelo Makae.

to research. He also serves on the council, together with Dr Luis Schwalbach. Three Grassland scientists (Profs Hennie Snyman, Nico Smit and Mr Paul Malan) attended an international Grassland Science Conference in Hohhot, China, with six scientific presentations. Natio-

nally, Prof. Hennie Snyman and Mr Paul Malan attended and made presentations at the Grassland Society Congress in Badplaas, and Prof. Nico Smit and Mr Gideon Janse van Rensburg attended the Wildlife Congress in Port Alfred.

Certain other research projects have also been funded by the industry (National Wool Growers' Association, Cape Mohair and Wool, Redmeat Producers Organisation, Meadows, Lucerne Producers' Organisation, Supreme Chickens, Virbac). More such actions are however necessary to help alleviate the financial research burden. Here Profs Hentie van der Merwe, HO de Waal, Dr Luis Schwalbach and Mr Foch de Witt made major inputs. Under the supervision of Prof. De Waal, methods are being investigated to look into the control of predators in the small stock industry. High level talks are being conducted with local and national government to address this problem (funded by the industry). Great financial losses are incurred annually due to predators.

In 2008 staff attended various national and international congresses with 87% of them making contributions. At a recent World

Congress of Animal Production (WCAP) in Cape Town, the contributions from the UFS were overwhelming – emphasising the fact that the department is the biggest and the best in South Africa.

Community service actions were again maintained and used as a way of advertising the department, Faculty of Natural and Agricultural Sciences and the university. The small-scale egg production project for women in rural areas had to be scaled down in 2008 due to the lack of funds. Nevertheless, the team of Prof. Johan Greyling, Mr Thapelo Makae, Mr Foch de Witt and Dr Luis Schwalbach are still providing the necessary health and managerial support.

Other community projects involve the training of small-scale livestock farmers in Bothaville (Prof. HO de Waal and Dr Luis Schwalbach) in basic husbandry skills. Cattle and sheep AI courses were presented in conjunction with Glen Agricultural Development Institute (Prof. Johan Greyling, Drs Luis Schwalbach, Khoboso Lehloenya) to students and farmers. An intensive three-day Animal Breeding workshop on modern breeding techniques was





At the inaugural lecture of Prof. Frikkie Nesor were, from the left: Prof. Johan Greyling, Departmental Chairperson of Animal, Wildlife and Grassland Science at the UFS, Prof. Nesor, Prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences, and Prof. Teuns Verschoor, Acting Rector of the UFS.



The Board of Trustees of the Northern Cape IDC Nguni Cattle Development Project held a meeting on the Main Campus of the UFS during the year. The UFS, the Industrial Development Corporation (IDC) and the Department of Agriculture and Land Reform in the Northern Cape are involved with this project, which aims to develop first-time farmers into Nguni stud farmers. The department assists with the training of the farmers. Here are, from the left: Ms Jacqui Maisela, Vice-Chairperson of the Board of Trustees and Chief Director: Agricultural Development Services of the Northern Cape Department of Agriculture and Land Reform, Prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS, and Mr Tommy Mohajane, Chairperson of the Board of Trustees.

organised by Prof. Frikkie Nesor, Prof. Japie van Wyk and Mr Mike Fair, in conjunction with Breedplan, for breeders nationally and from Namibia.

Two major projects (in the Northern Cape and the Free State) have been launched in conjunction with the Industrial Development Corporation (IDC) to empower selected black livestock farmers by providing them with Nguni cattle. These projects are being managed by Prof. De Waal and Dr Schwalbach and supported with training and technical advice. Another highlight in terms of community service was a goat information day presented at the Paradys Experimental Farm. Altogether 110 delegates (from first-year to

postgraduate students as well as farmers) attended this event. The sixth annual Cattleman's Conference was held by the department together with Glen Agricultural Development Institute, focusing on the economic environment and trends in the beef industry. Speakers were invited and the conference was attended by 130 people from the livestock industry. To further emphasise community involvement in general, contributions were also made on farmers' days.

To illustrate activities in which the department, faculty and university is propagated, staff have been involved as judges in the National Breed Plan and Voermol Cattle and Sheep Farmer of the Year (Profs Johan Greyling and Frikkie Nesor), the SA Dairy Farmer of the Year (Prof. Hentie van der Merwe) and the SA Young Farmer of the Year (Prof. HO de Waal) competitions. They also serve on formal agricultural committees such as the Red Meat Producers Organisation, the Free State Game Association, National Lucerne Organisation, South African Society for Animal Science, Grassland Society of Southern Africa (GSSA), World Poultry Organisation, National Woolgrowers Association, SA Veterinary Association, Arid Zone Forum, and so forth. Several members also serve on the editorial boards of national and international scientific journals (*Small Ruminant Research*, *Livestock Science*, *SA Journal of Animal Science*, *SA Journal of Grassland Science*, *Journal of Arid Environments*). ■

Research outputs

Research articles

Botha, P.R., Meeske, R. & Snyman, H.A. 2008. Kikuyu over-sown with ryegrass and clover: Dry matter production, botanical composition and nutritional value. *African Journal of Range and Forage Science* 25(3): 93-101.

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D'Almeida, A.M., Schwalbach, L.M.J., De Waal, H.O., Greyling, J.P.C. & Cardoso, L.A. 2008. 3-Methylhistidine in the male goat as an experimental model: Serum concentrations and an indicator of protein breakdown. *Scandinavian Journal of Laboratory Animal Science* 35(4): 1-5.

Du Toit, G. van N., Snyman, H.A. & Malan, P.J. 2008. Physical impact of grazing by sheep in the Nama Karoo subshrub/grass rangeland of South

Africa on litter and dung distribution. *South African Journal of Animal Science* 38(4): 326-330.

Engelbrecht, A., Cloete, S.W.P. & Van Wyk, J.B. 2008. Direct heterosis for liveweight and chick mortality in ostriches. *Australian Journal of Experimental Agriculture* 48(10): 1320-1325.

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Lemma, G. & Smit, G.N. 2008. Relationships between plant and soil nutrient status and position in the landscape on Pellic Vertisols of Ethiopia. *South African Journal of Plant & Soil* 25(2): 119-126.

Neser, F.W.C., Erasmus, G.J. & Scholtz, M.M. 2008. The use of a cluster analysis in across herd genetic evaluation for beef cattle. *South African Journal of Animal Science* 38(1): 51-57.

Van Wyk, J.B., Swanepoel, J.W., Cloete, S.W.P., Olivier, J.J. & Delpport, G.J. 2008. Across flock genetic parameter estimation for yearling body weight and fleece traits in the South African Dohne Merino population. *South African Journal of Animal Science* 38(1): 31-37.

Books

Smit, G.N. 2008. *Field Guide to the Acacias of South Africa*. Pretoria: Briza Publications.

Reports

Scholtz, G.D.J. 2008. *A preliminary study on the extraction of Lucerne (Medicago Sativa L.) protein concentrate (LPC) under laboratory conditions*.

Progress report to Griekwaland West Corporation, Douglas, South Africa.

Scholtz, G.D.J. 2008. *Lucerne production in South Africa*. Final report to Griekwaland West Corporation, Douglas, South Africa.

Conference contributions

Banga, C.B., Neser, F.W.C., Garrick, D.J. & Van der Westhuizen, J. 2008. *Economic values for dairy production traits under different milk payment systems in South Africa*. Paper presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.

Botha, P.R., Meeske, R. & Snyman, H.A. 2008. *The evaluation of two cultivated methods to over-sow perennial clovers into kikuyu*. Poster presented at the 21st International Grassland Congress and the 8th International Rangeland Congress, Hohhot, China. 29 June-05 July.

De Witt, F.H., Kuleile, N.P., Van der Merwe, H.J. & Fair, M.D. 2008. *Effect of limestone particle size on egg production and eggshell quality during late production*. Paper presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.

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De Witt, F.H., Kuleile, N.P., Van der Merwe, H.J. & Fair, M.D. 2008. *Influence of limestone particle size on egg production and eggshell quality of layers*. Poster presented at the 23rd World Poultry Congress, Queensland, Australia. 30 June - 04 July.

Einkamerer, O.B., De Waal, H.O., Combrinck, W.J. & Fair, M.D. 2008. *The effect of Opuntia-based diets on feed utilization and growth of Dorper wethers*. Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.

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Staff

Professors: Profs Johan Greyling, Frikkie Neser, Nico Smit, Hennie Snyman, Hentie van der Merwe, Japie van Wyk

Professors Extraordinary: Profs Amie Aucamp, Schalk Cloete, James Hayes, Michiel Scholtz

Associate Professors: Prof. HO de Waal

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

Lecturer: Dr Khoboso Lehloeny, Messrs Foch de Witt, Mike Fair, Paul Malan

Junior Lecturer: Messrs Ockert Einkamerer, Thapelo Makae

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- Els, S.P., De Witt, F.H., Van der Merwe, H.J., Fair, M.D. & Hugo, A.** 2008. *Effect of dietary lipid sources on production performances of broilers*. Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
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- Els, S.P., Hugo, A., De Witt, F.H. & Van der Merwe, H.J.** 2008. *Effect of dietary lipid sources on lipid oxidation of broiler meat*. Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
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- Engelbrecht, A., Cloete, S.W.P. & Van Wyk, J.B.** 2008. *Direct heterosis for live weight and chick mortality in ostriches*. Poster presented at the 4th International Ratite Science Symposium (4IRSS), Brisbane, Australia. 29 June - 04 July.
- Fair, M.D., Van Wyk, J.B. & Cloete, S.W.P.** 2008. *Genetic parameter estimates for certain production traits of ostriches*. Paper presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
- Foss, S., Nedambale, T.L., Greyling, J.P.C. & Schwalbach, L.M.J.** 2008. *Piglets born from frozen-thawed epididymal sperm obtained post mortem: A case study*. Paper presented at the 10th World Conference on Animal Production (WCAP), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
- Foster, L.A., Fourie, P.J., Neser, F.W.C. & Fair, M.D.** 2008. *Differences in physical traits such as coat score and hide thickness together with tick burdens and body condition score in four beef breeds in the Southern Free State*. Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
- Foster, L.A., Fourie, P.J., Neser, F.W.C. & Fair, M.D.** 2008. *Effect of heat stress on six beef breeds in the Zaïron district: The significance of breed, coat colour and coat type*. Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
- Hassen, H., Neser, F.W.C., De Kock, A. & Van Marle-Koster, E.** 2008. *Phenotypic and genetic variations of native chicken populations in northwest Ethiopia*. Poster presented at the 23rd World Poultry Congress, Queensland, Australia. 30 June - 04 July.
- Hassen, H., Neser, F.W.C., De Kock, A. & Van Marle-Koster, E.** 2008. *Village chicken production and marketing systems in northwest Ethiopia*. Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
- Janecke, B.B. & Smit, G.N.** 2008. *Assessment of faecal nitrogen as an indicator of nutritional status of browser and mixed feeder game species in the central Free State*. Paper presented at the Southern African Wildlife Management Association (SAWMA) Conference, Biodiversity Conservation: The Science Management Interface, Mpekweni Beach Resort, Port Alfred, South Africa. 16-19 September.
- Janse van Rensburg, G., Snyman, H.A. & Kellner, K.** 2008. *Rangeland restoration and soil water improvement in a semi-arid South Africa*. Poster presented at the Southern African Wildlife Management Association (SAWMA) Conference, Biodiversity Conservation: The Science Management Interface, Mpekweni Beach Resort, Port Alfred, South Africa. 16-19 September.
- Joubert, D., Rothauge, A. & Smit, G.N.** 2008. *Periodicity of recruitment of Acacia mellifera in semi-arid central Namibia*. Poster presented at the Southern African Wildlife Management Association (SAWMA) Conference, Biodiversity Conservation: The Science Management Interface, Mpekweni Beach Resort, Port Alfred, South Africa. 16-19 September.
- Lehloeny, K.C., Greyling, J.P.C. & Grobler, S.** 2008. *Can repeated superovulation and embryo recovery in Boer goats limit a donor participation in MOET programme?* Paper presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
- Malan, P.J. & Snyman, H.A.** 2008. *Dry matter production and partition of two palatable Karoo shrubs*. Poster presented at the 21st International Grassland Congress and the 8th International Rangeland Congress, Hohhot, China. 29 June-05 July.
- Malan, P.J. & Snyman, H.A.** 2008. *Rooting of Karoo shrub cuttings*. Poster presented at the 21st International Grassland Congress and the 8th International Rangeland Congress, Hohhot, China. 29 June-05 July.
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- Munyai, P.H., Mphaphathi, M.L., Raito, M.B., Makhafola, M.B., Mantiziba, C.W., Schwalbach, L.M.J., Greyling, J.P.C. & Nedambale, T.L.** 2008. *Effect of different extenders and preservation period on the survival rate of South African indigenous ram semen stored at 5°C*. Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention

- Centre, Cape Town, South Africa. 23-28 November.
- Price, M.M., De Witt, F.H., Einkamerer, O.B., Greyling, J.P.C. & Fair, M.D.** 2008. *The effect of different ionophores on production performance of feedlot wethers.* Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
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- Raito, M.B., Mphaphathi, M.L., Schwalbach, L.M.J., Greyling, J.P.C. & Nedambale, T.L.** 2008. *Brilliant cresyl blue staining improve the quality of selected indigenous cattle oocytes and their developmental capacity to blastocyst in vitro.* Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
- Rust, J.M., Visser, D.S., Venter, J.E., Boshoff, M.P., Foss, S. & Greyling, J.P.C.** 2008. *The effect of season on aspects of in vitro embryo production (IVEP) in sub-fertile beef cows.* Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
- Scholtz, G.D.J., Van der Merwe, H.J. & Tylutki, T.P.** 2008. *A model for assessing Medicago sativa L. hay quality.* Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
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- Scholtz, G.D.J., Van der Merwe, H.J. & Tylutki, T.P.** 2008. *The nutritive value of South African Medicago sativa L. hay.* Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
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- Smit, G.N.** 2008. *Understanding the problem of bush encroachment in southern African savannas: Lessons to be learnt from root studies.* Paper presented at the Southern African Wildlife Management Association (SAWMA) Conference, Biodiversity Conservation: The Science Management Interface, Mpekweni Beach Resort, Port Alfred, South Africa. 16-19 September.
- Smit, G.N. & Hagos, M.G.** 2008. *Effect of soil and subhabitat differentiation on seedling establishment and growth of Acacia mellifera subsp. detinens in a semi-arid savanna of South Africa.* Poster presented at the 21st International Grassland Congress and the 8th International Rangeland Congress, Hohhot, China. 29 June-05 July.
- Smit, G.N. & Pienaar, F.C.** 2008. *The influence of tree thinning on grass dry matter yield, with and without grazing by herbivore game species in the Marakele Park, South Africa.* Poster presented at the 21st International Grassland Congress and the 8th International Rangeland Congress, Hohhot, China. 29 June-05 July.
- Snyman, H.A.** 2008. *Efficiency of water use by cactus pear (Opuntia spp.).* Poster presented at the 21st International Grassland Congress and the 8th International Rangeland Congress, Hohhot, China. 29 June-05 July.
- Snyman, H.A.** 2008. *Productivity loss due to fire in a semi-arid rangeland of South Africa.* Poster presented at the 21st International Grassland Congress and the 8th International Rangeland Congress, Hohhot, China. 29 June-05 July.
- Van Niekerk, D.J., Nesor, F.W.C. & Van der Westhuizen, J.** 2008. *The possibility of a genotype x environment interaction in the South African Jersey population with reference to age at first calving.* Poster presented at the 10th World Conference on Animal Production (WCAP) and the Annual General Meeting of the South African Society for Animal Sciences (SASAS), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
- Vermeulen, S. & Snyman, H.A.** 2008. *Evaluation of the dry-weight-rank technique to determine the botanical composition of cultivated pastures.* Poster presented at the 43rd Annual Congress of the Grassland Society of Southern Africa, Badplaas, Mpumalanga, South Africa. 21-25 July.

Department of

Plant Sciences

“Postgraduate training continues to be an important activity in Plant Sciences” - Prof. Sakkie Pretorius.



Prof. Sakkie Pretorius.

Overview

The Department of Plant Sciences, which consists of the disciplines Botany, Plant Breeding and Plant Pathology, participated in many educational, research and service activities during 2008.

Profs Amie van der Westhuizen, Maryke Labuschagne and Neal McLaren served as subject heads for the respective disciplines. Ms Joyce Moloi was the subject head for Botany at the Qwaqwa Campus. Postgraduate training continues to be an important activity in Plant Sciences and academic staff supervised 91 students during 2008. Of these, 20 students were from foreign countries.

During the April and September graduation ceremonies, eight doctoral and 13 master's degrees were conferred. In addition, lecturers and students attended a postgraduate plant science symposium organised by the University of Johannesburg. The presentations by Abdurrahman Beshir and Scott Sydenham were voted best in the honours and master's categories, respectively.

In **Botany**, Prof. Louis Scott retired from the department at the end of 2008, but will continue his productive palynological research on a part-time basis. Dr Frank Neumann, a post-doctoral fellow with Prof. Scott, resigned his position in 2008 but continues to

collaborate on projects covering aspects of the environmental history of KwaZulu-Natal and the Western Cape. Dr Andrea Sanderson, also a post-doctoral fellow, researched the Cretaceous period palynology of the Atlantic Ocean. Prof. Scott served as guest editor for the Elsevier publication *Journal of Arid Lands*, which should appear in 2009. Dr Carlos Cordova of Oklahoma State University, United States of America (USA), visited Prof. Scott for three months to do research on silica bodies in plants. He presented a faculty guest lecture on “A biome-based paleoecological approach using opal phytoliths”. Dr Yolanda Fernandez-Jalvo of Madrid spent time with Prof. Scott regarding a Spain-South Africa research agreement on pollen taphonomy.

Prof. Amie van der Westhuizen travelled to the University of Muenster in Germany in March where he served on the examination panel for the thesis defence of Dr Jenni Moldenhauer. Michael Austenfeld, of the same university, spent three months at the University of the Free State (UFS) under the mentorship of Profs Van der Westhuizen and Sakkie Pretorius to work on biochemical and molecular aspects of stripe rust resistance in wheat. The long-standing collaboration between the UFS and the Department of Plant Biochemistry and Technology at the University of Muenster resulted in joint approval of a three-year agreement between these universities by the National Research Foundation (NRF) and the Federal Ministry of

Education and Research (BMBF) in Germany.

Prof. Johann du Preez, a vegetation ecologist, collaborated with several institutions during 2008. He assisted the South African National Biodiversity Institute (SANBI) with research on Free State flora, the Department of Tourism, Environmental and Economic Affairs with developing a biodiversity plan for the Free State, and the Northern Cape Department of Environmental Affairs and Tourism with surveying provincial nature reserves. Moreover, his broad interest in nature has earned Prof. Du Preez a place in the "Hoe verklaar jy dit?" programme on RSG, a national radio station of the South African Broadcasting Corporation (SABC).

Prof. Johan Grobbelaar lectured on climate change to several audiences in Bloemfontein. He spoke about his experiences on Marion Island in the UFS staff wellness programme and, on a cultural note, presented an evening of Spanish music to Bloemfontein music lovers.

Ms Lize Joubert assisted with the African Earth Observation Network (AEON) Earthwise extension programme for schools in Prieska, Northern Cape.

At the Qwaqwa Campus, Prof. Rodney Moffett is compiling a Sesotho Plant Dictionary and has successfully completed a list of Sesotho names with the corre-



Undergraduate students participating in an excursion to the De Hoop Nature Reserve.

sponding botanical names, their synonyms and references.

Dr Erwin Sieben secured funding for two research projects on "Functional classification of wetland plants" and "Compiling vegetation data in wetlands in KwaZulu-Natal, Free State and Mpumalanga". He published several papers and presented his research at two congresses. He also updated the PLK334 undergraduate module resulting in an

improved study guide, with a new focus on vegetation ecology, for both campuses.

Ms Joyce Moloi, a plant physiologist, authored and co-authored presentations at the International Conference on Biotic Plant Interactions in Brisbane, Australia. Her Ph.D. research, under supervision of Prof. Amie van der Westhuizen, was supported by the NRF's Thutuka programme.

Mr Robert Lentsoane designed and offered a short course on basic gardening principles.

In **Plant Breeding**, Dr Liezel Herselman visited the Virginia Polytechnic Institute and State University in Blacksburg, Virginia, USA, as part of a UFS delegation to renew the existing exchange



Some doctoral graduates and their promoters. From the left are: Prof. Johann du Preez, Dr Robert Brand (Ph.D. student in Botany), Prof. Johann Grobbelaar, Dr Nadine Koning (Ph.D. student in Botany), Prof. Sakkie Pretorius, Departmental Chairperson, Ms and Dr JD Rossouw (Ph.D. student in Plant Breeding/Plant Pathology), Dr Ansa van Vuuren (Ph.D. student in Plant Breeding) and Prof. Maryke Labuschagne.



Prof. Maryke Labuschagne receiving an award from the South African Cereal Science and Technology Association (CSTA) presented by Dr Duodo, CSTA president.



Michael Austenfeld (middle) of the University of Muenster in Germany spent three months in the department to work on biochemical and molecular aspects of stripe rust resistance in wheat. He was hosted by Profs Amie van der Westhuizen (left) and Sakkie Pretorius.

agreement the two universities. Prof. Maryke Labuschagne visited the Mauritius Sugar Industry Research Institute, Mauritius, and CIMMYT, ICRISAT and IITA representatives in Nairobi, Kenya, to discuss postgraduate and other research. In addition, she served as the South African representative at the American Association for Cereal Chemists (AACC) International Annual Meeting, in Honolulu, Hawaii where she moderated and chaired different sessions. During a visit to Ghent, Belgium, Prof. Labuschagne co-authored three presentations at

the First Scientific Meeting of the Global Cassava Partnership.

Prof. Labuschagne received several awards in 2008. As winner of the National Science and Technology Forum (NSTF) award in the category "Research Capacity Development", she received R100 000. She also received the South African Cereal Science and Technology award of R30 000 for research and development. Furthermore, she was elected "South African Agriculturalist of 2008" by the Agricultural Writers' Association of South Africa.

To improve the infrastructure of the molecular plant breeding laboratory, Dr Herselman received an amount of R700 000 from the NRF's National Equipment Programme for a 'GelScan 3000' apparatus. Another laboratory in the division was upgraded and new work spaces were created from storerooms. Prof. Labuschagne's appointment to the genetically modified organisms (GMO) advisory committee of the South African government was extended for another term. Between Prof. Labuschagne and Dr Herselman, they authored or co-authored ten papers in accredited journals.

Two Ph.D. students in Plant Breeding spent 2008 at the John Innes Centre in Norwich, United Kingdom (UK). These students, with Prof. Renée Prins of CenGen as principal promoter, are conducting research funded by the Biotechnology and Biological Sciences Research Council (BBSRC) on genetic aspects of rust resistance in wheat.

In **Plant Pathology**, Prof. Wijnand Swart was part of a six-person delegation nominated by the Department of Science and Technology (DST) to visit Mexico on a fact-finding mission with a view to a bilateral agreement on scientific cooperation between South Africa and Mexico. He was also invited to The Netherlands where he presented two papers on policy issues in South African agriculture.

Prof. Sakkie Pretorius visited Ethiopia to assist the Durable Rust Resistance in Wheat (DRRW) project, coordinated by Cornell University in the USA, in establishing critical facilities at designated research institutions. He was also invited to Shimla and New Delhi in India where he gave presentations on research relating to the Ug99 wheat stem rust race. At the UFS he continued his NRF and Winter Cereal Trust-supported research on durable resistance in wheat to rust diseases. Prof. Renée Prins of CenGen and an affiliated staff member at UFS, provided the molecular genetics support to this research. One of Prof. Pretorius' responsibilities is the extensive testing of all commercial wheat



Prof. Gary Peterson (middle), Texas AgriLife & Extension Center, Lubbock, Texas and INTSORMIL Southern Africa programme coordinator and Dr John Yohe (right), INTSORMIL Programme Director, Lincoln, Nebraska with Mr Leo Mpofo, currently a Ph.D. student in Plant Pathology at the UFS. Mr Mpofo's studies are fully supported by the INTSORMIL programme.

cultivars and promising breeding lines to rust diseases. This work is done in collaboration with the Agricultural Research Council's (ARC) Small Grain Institute, Pannar and Sensako.

Two master's and three doctoral students were recruited to work with Profs Neal McLaren and Wijnand Swart. Prof. McLaren secured new research projects on mycotoxins in sorghum grain as well as the regional INTSORMIL programme for Southern Africa. Dr John Leslie (Kansas State University, USA) and Dr Gary Peterson (Texas A&M University, USA), respectively INTSORMIL Principal Investigator and Southern Africa Regional Coordinator, visited Prof.

McLaren to discuss progress. Dr Leslie also acts as co-promoter for the Ph.D. project of Ms Adré Minnaar-Ontong. In the rust programme, Prof. Pretorius hosted Dr Rick Ward, coordinator of the DRRW project at Cornell University, as well as Dr Bob McIntosh from the University of Sydney, Australia.

In his capacity as a field crops pathologist Prof. McLaren served as panel member for the Sclerotinia Working Group, Soybean Rust Task Team and Sorghum Forum. Ms Wilmarie Kriel, an expert on Fusarium head blight of wheat, gave five presentations on this topic at farmer's days and a seed conference during the year. ■

Research outputs

Research articles

Benesi, I.R.M., Labuschagne, M.T., Herselman, L., Mahungu, N.M. & Saka, J.K. 2008. The effect of genotype, location and season on cassava starch extraction. *Euphytica* 160(1): 59-74.

Brand, R.F., Du Preez, P.J. & Brown, L.R. 2008. A floristic description of the Afromontane fynbos communities on Platberg, Eastern Free State, South Africa. *Koedoe* 50(1): 32-41.

Coetzee, J.A. 2008. Reminiscences of palynological research during early years in the Department of Botany, University of the Free State. *Navorsinge Nasionale Museum, Bloemfontein* 24(1): 1-8.

Coetzee, R., Labuschagne, M.T. & Hugo, A. 2008. Fatty acid and oil variation in seed from kenaf (*Hibiscus cannabinus* L.). *Industrial Crops and Products* 27(1): 104-109.

Staff

Main Campus:

Professors: Profs Sakkie Pretorius, Johan Grobbelaar, Maryke Labuschagne, Neal McLaren, Louis Scott, Wijnand Swart, Amie van der Westhuizen, Charl van Deventer, Rudi Verhoeven

Associate Professor: Prof. Johann du Preez

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

Senior Lecturer: Dr Liezel Herselman

Lecturers: Drs Barbara Mashope, Elizma Koen, Lintle Mohase, Gerhard Potgieter, Andor Venter, Botma Visser, Ms Wilmarie Kriel

Professional and Technical Staff: Mss Cornel Bender, Lize Joubert, Mr Hendri Pretorius

Administrative and Support Staff: Mss Sadie Geldenhuys, Suzine Uys, Erna van Deventer, Zelda van der Linde, Hilda Dlamini, Lilian Molosi, Messrs Gerald Moshodi, Dirk Jansen, Petrus Foko, Simon Pheneti

Qwaqwa Campus:

Lecturers: Dr Erwin Sieben, Mr Robert Lentsoane, Ms Joyce Moloji

Junior Lecturer: Mr Raymond Pitso

Research Fellow: Prof. Rodney Moffett

Assistants: Messrs Ngaka Mzizi, Pheello Mojau

Contact details

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- Craven, M., Barnard, A. & Labuschagne, M.T. 2008. Significance of kernel moisture content in determination of Hagberg Falling Number in wheat. *South African Journal of Plant Soil* 25(2): 71-78.
- Grobbelaar, J.U. 2008. A century of botany at the University of the Free State. *Navorsing Nasionale Museum, Bloemfontein* 24(2): I-V.
- Grobbelaar, J.U. 2008. Algal biotechnology: Four decades of research at the University of the Free State, moving from laboratory to commercial scale. *Navorsing Nasionale Museum, Bloemfontein* 24(2): 9-20.
- Groenewald, E.G. 2008. Plant tissue culture research at the Department of Plant Sciences, University of the Free State. *Navorsing Nasionale Museum, Bloemfontein* 24(3): 21-28.
- Janse van Rensburg, B., Flett, B.C., McLaren, N.W. & McDonald, A.H. 2008. Variation in the identification of *Fusarium* spp. in maize samples due to enumerator and growth medium. *South African Journal of Plant and Soil* 25(2): 105-110.
- Jin, Y., Szabo, L., Pretorius, Z.A., Singh, R.P. & Fetch, T. 2008. Detection of virulence to Sr24 within race TTKS of *Puccinia graminis* f. sp. *tritici*. *Plant Disease* 92(6): 923-926.
- Joubert, L., Venter, H.J.Y. & Verhoeven, R.L. 2008. *Cryptolepis bifida* (Apocynaceae: Periplocoideae), a new species from Kenya and Tanzania, Africa. *Botanical Journal of the Linnean Society* 157(2): 343-346.
- Kena, M. & Swart, W.J. 2008. Effect of composted animal manure on damping-off of vegetable seedlings. *Journal of Plant Pathology* 90(S2): 411.
- Klopper, R., Du Preez, P.J. & Smith, G.F. 2008. New evidence in support of a disjunct distribution of *Aloe karasbergensis*. *Bothalia* 38(1): 82.
- Kriel, W.M. & Pretorius, Z.A. 2008. The FHB challenge to irrigation wheat production in South Africa. *Cereal Research Communications* 36(Suppl. B): 569-571.
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- McLaren, N.W. 2008. Reaction of South African soybean cultivars to rust caused by *Phakopsora pachyrhizi*. *South African Journal of Plant and Soil* 25(1): 49-54.
- McLaren, N.W. & Craven, M. 2008. Evaluation of soybean cultivars for resistance to sclerotinia stalk rot in South Africa. *Crop Protection* 27(2): 231-235.
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- Negussie, T. & Pretorius, Z.A. 2008. Yield loss of lentil caused by *Uromyces viciae-fabae*. *South African Journal of Plant and Soil* 25(1): 32-41.
- Neumann, F., Stager, C., Scott, L., Venter, H.J.T. & Weyhenmeyer, C. 2008. Holocene vegetation and climate records from Lake Sibaya, KwaZulu-Natal (South Africa). *Review of Palaeobotany and Palynology* 152(3-4): 113-128.
- Nunkumar, A., Caldwell, P.M. & Pretorius, Z.A. 2008. Alternative hosts of Asian soybean rust (*Phakopsora pachyrhizi*) in South Africa. *South African Journal of Plant and Soil* 25(1): 62-63.
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- Ojulong, H., Labuschagne, M.T., Fregene, M. & Herselman, L. 2008. Introgression of genes for dry matter content from wild cassava species. *Euphytica* 164(1): 163-172.
- Olsen, A., Prinsloo, L.C., Scott, L. & Jäger, A.K. 2008. Hyraceum, the fossilized metabolic product of rock hyraxes (*Procavia capensis*), shows GABA-benzodiazepine receptor affinity. *South African Journal of Science* 103(11-12): 437-438.
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Chapters in books

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Venter, A.M. 2008. Lycium. In *Sappi tree spotting: Cape from coast to Kalahari*, edited by V. Thomas, E. Moll & R. Grant. Johannesburg: Jacana Media. pp. 30, 46, 104, 148.

Reports

Kotze, D., Ellery, W., Rountree, M., Grenfell, M., Marneweck, G., Nxele, I., Breen, C., Dini, J., Batchelor, A. & Sieben, E. 2008. *WET-Rehab Plan: Guidelines for planning wetland rehabilitation in South Africa*. Report TT 336/08 to the Water Research Commission (WRC), Pretoria, South Africa.

Sieben, E.J.J., Kotze, D.C., Ellery, W.N. & Russell, W. 2008. *Using vegetation in wetland rehabilitation*. Chapter 6 in *WET-Rehab Methods: National Guidelines and Methods for Wetland Rehabilitation*, edited by W. Russel. Report TT 341/08 to the Water Research Commission (WRC), Pretoria, South Africa.

Conference contributions

Akinbo, O., Labuschagne, M.T. & Fregene, M. 2008. *Quantitative trait loci (QTL) mapping of protein content in backcross derivatives of inter-spe-*



Prof. Maryke Labuschagne was voted South Africa Agriculturist of 2008 by the Agricultural Writers' Association of South Africa. Pictured with her are the Farmer and Emerging Farmer of the Year.



Dr Robert McIntosh (right), emeritus professor from the University of Sydney, Australia, and an advisor to the Durable Rust Resistance in Wheat project coordinated by Cornell University, during his visit to Prof. Sakkie Pretorius.



The National Science and Technology Forum (NSTF) prize for capacity building was awarded to Prof. Maryke Labuschagne. Here are: Mr MA Mangena, Minister of Science and Technology, Prof. Labuschagne and a representative of Eskom, which was the sponsor of the award.

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- Akinbo, O., Labuschagne, M.T., Marin, J., Ospina, C., Gutierrez, J & Fregene, M.** 2008. *Quantitative trait loci (QTL) mapping of protein content in backcross derivatives of inter-specific hybrids from Manihot esculenta ssp flabellifolia and cassava (Manihot esculenta Crantz).* Poster presented at the 1st Scientific Meeting of the Global Cassava Partnership (GCP-1): Cassava Meeting the Challenges of the New Millennium, Institute of Plant Biotechnology for Developing Countries (IPBO), Ghent, Belgium. 21-25 July.
- Akinbo, O., Labuschagne, M.T., Ospina, C., Marin, J., Gutierrez, J. & Fregene, M.** 2008. *Bringing wild alleles back into the primary gene pool: Introgression of high protein content from Manihot esculenta ssp flabellifolia into cassava (Manihot esculenta Crantz).* Poster presented at the 1st Scientific Meeting of the Global Cassava Partnership (GCP-1): Cassava Meeting the Challenges of the New Millennium, Institute of Plant Biotechnology for Developing Countries (IPBO), Ghent, Belgium. 21-25 July.
- Appelgryn, J.J. & Visser, B.** 2008. *Evidence for volatile signalling between leaf-rust infected and uninfected wheat.* Oral presentation delivered during the 34th Annual Conference of the South African Association of Botanists (SAAB), (Joint Conference with the Southern African Society for Systematic Biology), Drakensville Mountain Resort, Drakensberg, South Africa. 14-18 January.
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- Berner, J. & Van der Westhuizen, A.J.** 2008. *A role for lipids and phenolics in the RWA resistance response.* Oral presentation delivered at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Brand, R.F., Du Preez, P.J. & Brown, L.R.** 2008. *The phytosociology of afro-montane fynbos communities on Platberg, Eastern Free State, South Africa.* In *Frontiers of Vegetation Science – An Evolutionary Angle*, edited by L. Mucina (et al.). Somerset West: Keith Phillips Images. Proceedings of the 51st Annual Symposium of the International Association for Vegetation Science (IAVS), Stellenbosch University, Stellenbosch, South Africa. 7-12 September. p. 26.
- De Waal, C., Venter, A.M. & Miller, J.S.** 2008. *Breeding systems in African Lycium (Solanaceae).* Oral presentation delivered during the 34th Annual Conference of the South African Association of Botanists (SAAB), (Joint Conference with the Southern African Society for Systematic Biology), Drakensville Mountain Resort, Drakensberg, South Africa. 14-18 January.
- Grobbelaar, J.U.** 2008. *Factors governing algal growth in photobioreactors: the “open” versus the “closed” debate.* Invited paper delivered during the 3rd Congress of the International Society for Applied Phycology and the 11th International Conference on Applied Phycology, National University of Ireland, Galway, Ireland. 21-27 June.
- Grobbelaar, J.U.** 2008. *From laboratory to commercial production.* Invited paper delivered during the 3rd Congress of the International Society for Applied Phycology and the 11th International Conference on Applied Phycology, National University of Ireland, Galway, Ireland. 21-27 June.
- Grobbelaar, J.U.** 2008. *The upper limits of photosynthesis and implications for algal biotechnology.* Invited paper delivered during the 3rd Congress of the International Society for Applied Phycology and the 11th International Conference on Applied Phycology, National University of Ireland, Galway, Ireland. 21-27 June.
- Jin, Y., Szabo, L. & Pretorius, Z.A.** 2008. *Virulence variation within the Ug99 lineage.* Proceedings of the 11th International Wheat Genetics Symposium (IWGS), Brisbane Convention Centre, Brisbane, Australia, edited by R. Appels, R. Eastwood, E. Lagudah, P. Langridge & M.M. Lynne. Sydney: Sydney University Press. 24-29 August.
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evidence based policy making. Invited paper delivered during the International Conference on Evidence Based Policy Making: International Best Practices in Connecting Science and Policy, De Bazel, Amsterdam, The Netherlands. 19-20 June.

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Department of

Soil, Crop and Climate Sciences

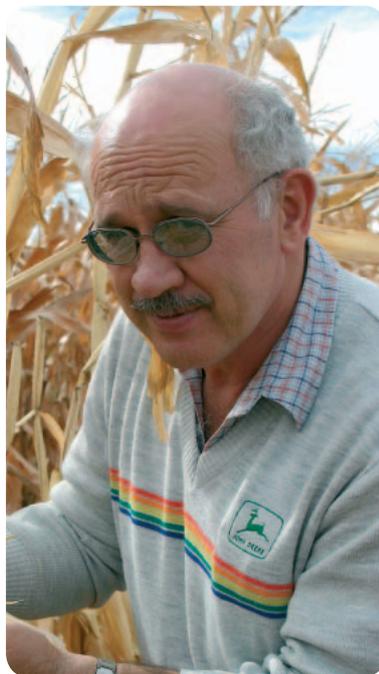
“About 40% of our postgraduate students are from countries in Africa” - Prof. Chris du Preez.

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. In addition to undergraduate and postgraduate teaching in the four disciplines, the department also delivers teaching contributions at the Centre for Sustainable Agriculture and Rural Development, Environmental Management, Disaster Management and the Department of Quantity Surveying and Construction Management at the University of the Free State (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 2008 an average of 20 master's and 15 doctoral students were enrolled. Approximately 40% of these students come from countries like Botswana, Eritrea, Ethiopia, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Swaziland, Zambia and Zimbabwe. Six master's and five doctoral students graduated.

During 2008 the department managed to improve some of its infrastructure for teaching and research. Approximately R1 million was spent on the upgrading of some laboratories. Various improvements were also made to the department's experimental site on the



Prof. Chris du Preez.



West Campus of the UFS and at the Kenilworth Experimental Site.

Research in the department is aimed at various aspects of the soil-crop-atmosphere system. Approximately R3 million was spent on research in 2008, 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), Protein Research Trust (PRT), British Royal Society, New York Botanical Gardens, Omnia Fertilizer Ltd., Syngenta and Agraforum. Findings of this research are published in research articles and pre-

sented at conferences as displayed in the research outputs later on.

Agrometeorology received joint funding with the University of Nottingham from the NRF and the British Royal Society to host a workshop at the UFS on *Water use by under-utilized crops in semi-arid areas*. This was a ground-breaking visit which brought together scientists and practitioners from 12 countries including the United Kingdom (UK) and South Africa. The new ideas developed through the visit will lead to strongly-focused and long-term research opportunities.

During the workshop there were presentations from 16 scientists



Mr Johan Barnard, (left) Ph.D. student, and Mr Jason Sparrow, master's student, preparing soil for a drainage curve determination at the Riet River Irrigation Scheme.

Messrs Elias Yokwane (left), technician, Johan Barnard (middle), Ph.D. student, and Jason Sparrow (right), master's student, determining the drainage curve of soil at the Riet River Irrigation Scheme.



Ms Elzette Venter, honours student, determining the leaf area of maize.

for traits of interest in field trials in the targeted climatic regions and to develop a decision support system that can provide validated information for use in dissemination activities. The possibility of working together on EU projects is the most probable further collaboration. The participants have now established contact with researchers in their own field as well as other related fields of interest and will now develop their own further collaboration.

Agrometeorology continued in several research projects with outside funding, amongst these two from the WRC: *Applications of rainfall forecasts for agriculturally related decision making in selected catchments* and *Water use of drought tolerant food crops*. Both are done in collaboration with the University of KwaZulu-Natal. The Canadian International Development Research Centre capacity building project in Zambia and Zimbabwe continued as planned. Prof. Walker visited her doctoral students and participated in a community level crops modelling exercise with small scale farmers at Monze and Sinazongwe in southern Zambia. Dr Stephen Crimp from Australia also visited the UFS in connection with this project and assisted students with weather/climate data and modelling exercises.

Research in weed science is ongoing in the section, with the effect of different formulations of alachlor on the bioactivity of this herbicide on sunflower being investigated. This work demonstrated conclusively that available cultivars differed in their sensitivity to the herbicide, and that this sensitivity was significantly affected by both the herbicide formulation being used and the soil type in which the crop was planted. The effects of various environmental factors on the sensitivity of the crop to this herbicide were also studied in pilot trials. This work will continue in an attempt to elucidate the cause of herbicide damage that has been noticed in the field. An investigation into the purported allelopathic effect of *Amaranthus cruentus* has com-

from a variety of disciplines as well as inputs from the SA-EU National Contact Point for Environment and the university's international office. Following the presentations, the participants (including 12 postgraduate students from the UFS) formed several breakaway groups to work out the details of the proposals. Two project proposals were formulated during the workshop. The first concerns the *Use of weather and seasonal climate forecasts for food security in sub-Saharan agriculture*. The aim is to produce a user-friendly decision support system with agronomic and epidemiological prediction facilities. This will link users with a database tailored to their region, with the current farming systems and agronomic practices and then updated on a weekly basis using appropriate technology.

The second proposal is about *Evaluation of climate-resilient crops to cope with climate variability and change*. The aim is to identify criteria to evaluate the species, to evaluate promising plant material

menced, and will be continued during the coming year.

Agronomy research was also undertaken during the past year, and a number of research projects are currently in the planning stages. A study was initiated to establish the optimum plant population and water use of an ultra-fast maize hybrid under irrigation. This was done in an attempt to answer the question regarding the extent to which maize populations can be increased, or whether there are other plant configurations that would be more suitable at the high planting densities that are currently being seen under irrigation. In this trial different planting densities from 50 000 to 150 000 plants ha⁻¹ have been established at row widths of 0.225 to 0.9 m. This initial study will be expanded to include varieties with different growing season lengths and varying planting densities at a constant row width of 0.9 m.

Horticultural research was vested mainly in the training of students for advanced degrees, and on the effect of nitrogen fertiliser on the yield and quality of Swiss chard was investigated. This crop is very important in the poorer communities in particular where it plays an important role in the diet. It was found that yield increased with increasing levels of nitrogen, with no decrease even at an application rate of 800 kg N ha⁻¹, while time of application also affected yield. Nitrate content of the leaves was affected by the source of nitrogen used, with both ammonium nitrate and potassium nitrate increasing nitrate levels. This is an important finding as high nitrate levels may have a negative effect on human health.

The physiology team, under the leadership of Prof. Seef Pretorius, is engaged in long term research on natural product development for organic farming systems, seed treatments of economically important crops, yield enhancement and quality improvement of fruit, vegetable and field crops, development of alternative crops, and enhancement of systemically induced resistance of crop plants towards biotic and abiotic stress

factors. These aspects will be reported on in this order.

More than 3 000 wild plants have been screened for antifungal, anti-bacterial, bio-stimulatory and herbicidal activity. One product, a plant strengthening agent, was developed and commercialised during 2008. Over many seasons this product has shown the ability to induce resistance of monoculture crops to moderate biotic and abiotic stress conditions without jeopardising the potential yield. A second product, a natural fungicide, is in advanced stages of development. During the past season it was shown that the active compounds from two wild plants have direct antifungal properties against a wide range of plant pathogens, including rusts, and also have the ability to induce resistance to biotic stressors. The latter has recently been proven on gene level. A patent was registered in 2008 and trials to confirm the commercial potential are presently underway.

The direct treatment of seeds with either bio-stimulatory products or fertilizer prior to planting, or application of these chemicals mechanically at planting, with the aim of enhancing seedling vigour and plant stand, is gaining interest in South Africa. Research is still necessary to verify the economic potential of this approach. As a result a large number of laboratory and field trials, using a variety of fertilizer and bio-stimulants, were conducted during the past season. In some cases excellent results were obtained with a specific fertilizer mix in combination with a specific commercial bio-stimulant. Under field conditions plant stand as well as the final yield of wheat and maize were positively affected.

A vast number of statistical and commercial field trials using the patented natural bio-stimulatory product (reported last year) over several seasons confirmed the yield and quality-enhancing properties of this product in vegetables, fruit and field crops, especially under irrigation conditions. However, the yield results under rain-fed conditions were rather erratic. Conse-



Mr Tesfuney Weldemichael, Ph.D. student, determining wind velocity with an anemometer in maize.

quently, research was focused on finding solutions to this problem using wheat and maize. For this purpose an uptake enhancer, developed by the North-West University, was applied together with the product. As a result of the higher uptake of the active compounds, significant yield increases were demonstrated under dry land conditions when using the two products in combination.

The development of new crops is based on first identifying a commercial property, e.g. a nutritional property or any of the above-mentioned properties, to supply the rationale for establishing the agronomic requirements of the potential new crop. In this regard the two donor plants mentioned earlier show above average potential as new crops. This potential will be pursued after the antifungal product has been fully developed.

Crop protection against biotic stress factors via systemic induced resistance was investigated over the past 15 years. In the late 90s SYNGENTA commercialised a product, BION that induced resistance in crops to stress factors.



Doctoral students, Durton Nanja (left) from Zambia, and Ms Veronica Makuvaro from Zimbabwe, working on a crop model for a village in Monze, Zambia as part of an IDRC Capacity Building project to cope with climate change.

However, at that stage the agricultural community was probably not ready for this concept and the product was removed from the market. Lately, following ongoing press releases with regard to global warming, carbon dioxide level elevation and sporadic abiotic environmental stresses on the planet, there is renewed interest in this type of product, and BION has in fact returned to the market. In the mean time we have identified two molecules from wild plants that have an above average potential to contribute to systemically-induced resistance to both biotic and abiotic stress factors. The mechanism of action of these compounds has been partially elucidated physiologically and on gene level. The value of this discovery is that both molecules are organic, can be registered as suitable for organic plant production, and have the potential to be developed as natural products. A patent for both compounds was registered in 2008.

Research on irrigation and salinity of soils is entering a new phase

through the Free State Department of Agriculture funded project: *Application of electromagnetic induction technology for characterizing salinity and water logging in irrigated fields*. A salinity monitoring system was compiled by using electromagnetic induction and global positioning system technology. Prof. Leon van Rensburg is testing the system currently and at the same time he is training two members of the Oppermans community to use it properly.

The Water Cluster of the UFS provided funds to support Mr Ben Schoonwinkel in his study on water logging and the impact thereof on crop yields. This research links strongly with the current WRC-funded project *Managing salinity associated with irrigation in selected areas of South Africa*. The latter project is in its last year and a report will follow soon on best management practices of salinity under irrigation. Staff members involved are Profs Chris Du Preez, Leon Van Rensburg and Alan Bennie and Messrs Johan Barnard and Jason Sparrow.

The second phase of a research project on the fate of organic matter in cultivated plinthic soils reverted to perennial pasture progressed smoothly under the leadership of Prof. Wulf Amelung of the University of Bonn in Germany. Prof. Du Preez is a member of this team, which is financed by the Research Foundation of Germany. The planning of a third phase destined to start next year is in an advanced stage. In conjunction with this research, Prof. Du Preez and Ms Elmarie Kotzé investigated the influence of cultivation practices on the organic matter content of a plinthic soil in a long-term experiment of the Agricultural Research Council's (ARC) Small Grain Institute at Bethlehem, Eastern Free State.

Prof. Du Preez is also a member of a team conducting research on the modelling of non-point pollution of water by agriculture. Researchers from five universities, namely the universities of KwaZulu-Natal, Pretoria, Stellenbosch, Free State and the Western Cape as well as two ARC institutes (Soil, Climate and Water and Plant Protection)

have been incorporated due to the multi-disciplinary nature of the work. This project is managed by Sigma Beta Consulting Engineers and is nearing its completion.

Until recently, hydrological models either ignored the role of soil, or treated it as a uniform system. To address this aspect further, the WRC funded the pedology team consisting of Drs Le Roux, Van Huyssteen and Malcolm Hensley for another three years to bridge the gap known internationally as hydrogeology. The project entitled: *Hydropedological interpretation of soils in selected catchments with the aim of improving efficiency of hydrological models* is led by Dr Le Roux. Conceptual models of the hydrology of characteristic hillslopes in different catchments will be developed.

Dr Cornie van Huyssteen was the Vice-President of the Soil Science Society of South Africa (SSSSA). He also served as Chairman of the Soil Survey Society of South Africa and on the Editorial Committee of the *South African Journal of Plant and Soil*.

Dr Piet le Roux visited Kenya to attend a workshop on invitation of the Joint Research Commission of Soil Atlas for Africa. Ideas were exchanged on the publication of a Soil Atlas for Africa.

Prof. Du Preez was appointed to the Editorial Board of *Water SA* for a three-year term. He was also requested by the Department of Water Affairs and Forestry to serve on a team developing risk-based water quality guidelines for South Africa.

Prof. Sue Walker and Ms Linda de Wet attended a four week workshop entitled: *Qualitative research in practice*. They were both awarded a certificate in qualitative research from the Division: Student Development and Success at the UFS. Ms De Wet also attended two other workshops, namely *Adult learners, their characteristics and needs* by Prof. Julia Preece and *Agriculture market prospects* by Prof. Johan Willemse from the university's Department of Agricultural Economics. She also arranged a

NewStart Eco-gardening course using a water-saving irrigation system for interested staff on the campus, and attended a *Writing of learning outcomes* course.

Prof. Sue Walker was invited to the Regional Capacity Building Workshop on Climate Change Adaptation for Agriculture in East and Greater Horn part of Africa, funded by the Rockefeller Foundation. She presented several talks and facilitated the discussions around community participation and development of agrometeorology services and products from the seasonal climate forecasts. While in Nairobi, Prof. Walker also delivered the main opening address for the Greater Horn of Africa Climate Outlook Forum, at which the latest seasonal climate forecast was announced and discussed. This provided a good time to interact with climate scientists from this part of Africa and to gain some ideas of things that could be implemented in South Africa.

The highlight of the year for Agrometeorology was that Prof. Kees Stigter, a world renowned Agrometeorologist, spent four months as a visiting professor in the department. His visit began with interactions with both the South African Weather Services and the National Department of Agriculture in Pretoria. Then he was a guest speaker at the opening

of the Combined Conference of the South African Society of Crop Production, the Soil Science Society of Southern Africa, the Southern African Weed Science Society (SAWSS) and the Southern African Society for Horticultural Sciences (SASHS) held at Rhodes University in Grahamstown with a talk entitled *Panta Rhei: changes in agrometeorological adaptation strategies to climate change*.

The major contribution that Prof. Stigter made was that he presented two one-week training seminars. The first dealt with the theory and practices of agrometeorology services. It was attended by 48 people from five provinces in South Africa. The second was on the contribution of agrometeorology to sustainable agriculture and was also attended by 40 people. The majority of the participants are employed by the various provincial departments of agriculture and they serve in a section dealing with agricultural disaster management and early warning. These courses were funded by the national Department of Agriculture: Directorate Agricultural Disaster Risk Management.

Further, Prof. Stigter also interacted with the postgraduate students and delivered undergraduate classes on *Microclimate manipulation*. Due to his wealth of knowledge and experience

in Africa over 30 years he was able to advise and give insight to students busy with a whole range of agrometeorology projects – including in-field rainwater harvesting, soil evaporation, dissemination of weather and climate forecasts and others related to the development of agrometeorology services of all types. He has truly been an inspiration to the staff and students in Agrometeorology. ■

Research outputs

Research articles

De Waal, H.O., Fouche, H.J. & Snyman, H.A. 2008. Dealing with fires during drought. *Agri-Outreach* 10: 5-7.

Dikgwatlhe, S.B., Ceronio, G.M. & Van Rensburg, L.D. 2008. Wheat (*Triticum aestivum* L.) growth and yield response to saline irrigation water under controlled conditions. *South African Journal of Plant and Soil* 25: 172-177.

Engelbrecht, G.M., Du Preez, C.C. & Spies, J.J. 2008. Response of *Lachenalia* growing in soil to nitrogen fertilization during the pot plant phase. *South African Journal of Plant and Soil* 25: 92-98.

Kotze, E. & Du Preez, C.C. 2008. Influence of long-term wheat residue management on acidity and macronutrients in an Avalon soil. *South African Journal of Plant and Soil* 25: 14-21.

Le Roux, P.A.L. & Du Preez, C.C. 2008. Micromorphological evidence of redox activity in the soft plinthic B horizon of a soil of the Bainsvlei form in an arid bioclimate. *South African Journal of Plant and Soil* 25: 84-91.

Molete, S.F., Du Preez, C.C. & Marake, M.V. 2008. Relations between phosphorus retention parameters and some other properties of the benchmark soils in Lesotho. *South African Journal of Plant and Soil* 25: 99-104.

Staff

Professors: Profs. Chris du Preez, Seef Pretorius, Leon van Rensburg, Sue Walker

Affiliated Associate Professors: Prof. M Hensley

Senior Lecturers: Drs James Allemann, Piet le Roux, Cornie van Huyssteen

Lecturers: Drs Gert Ceronio, Gesine Engelbrecht, Mss Anneline Bothma-Schmidt, Linda de Wet, Elmarie Kotzé

Junior Lecturers: Mr Abraham Steyn

Professional Officers: Ms Yvonne Dessels, Mr Wilhelm Hoffman, Dr Elmarie van der Watt

Senior Assistants: Mss Ronelle Etzebeth, Brenda Oosthuizen, Rida van Heerden

Technical Assistants: Messrs Samuel Boer, Daniël Mavuya, Edwin Moeti, Gabriël Mokoena, Edward Nthoba

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- Pretorius, J.C. & Swart, W.J.** 2008. Antifungal properties of *Agapanthus africanus* L. extracts against plant pathogens. *Crop Protection* 27: 1052-1060.
- Tesfaye, K., Walker, S. & Tsubo, M.** 2008. Comparison of water relations, leaf gas exchange and assimilation of three grain legumes under reproductive period water deficit. *Journal of Agronomy and Crop Science* 7: 102-114.
- Twomlow, S., Love, D. & Walker, S.** 2008. The nexus between integrated natural resources management and integrated water resources management in Southern Africa. *Journal of Physical Chemistry* 33: 889-898.
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Conference contributions

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- Baloyi, T.C., Kutu, F.R. & Du Preez, C.C.** 2008. *Maize grain yield and change in soil microbial biomass carbon following application of industrially manufactured amendments.* Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.
- Barnard, J.H., Van Rensburg, L.D. & Bennie, A.T.P.** 2008. *Managing root zone salinity through leaching.* Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.
- Barnard, J.H., Van Rensburg, L.D., Sparrow, J., Bennie, A.T.P. & Du Preez, C.C.** 2008. *Assessing irrigation scheduling practices by wheat farmers in managing salinity at Orange-Riet Scheme.* Paper presented at the 1st Annual Orange River Basin Symposium, The Orange River Basin: The Resource, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 12-14 November.
- Botha, J.J., Hensley, M., Van Rensburg, L.D. & Anderson J.J.** 2008. *Quantifying evaporation under various mulching strategies.* Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.
- Botha, J.J., Van Rensburg, L.D., Anderson, J.J. & Hensley, M.** 2008. *Review of the sustainability of the in-field rainwater harvesting crop production system.* Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.
- Fraenkel, C.H., Le Roux, P.A.L. & Van Rensburg, L.D.** 2008. *Spatial variability of selected soil properties in soil map units.* Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.
- Jennings, K. & Van Huyssteen, C.W.** 2008. *The effect of degree and duration of water saturation on selected redox indicators.* Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.
- Joseph, L.F., Van Rensburg, L.D. & Botha, J.J.** 2008. *Selected soil and climate properties of the Fort Hare/*



Supervisors and doctoral students share a joke as they extract information from natural resource maps drawn by farmers in the Monze district of Zambia, as part of an IDRC Capacity Building project to cope with climate change. From the left are: Prof. Sue Walker, from the department, Dr Adelaide Munodawafa, Midland State University, Zimbabwe, Mr Prospard Gondwe, Ph.D. student, Dr John Dimes, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Bulawayo and Veronica Makuvaro, Ph.D. student.

Oakleaf ecotope related to the in-field rainwater harvesting technique. Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.

Kuenene, B.T. & Van Huyssteen, C.W. 2008. *Soil morphology as signature of soil water regime for selected profiles in the Cathedral Peak VI catchment.* Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.

Le Roux, P.A.L. 2008. *Hydrological soil types of the Orange River Basin.* Paper presented at the 1st Annual Orange River Basin Symposium, The Orange River Basin: The Resource, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 12-14 November.

Le Roux, P.A.L. & Hensley, M. 2008. *Predictive mapping: Exploiting tacit knowledge to improve soil surveying.* Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African

Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.

Matthews, N., Grove, B., Barnard, J.H. & Van Rensburg, L.D. 2008. *An economic case for salinity management.* Paper presented at the 3rd South African National Commission on Irrigation and Drainage Symposium (SANCID), Club Mykonos, Langebaan, South Africa. 18-20 November.

Matthews, N., Grove, B., Barnard, J.H. & Van Rensburg, L.D. 2008. *Economic analysis of salinity management.* Paper presented at the 1st Annual Orange River Basin Symposium, The Orange River Basin: The Resource, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 12-14 November.

Matthews, N., Grove, B., Barnard, J.H. & Van Rensburg, L.D. 2008. *Modelling the economic effects of irrigation water salinity management for sustainable crop production.* Paper presented at the 46th Annual Conference of the Agricultural Economics Association of South Africa (AEASA): Rethinking Agriculture and Rural Development in Southern Africa, Safari Lodge, Windhoek, Namibia. 23-26 September.

Mupangwa, W., Walker, S. & Twomlow, S. 2008. *Cowpea yield and soil water responses to minimum tillage and mulching.* Paper presented at the 9th Waternet/WARFSA/GWP-SA Symposium in association with the International Commission on Water Resources Systems (ICWRS): Water and Sustainable Development for

Improved Livelihoods, Johannesburg, South Africa. 29-31 October.

Mupangwa, W., Walker, S. & Twomlow, S. 2008. *Soil water responses to conservation tillage.* Paper presented at the Workshop of the Challenge Program on Water and Food (CPWF), Project Number 17, Johannesburg, South Africa. 3-5 September.

Nhantumbo, A.B.daC., Katterer, T., Ledin, S. & Du Preez, C.C. 2008. *Carbon loss from *Brachystecia spiciformis* leaf litter in the sandy soils of southern Mozambique.* Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.

Phahlane, M. & Walker, S. 2008. *The connection between sea surface temperatures and seasonal streamflow the upper Olifants Catchment, South Africa.* Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.

Pretorius, J.C. 2008. *Evaluation of gene expression in wheat upon treatment with a novel plant activator.*

- Paper presented at the 34th Annual Conference of the South African Association of Botanists (SAAB), (Joint Conference with the Southern African Society for Systematic Biology), Drakensville Mountain Resort, Drakensberg, South Africa. 14-18 January.
- Pretorius, J.C. & Van der Watt, E.** 2008. *Lucky Plant: A new plant strengthening agent for house and garden plants*. Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.
- Steyn, A. & Mbuende, M.** 2008. *Monitoring drought in Namibia*. Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.
- Ukoh Haka, I.B., Van Rensburg, L.D. & Du Preez, C.C.** 2008. *Quantifying transpiration efficiency of canola (Brassica campestris) at different growth periods in a semi-arid environment*. Paper presented at the 1st Annual Orange River Basin Symposium, The Orange River Basin: The Resource, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 12-14 November.
- Van der Laan, M., Annandale, J.G., Du Preez, C.C., Tesfamariam, E., Benade, N., Bristow, K.L. & Stirzaker, R.J.** 2008. *A new capability in SWB-Sci to model nitrogen and phosphorus dynamics in cropping systems*. Paper presented at the 3rd South African National Commission on Irrigation and Drainage Symposium (SANCID), Club Mykonos, Langebaan, South Africa. 18-20 November.
- Van der Laan, M., Annandale, J.G., Stirzaker, R.J., Du Preez, C.C., Bristow, K.L. & Tesfamariam, E.H.** 2008. *Improving water, salt and nutrient management through the use of solute signatures*. Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.
- Van der Watt, E., Buitendag, R.A. & Pretorius, J.C.** 2008. *Yield increases in rainfed maize in light of increasing input costs*. Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.
- Van Huyssteen, C.W.** 2008. *Is there hydro-pedological order in the WRB?* Paper presented at the International Conference and Field Workshop on Soil Classification: Soil - A Work of Art of the Nature, University of Chile, Santiago, Ovalle, Chile. 9-17 November.
- Van Huyssteen, C.W.** 2008. *Towards the definition of soil indicators for wetland delineation*. Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.
- Van Huyssteen, C.W., Collins, N., Grundling, A.T. & Grundling, P.L.** 2008. *Reviewing the rationale for the classification of three wetland zones in South Africa*. Paper presented at the National Wetland Indaba, Skukuza, Kruger National Park, South Africa. 28-31 October.
- Van Rensburg, L.D., Barnard, J.H., Le Roux, P.A.L., Van Huyssteen, C.W., Vermeulen, P.D. & Du Preez, C.C.** 2008. *Changes in salinity of natural resources in the Orange-Riet Irrigation Scheme: A desktop study*. Paper presented at the 1st Annual Orange River Basin Symposium, The Orange River Basin: The Resource, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 12-14 November.
- Van Tol, J., Le Roux, P.A.L., Hensley, M. & Lorentz, S.** 2008. *Soil properties as indicators of hillslope hydrology*. Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.
- Walker, S.** 2008. *Adaptation interventions and tools for agriculture based on community interactions*. Paper presented at the Agricultural Climate Change Sector Plan Workshop, Pretoria, South Africa. 12-13 February.
- Walker, S.** 2008. *Adaptation interventions and tools for agriculture based on community interactions*. Paper presented at the Regional Capacity Building Workshop on Climate Change – Adaptation for Agriculture: Strengthening the Response to Climate Change, Nairobi, Kenya. 17-27 August.
- Walker, S.** 2008. *Agromet services in Free State - What is available?* Paper presented at the South African Society for Atmospheric Sciences (SASAS) 2008 Conference, University of Pretoria, Pretoria, South Africa. 30 September-1 October.
- Walker, S.** 2008. *Community based adaptations*. Paper presented at the Greater Horn of Africa Climate Outlook Forum (GHACOF 22), Nairobi, Kenya. 28-29 August.
- Zuma-Netshiukhwi, G. & Walker, S.** 2008. *Local indigenous knowledge used as seasonal forecast in the central Free State*. Paper presented at the Combined Congress 2008: Combined Congress of the Soil Science Society of South Africa, the South African Society of Crop Production, the Southern African Society for Horticulture Sciences and the Southern African Weed Science Society, Rhodes University, Grahamstown, South Africa. 21-24 January.

Departments in the

Building Sciences



Department of

Architecture

“We received unconditional accreditation for all our programmes” - Prof. Jan Smit.



Prof. Jan Smit.

Overview

The Department of Architecture will remember the year 2008 for the long-awaited changes and upgrading of its infrastructure and facilities and for the renewal and confirmation of its unconditional accreditation status with the South African Council for the Architectural Profession (SACAP), the Royal Institute of British Architects (RIBA) and the Commonwealth Association of Architects (CAA).

For 2008, the department received 350 enquiries for the B.A.S. undergraduate degree course, from which 52 students were selected to enroll. The tendency of increasing numbers of applications continues unabated.

The department received unconditional accreditation for all three degrees offered after a panel of five people scrutinised all courses and modules at the end of July 2008. The accreditation confirms the department's international status. This is a significant achievement, since this department is the only tertiary institution, of the seven that were visited, to receive unconditional status. Three further architectural institutions remain to be visited in the next few years. The department is proud and honoured: we believe that the success was due to a team effort of consistent and very hard work.

One of the highlights of 2008 was the Architecture Student

Conference (ASC) hosted by the department. This was the fourth time that the department has hosted this annual event. A total of 710 students from 11 other tertiary architectural institutions visited Bloemfontein from 24-30 August 2008. The ASC coincided with the 20th Sophia Gray Memorial Lecture, with guest speakers Ms Anja van der Merwe and Mr Macio Miszewski presenting buildings and projects from the Van der Merwe Miszewski Architects based in Cape Town.

During the week of the conference talks were presented by the following esteemed speakers: Mr Hugh Fraser spoke on *The real theatre of le Corbusier* and *The international concrete theatre*; Prof. Jan Smit presented *Landscape and laboratory*; Nnamdi Elleh presented *How is African Architecture a theatre of life?* and Pattabi Raman spoke on *Order, disorder and spontaneity*. Mr Pieter Mathews delivered a presentation entitled *Storyboard for a studio* and Mr Ludwig Hansen's contribution was *Design like you give a damn*. Mr Fanuel Motsepe presented *Morning live*.

International speakers included Messrs Graham Morrison of the London practice of *Allies & Morrison*, and Will Bruder of Phoenix, United States of America (USA), who presented the annual lecture *Poetry and Pragmatism / People and Places*, sponsored by the Southern African Institute of Steel Construction (SAISC).

At the conference Mr Charles de Jager, an honours student, pre-

sented the curriculum content at the department as experienced from a student's perspective. He was one or three national winners at honours degree level of the Carl and Emily Fuchs Foundation Student Prize.

Mr Rudolf and Ms Martie Bitzer, both lecturers at the department, presented the *Manipulation of the Planar Element: Observations on Generic Design*, based on a study tour to the Milan Furniture Fair (*Fiere Milano*), Italy in April 2007. They were also invited to deliver this talk on 18 September 2008 at the Mpumalanga Institute of Architects in Witrivier.

Students attending the above-mentioned conference could choose between a tour of landmark buildings in Bloemfontein, some special stone buildings in the Eastern Free State, the historic architecture of Kimberley or a visit to Maseru, the capital of the nearby Mountain Kingdom of Lesotho.

As part of the conference the department organised the annual Murray and Roberts Des Baker National Architectural Student Competition for all third-year students together with the SHIFT Housing Competition and ESKOM Light Competition at the Oliewenhuis Art Gallery during the conference period in August and September 2008.

Staff members serve in various national institutes and on a number of councils. Messrs Bitzer, Bosman, Du Preez, Pretorius, Ras, Swart and Ms Smit are members of the South African Institute of Architects (SAIA) and registered with SACAP. Profs Smit and Raman are also members of these bodies. Mr Kobus du Preez is a member of the SAIA Heritage Committee and chairperson of the Permit Committee of the Free State Heritage Authority.

Mr Jan Ras is a member of the SAIA Board of Representatives and the SAIA Education Committee. He also organised the 2008 Architectural Student Conference, is involved in private practice and served on several advisory committees.



SMIT Architects design, built in Oubos Eco Estate outside Bloemfontein.

Prof. Raman was invited by the *Friends of Oliewenhuis* to give a talk on *Art as a Paradigm for Architecture*. He continued serving as a technical advisor to the Freedom Park Project in Pretoria, and he was also invited by the University of Newcastle in the United Kingdom (UK) to give a lecture on contemporary architecture in

South Africa. Furthermore, he formulated a proposal for a student exchange programme. He presented lectures in *Shifting Narratives in Contemporary South African Architecture* at a School of Architecture in Mumbai and lectures on *Housing and Recent South African Works* to the Association Schools of Architecture in Puna, India.



The 20th Sophia Gray Memorial Lecture was presented by Macio Miszewski and Anya van der Merwe Miszewski of the well-known Cape Town firm Van der Merwe Miszewski Architects. The lecture, which coincided with the national student architecture conference which was presented in Bloemfontein, attracted about 700 people. At the lecture are, from the left: Prof. Jan Smit, Departmental Chairperson of the Department of Architecture at the UFS, Ms Van der Merwe, Mr Miszewski and Mr Lloyd Rubidge of Van der Merwe Miszewski Architects.

Mr and Mrs Will Bruder during the Architecture Student Conference (ASC), which was hosted by the department.



A library building designed by Mr Will Bruder.

The practice work of SM!T Architects (Prof. Jan Smit and his wife Ms Petria Jooste-Smit) received coverage in the popular press for houses designed and built in the Oubos Eco Estate and on a smallholding outside Bloemfontein. The Oubos house was featured in the local magazine *PASSI* and the smallholding house was showcased in the *Top Billing* magazine (November 2008). The latter house was also identified to appear on the *Top Billing* magazine programme early in 2009. Prof. Smit's five favourite Bloemfontein buildings were published in the *VISI* magazine (Spring 2008) and he was on the *VISI* jury panel for *Designer of the Year* award.

Ms Wilandi Esterhuysen continued lecturing at the department and utilised the outcomes of the Centre for People and Buildings to complete her master's dissertation.

A survey for the South African Netherlands Research Programme on Alternatives in Development (SANPAD) project in Bankhara Budolong near Kuruman, Northern Cape Province.

The results of post-occupancy evaluation studies of two Telkom buildings were used to determine a set of recommended minimum standards towards which the planning and design of workplaces can be guided.

Part-time lecturer Ms Martie Bitzer designed pewter art for Coca Cola SA and the Tsogo Sun Group as permanent collections of work for both of the companies' headquarters. These are used as tools in communicating their mission and vision statements through the medium of art.

Mr Gerhard Bosman attended the *TERRA2008 10th International Conference on the Study and Conservation of Earthen Architectural Heritage* in Bamoko, Mali in Western Africa from 1-5 February 2008, on behalf of the Unit for Earth Construction (UEC). He presented a poster entitled *Promoting earth construction in South Africa – Stimulating health and wealth in poor communities in South Africa*, and also joined a study tour to visit conservation projects in Timbuktu, Djenne and Mopti to learn from the restoration of the unique earth-constructed mosques, some dating back to 1325. From 2-5 October 2008 he attended a course for architects on *Designing with Natural Stone*, in Verona, Italy. He visited the International Marmomac exhibition in Verona as well as several marble and granite quarries in the Verona and Pisa mountains.

Ms Petria Jooste-Smit and Mr Gerhard Bosman, together with Prof. Das Steyn, Departmental Chairperson of the Department of Urban and Regional Planning at the

UFS, presented their final document on the Research Project: *A South African Renaissance: Acceptability of sustainable, high quality earth constructed, public and private buildings to support sustainable local economic development*. This concluded the research project funded by the South African Netherlands Research Programme on Alternatives in Development (SANPAD).

Mr Kobus du Preez spent the first semester on a sabbatical and prepared an introduction for a new book on contemporary South African architecture, edited by Prof. Ora Joubert.

Mr Gert Swart retired from academia and the department in April 2008 and Ms Alet van der Merwe left the department in May 2008 to pursue a career in London, UK.

In spite of challenging economic times, the department continued with the long-standing tradition of exposing the students through academic tours showing *The New, the Old and Architecture in Construction*. Students in their first to fourth years visited Johannesburg, Cape Town, Durban and Clarens.

Students took part in several national student competitions. In August 2008 Mr Rudolf Naudé won the annual National Student Competition of the Cement and Concrete Institute.

In August 2008 Rhonwen Baker, a second-year student, won the National Tripod Photography competition while Thelouise van Zyl, a third-year student, received the third prize. ■





Mr Rudolf Naudé won the National Cement and Concrete Institute Competition for honours students. Rudolf is shown here with his tutor, Prof. Pattabi Raman.



Rhonwen Baker won the national Tripod Photography competition with Thelouise van Zyl taking third place.



Charles de Jager, an honours student (together with two other students from other institutions), won the Carl and Emily Fuchs Foundation Student Prize.

Research outputs

Research articles

Raman, P.G. 2008. From sweatshops to places of production, global evolution of industrial buildings. *Journal of the South African Institute of Architects* July/August: 12-15.

Raman, P.G. 2008. Modernism public space and public art. *South African Journal of Art History* 23(1): 245-257.

Raman, P.G. 2008. Placeness to place: Lilliesleaf Liberation Centre: Living history. *Journal of the South African Institute of Architects* November/December: 60-67.

Raman, P.G. 2008. Restructuring of the central building: University of the Free State. *Journal of the South African Institute of Architects* May/June: 26-29.

Conference contributions

Bosman, G. 2008. *Promoting earth construction in South Africa: Stimulating health and wealth in poor communities in South Africa*. Poster presented at the 10th International Conference on the Study and Conservation of Earthen Architectural Heritage (Terra 2008), Bamako, Mali, Western Africa. 1-5 February.

Raman, P.G. 2008. *Modernism, public space and public art*. Keynote address presented at the 2nd Annual Conference of the Art Historical Work Group of South Africa: Space and Places; Production, Process and Contestation, University of Pretoria, South Africa. 14-15 March.

Staff

Professor: Prof. Pattabi Raman

Associate Professor: Prof. Jan Smit

Senior Lecturers: Ms Petria Jooste-Smit

Lecturers: Messrs Gerhard Bosman, Kobus du Preez, Jan Ras, Gert Swart

Junior Lecturers: Messrs Rudolf Bitzer, Henry Pretorius, Ms Alet van der Merwe

Contract Lecturers: Messrs Charl-Pierre Cilliers, Sergio Nunes, Riaan Steenkamp, Jaco Olivier, Mss Martie Bitzer, Paula Gutter, Nicola Wessels, Alna Bouwer, Wilandi Esterhuysen

Secretary: Ms Martie de Jager

Typist/Clerk (academic year): Ms Ansue Schultz

Departmental Assistant: Ms Zelda Bronkhorst

Messenger: Mr Alfred Qiqimana

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Department of

Quantity Surveying and Construction Management

"We have received international accreditation by two prestigious professional bodies, and national accreditation by three statutory bodies" - Prof. Basie Verster.



Prof. Basie Verster.

Overview

During 2008, 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 (UFS) is currently the only university outside the United Kingdom (UK) which offers an internationally accredited open learning programme in Quantity Surveying, as accredited by the Royal Institution of Chartered Surveyors (RICS).

Furthermore, unconditional international accreditation was also awarded to the department, with Accredited Centre Status, by the

Chartered Institute of Building (CIOB).

Students performed well on national as well as international level. In 2008, Mr HJ Grobbelaar, an honours student, received the prestigious RICS prize, and Ms MSF Pietersen, a third-year student, the Bell-John prize for the most versatile student in any study year. Ms PD Makhado received the South African student prize from the CIOB for the highest average overall average in B.Sc. Honours (Construction Management). She also received the LTA Building prize and the PPS prize for the best final year student in B.Sc. (Construction Management).

Ms Desmé Human, an honours student, received the Kenneth K. Humphreys award from the International Cost Engineering Council (ICEC). This award is seen as the most prestigious international award of its kind, and was awarded to Ms Human for the most outstanding Quantity Surveying paper submitted by a student or a young adult for the period 2006–2008.

With regard to research, the department is one of 14 international research associates that took part, together with the Wirtshfts University of Vienna, Austria, in a joint research project on Maturity in Project Oriented Communities from 2005-2007. Four invited papers on the South African results have already been presented in Vienna. The final international research report was published in 2007 by the Viennese partners.

The department took part in research projects together with the Council for Scientific and Industrial Research (CSIR), Trac and the Construction Industry Development Board (CIDB), and comprehensive results were made known in 2008. During the same year, an additional research project on Indicators for the Construction Industry was successfully completed for the CIDB. Departmental lecturers and students also presented ten successful papers at international congresses in Toronto and Edmonton, Canada.

In the field of education, students are offered lectures through the medium of residential or open learn-



Lecturers and students delivered papers during the conference of the Pacific Association of Quantity Surveyors (PAQS) held in Edmonton, Alberta, Canada. Here are, from the left: Profs Basie Verster, Andries Hauptfleisch, Mss AHJ du Toit, Benita Kotzé, Messrs Nic Lesar, Carl van Zyl, Mark Ward and Pierre Oosthuizen.

ing programmes. In 2008, the department served a total of 320 undergraduate students, 116 honours students, 41 students on master's level, and six Ph.D. students.

The department also presents various registered short programmes and courses as an additional training action. In 2008, 42 students were registered for the QCP open learning programme; 92 students completed the Facilities Management Programme (FMP) supported by the South African Property Owners Association (SAPOA); and 42 Project Management students completed the Intensive Project Management programme (IPMP), also supported by SAPOA.

The department's involvement with the community is recognised by the continued mentorship programme offered to emerging entrepreneurs. The Centre for Construction Entrepreneurs has for the past 20 years offered training to many small, emerging building contractors. The successful Facilities Management programme, offered over a period of three years, was initiated in 2008 with 20 students registered during the first year.

Through the medium of the accredited Construction Mentorship Programme, the department

offers an on-going development service to emerging building contractors and other interest groups. The principle of the mentor-based development programme is currently the standard component for development in the construction industry. The highly reputed Expanded Public Works Programme (EPWP) accepted the principle of mentors for emerging building contractors in their programme. Personnel of the UFS, together with the CSIR and other consultants, are leading the development and implementation of mentorships. Mentors who present mentorship services are accredited by the UFS.

Over the past few years, the department has delivered significant contributions to the various professions in the construction industry and has maintained statutory accreditation by the South African Council for the Quantity Surveying Profession (SACQSP), the South African Council for the Project and Construction Management Profes-

sions (SACPCMP), and the South African Council for the Property Valuers Profession (SACPVP). Internationally, the department is accredited by the RICS in the UK and the CIOB, also in the UK. This accreditation was reconfirmed in 2008.

Alumni of the university practise mainly in South Africa, but many are employed in countries such as England, Ireland, Dubai and some African countries. To serve the many facets of the industry, per-

Ms Desmé Human received the Kenneth K. Humphreys Award from the International Cost Engineering Council (ICEC) in Toronto, Canada. Here she is with Prof. Basie Verster, Head of the Department.



sonnel are appointed from diverse backgrounds such as quantity surveying, construction management, project management, engineering and property economy.

Prof. Basie Verster, Head of the Department, serves on the South African Council for the Quantity Surveying Profession, is Chairman of the Education Standards and Research Committee of the Council and serves on the Management Board of the Association of South African Quantity Surveyors (ASAQS). Prof. Verster also serves on the UFS Council.

Dr Hendrik Marx was elected as Honourary Secretary and Board Member of the Association of Schools of Construction of Southern Africa (ASOCSA).

On international level, members of the department are actively involved in committees of the Chartered Institute of Building – South Africa (CIOB-SA), the ICEC, and the RICS in the UK, and Prof. Verster was appointed Vice-Chairman (Education) of the CIOB (Africa).

The *Acta Structilia* is a fully accredited scientific journal, endorsed by the South African Council for the

SACQSP and the RICS. In 2008, the journal celebrated its 15th year. This journal offers publication opportunities for independent, peer-reviewed articles by local and overseas researchers on the fields of physical and development sciences. Since 1993, 64 research articles, eight review articles, 12 international articles, 12 commentaries, eight book reviews and eight introductions have been published in the journal.

In 2008 the 24th publication of the student journal, *Bouvaria*, was published. ■

Staff

Professor: Prof. Basie Verster

Contract Professor: Prof. Andries Hauptfleisch (in Midrand)

Senior Lecturer: Dr Hendrik Marx

Lecturers: Messrs Frank Berry, Ben Swart, Hendrik van Vuuren, Ms Benita Kotzé

Contract Lecturers: Messrs Carl van Zyl, Pierre Oosthuizen

Academic Assistants: Mss Alna Beukes, Alet Esterhuyse, Marie-Louise Roux

Secretary: Ms Elza van der Walt

Administrator, Distance Learning: Ms Elize Scholtz

Senior Typist/Clerk: Ms Elsje van Wyk

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Research outputs

Research articles

Hauptfleisch, A.C. 2008. Facilities management: An analysis of evolving educational needs in a developing profession. *ACTA Structilia* 15(1): 133-141.

Verster, J.J.P., Hauptfleisch, A.C. & Kotzé, B.G. 2008. Dimensions of a mature quantity surveying profession. *ACTA Structilia* 15(1): 22-38.

Chapters in books

Hauptfleisch, A.C. 2008. Facilities management: A primary body of knowledge for tertiary and continuing education in facilities management in South Africa. In *SAPOA/IPD Real Estate Research Yearbook 2008*, edited by P. Leitich and U. Leitich. Johannesburg, University of the Witwatersrand. pp. 246-251.

Conference contributions

Berry, F.H. & Du Toit, A.H.J. 2008. *Communication instruments used by the engineering and quantity surveying professions and their communication capabilities in the construction industry.* Paper presented at the 12th Annual Pacific Association of Quantity Surveyors (PAQS) 2008 Congress: Construction in Challenging Environments. Edmonton, Alberta, Canada. 16-18 June.

Berry, F.H., Kotzé, B.G. & Du Toit, A.H.J. 2008. *The performance of professional quantity surveyors compared with engineers, architects and project managers in terms of communication capabilities and communication instruments: A future perspective.* Paper presented at the South African Council

for the Quantity Surveying Profession Conference (SACQSP 2008), Midrand, Johannesburg, South Africa. 10 October.

Hauptfleisch, A.C. 2008. *Facilities management: Validation of a primary body of knowledge for tertiary and continuing education in South Africa.* Paper presented at the 12th Annual Pacific Association of Quantity Surveyors (PAQS) 2008 Congress: Construction in Challenging Environments. Edmonton, Alberta, Canada. 16-18 June.

Hauptfleisch, A.C. 2008. *The role of total quality management as a key intervention in small construction capacity building in South Africa.* Paper presented at the 5th Post Graduate Conference on Construction Industry Development (CIDB), University of the Free State, Bloemfontein, South Africa. 16-18 March.

Hauptfleisch, A.C., Verster, J.J.P. & Lazarus, S. 2008. *The quantification of outcomes in emerging construction contractor development.* Paper presented at the Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Built Environment (CBE): The 3rd Built Environment Conference, Cape Town, South Africa. 6-8 July.

Human, D. 2008. *Implementation of affirmative action and Black Economic Empowerment (BEE) in the construction industry.* Paper presented at the 52nd Annual Meeting of the Association for the Advancement of Cost Engineering (AACE) International and the 6th World Congress of the International Cost Engineering Council (ICEC) on Cost

Engineering, Project Management and Quantity Surveying, Toronto, Canada. 29 June-2 July.

Kotzé, B.G. & Verster, J.J.P. 2008. *The built environment in Southern Africa: The influence of diversity, culture and tourism on conservation.* Paper presented at the International Council on Building (CIB W89) International Conference in Building Education and Research (BEAR 2008), Heritage Kandamala, Sri Lanka. 10-15 February.

Kotzé, B.G., Berry, F.H. & Verster, J.J.P. 2008. *Communication as a crucial element in project management.* Paper presented at the 12th Annual Pacific Association of Quantity Surveyors (PAQS) 2008 Congress: Construction in Challenging Environments. Edmonton, Alberta, Canada. 16-18 June.

Kotzé, B.G., Berry, F.H. & Verster, J.J.P. 2008. *Communication and communication instruments as project development interventions.* Paper presented at the Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Build Environment (CBE): The 3rd Built Environment Conference, Cape Town, South Africa. 6-8 July.

Kotzé, B.G., Verster, J.J.P. & Berry, F.H. 2008. *Construction industry standardisation and effective communication.* Paper presented at the 5th Post Graduate Conference on Construction Industry Development (CIDB), University of the Free State, Bloemfontein, South Africa. 16-18 March.

Lezar, N. & Verster, J.J.P. 2008. *Implementation of training for first-line supervisors and the development of mentorship programmes for supervisors in the construction industry.* Paper presented at the 12th Annual Pacific Association of Quantity Surveyors (PAQS) 2008 Congress: Construction in Challenging Environments. Edmonton, Alberta, Canada. 16-18 June.

Marx, H.J. 2008. *Contractors' perspective of the condition of the construction industry as captured by the CIDB survey of construction industry indicators 2007.* Paper presented at the South African Council for the Quantity Surveying Profession Conference (SACQSP 2008), Midrand, Johannesburg, South Africa. 10 October.

Okumbe, J.O. 2008. *Development of mechanisms implemented to limit financial risks in the South African construction industry.* Paper presented at the

11th Annual Research Seminar, Central University of Technology, Bloemfontein, South Africa. 17 October.

Okumbe, J.O. 2008. *Evaluation of an awareness and practices in the built environment.* Paper presented at the Council for the Built Environment (CBE) 2008 Inaugural Annual Symposium of the Built Environment: Asserting Relevance in a Booming Built Environment, Gallagher Estates, Midrand, Johannesburg, South Africa. 14-15 May.

Okumbe, J.O. & Verster, J.J.P. 2008. *Construction industry perspective on causes and effects of delays in South Africa.* Paper presented at the Royal Institution of Chartered Surveyors (RICS) Construction and Building Research Conference (COBRA 2008), Dublin, Ireland. 4-5 September.

Okumbe, J.O. & Verster, J.J.P. 2008. *Selection and administration of construction contracts in Botswana.* Paper presented at the Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Build Environment (CBE): The 3rd Built Environment Conference, Cape Town, South Africa. 6-8 July.

Oosthuizen, P.M. & Grobbelaar, H. 2008. *The valuation of building replacement cost in South Africa.* Paper presented at the Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Build Environment (CBE): The 3rd Built Environment Conference, Cape Town, South Africa. 6-8 July.

Oosthuizen, P.M. & Verster, J.J.P. 2008. *A quantity surveying maturity model as a benchmark tool for future development beyond 2010.* Paper presented at the South African Council for the Quantity Surveying Profession Conference (SACQSP 2008), Midrand, Johannesburg, South Africa. 10 October.

Oosthuizen, P.M. & Verster, J.J.P. 2008. *Measurement methodology for quantity surveying maturity.* Paper presented at the 12th Annual Pacific Association of Quantity Surveyors (PAQS) 2008 Congress: Construction in Challenging Environments. Edmonton, Alberta, Canada. 16-18 June.

Samuel, R. 2008. *Effective and efficient project management on government projects.* Paper presented at the 5th Post Graduate Conference on

Construction Industry Development (CIDB), University of the Free State, Bloemfontein, South Africa. 16-18 March.

Van Zyl, C.H. 2008. *The challenge for tertiary educators to solve the human resource need in the construction industry.* Paper presented at the 12th Annual Pacific Association of Quantity Surveyors (PAQS) 2008 Congress: Construction in Challenging Environments. Edmonton, Alberta, Canada. 16-18 June.

Verster, J.J.P., Berry, F.H. & Van Zyl, C.H. 2008. *Lessons learned in avoiding differences and disputes: A quantity surveying perspective based on a case study in project communication.* Paper presented at the 12th Annual Pacific Association of Quantity Surveyors (PAQS) 2008 Congress: Construction in Challenging Environments. Edmonton, Alberta, Canada. 16-18 June.

Verster, J.J.P., Hauptfleisch, A.C. & Kotzé, B.G. 2008. *Dimensions of quantity surveying maturity and the development of the profession towards a learned society.* Paper presented at the 12th Annual Pacific Association of Quantity Surveyors (PAQS) 2008 Congress: Construction in Challenging Environments. Edmonton, Alberta, Canada. 16-18 June.

Verster, J.J.P., Kotzé, B.G. & Hauptfleisch, A.C. 2008. *The pillars of quantity surveying for a learned society.* Paper presented at the 52nd Annual Meeting of the Association for the Advancement of Cost Engineering (AACE) International and the 6th World Congress of the International Cost Engineering Council (ICEC) on Cost Engineering, Project Management and Quantity Surveying, Toronto, Canada. 29 June-2 July.

Ward, M.C. & Verster, J.J.P. 2008. *Sustainable urban development: Lessons for emerging markets.* Paper presented at the 12th Annual Pacific Association of Quantity Surveyors (PAQS) 2008 Congress: Construction in Challenging Environments. Edmonton, Alberta, Canada. 16-18 June.

Zietsman, R. 2008. *Defects in the construction industry – Then and now.* Paper presented at the 5th Post Graduate Conference on Construction Industry Development (CIDB), University of the Free State, Bloemfontein, South Africa. 16-18 March.

Department of

Urban and Regional Planning

“The programme in Urban and Regional Planning has now been accredited for three years” - Prof. Das Steyn.



Prof. Das Steyn.

Overview

2008 has been a year of consolidation for the Department of Urban and Regional Planning. The new honours and master's programmes are working well, with the second group of graduates from the master's programme graduating this year. After a dip in enrolments, the number of students registering for the courses is increasing.

Accreditation of new programmes is always essential to ensure that graduates can register with the relevant professional associations.

Two inspections were held. One was by the Royal Town Planning Institute (RTPI) in 2007, one of the foremost institutes in the world,

and the other was the South African Council for Town and Regional Planners (SACPLAN) in 2008, responsible in terms of the town planning professions' legislation for the quality of South African planning education.

In November the evaluation committee of SACPLAN evaluated the department's programmes. The programmes were provisionally accepted, with a follow-up visit planned for 2010. This means that graduates from all programmes (old and new) may register as candidate planners and after submission of a practical training report, can become professional planners.

The University of the Free State's (UFS) programme in Urban and Regional Planning has now been accredited for three years.

The RTPI, on invitation of the UFS, visited the department on Friday, 12 October 2007 to undertake a preliminary inspection of the content and quality of the programme offered here (i.e. the Bachelors (Honours) in Spatial Planning and Master's in Urban and Regional Planning) and to benchmark it against the RTPI planning education standards and requirements. The intention was to determine whether the department could qualify for a comprehensive evaluation for RTPI accreditation. The RTPI secretariat gave oral feedback at the end of the visit indicating that "There is much to commend about the planning programmes and in theory the combination of the B. (Hons) and one year master's degree could represent a programme capable of seeking RTPI accreditation for chartered status."

The department had nine graduates with B. (Hons) in Spatial Planning, 14 master's students in Urban and Regional Planning and one with a Ph.D. degree.

Students from the department had several achievements. Mr JH Theron graduated with a doctorate. The topic of his thesis was *Lessons from the strategic management of integrated development planning in KwaZulu-Natal (KZN) from 1994 to 2006*. Not only was his thesis of a high standard, it was also particularly relevant. In

the words of one of the external examiners, "The thesis has been well conceptualized, carefully researched and documented. One of the particular values of this thesis is that it makes available a large and complex body of information about the way in which the KZN province managed the integrated development planning process at both provincial and municipal levels in a carefully documented and systematic form. It provides a concise, yet comprehensive summary of the recommendations for more effective strategic management of integrated development planning in KZN. These recommendations are equally applicable

for other provinces or developing countries."

Mr Andile Mshumpela received an award for the best housing student from the South African Housing Federation.

Dr Marlène Campbell was part of a multi-disciplinary research team of the UFS and the CSIR Built Environment appointed by Trans African Concessions (Pty) Ltd (TRAC) to undertake a socio-economic impact study on the Maputo Development Corridor (MDC) along the N4 toll route. Their initial findings indicate that there has indeed been an increase in income levels along the route. ■



From the left are: Prof. Das Steyn, Departmental Chairperson, Ms Dienie Steenkamp from the department, Sir Peter Hall, one of the foremost theorists in planning and Mr Rodney Swart, former student at the department during Sir Peter's visit to South Africa.



Mr Piet Potgieter (left), lecturer in the department and Mr Brian Campbell, honors student in Spatial Planning.

Staff

Professor: Prof. Das Steyn

Senior Lecturer: Dr Marlène Campbell

Lecturers: Mr Pieter Potgieter, Ms Lize Barclay

Part-Time Lecturers: Prof. Wynand Senekal, Mr Neil Devenish

Senior Professional Officer: Ms Dienie Steenkamp

Typist/Clerk: Ms Riana Hugo

Assistant Officer: Ms Antoinette Nel

Research outputs

Research articles

Campbell, M.M. & Phago, K.G. 2008. The impact of major sporting events on the economy and the people of a developing region: The case of the 2010 World Cup Soccer Tournament. *Africa Insight* 38(3): 26-34.

Campbell, M.M., De Kock, J. & Van der Westhuizen, T. 2008. Secure tenure for the urban poor: Lessons from a community-based land-tenure approach in Windhoek, Namibia. *Town and Regional Planning* 52: 45-54.

Reports

Campbell, M.M. 2008. *The viability of a corridor development along the R30 Route between Welkom and Bloemfontein in terms of the Provincial Spatial Development Framework of the Free State*. Research Report No. 32 to the Department of Urban and Regional Planning, University of the Free State, Bloemfontein, South Africa.

Potgieter, P.J. & Steyn, J.J. 2008. *Bloemfontein CBD Masterplan Project T1: Demarcation of Study*

Contact details

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Students on tour to Gauteng.

Area. Research Report No. 33 to the Department of Urban and Regional Planning, University of the Free State, Bloemfontein, South Africa.

Potgieter, P.J. & Steyn, J.J. 2008. *Bloemfontein CBD Masterplan Project T2: Literature review report*. Research Report No. 34 to the Department of Urban and Regional Planning, University of the Free State, Bloemfontein, South Africa.

Potgieter, P.J. & Steyn, J.J. 2008. *Bloemfontein CBD Masterplan Project T3: Land-use Survey*. Research Report No. 35 to the Department of Urban and Regional Planning, University of the Free State, Bloemfontein, South Africa.

Potgieter, P.J. & Steyn, J.J. 2008. *Bloemfontein CBD Masterplan Project T4: Comprehensive CBD land-use plan*. Research Report No. 36 to the

Department of Urban and Regional Planning, University of the Free State, Bloemfontein, South Africa.

Conference contributions

Campbell, M.M. 2008. *Informal settlements and tenure options: Freehold or leasehold?* Paper presented at the 3rd Conference of the South African Planning Institute (SAPI) - Planning Africa: Shaping the Future, Sandton Convention Centre, Johannesburg, South Africa. 13-16 April.

Campbell, M.M. 2008. *The impact of transport corridors in promoting development: The position of Welkom*. Paper presented at the Conference on Planning and Development Perspectives of Mining Towns in South Africa, North-West University, Potchefstroom, South Africa. 18 June.

Campbell, M.M. 2008. *The viability of corridor development between Bloemfontein and Welkom*. Paper presented at the 5th Post Graduate Conference on Construction Industry Development (CIDB), University of the Free State, Bloemfontein, South Africa. 16-18 March.

Campbell, M.M. & Mshumpela, A.S. 2008. *The people's housing process: The case of the Amathole District Municipality*. Paper presented at the 44th International Society of City and Regional Planners (ISOCARP) Conference, Urban Growth without Sprawl: A Way Towards Sustainable Urbanization, Dalian, China. 19-23 September.

Campbell, M.M. & Mshumpela, A.S. 2008. *The peoples housing process: A viable option for quality low cost housing*. Paper presented at the Southern African Housing Foundation (SAHF) Conference and Exhibition: Developing Communities, Cape Town, South Africa. 12-15 October.

Potgieter, P.J. 2008. *Control in the Bloemfontein inner city renewal plan: How the planner lost against power*. Paper presented at the 3rd Conference of the South African Planning Institute (SAPI) - Planning Africa: Shaping the Future, Sandton Convention Centre, Johannesburg, South Africa. 13-16 April.

Steyn, D. & Stapelberg, H. 2008. *Planning and planning education in the Free State, South Africa*. Paper presented at the Inaugural Meeting of the Association of African Planning Schools (AASP), Cape Town, South Africa. 13-15 October.

Steyn, J.J. 2008. *The process of testing community's acceptability of high quality earth constructed building methods as a means to support local economic development*. Paper presented at the 5th Post Graduate Conference on Construction Industry Development (CIDB), University of the Free State, Bloemfontein, South Africa. 16-18 March.

Departments in the

Natural Sciences



Department of

Chemistry

“The further upgrading of our research equipment contributed to a sustained high research output.” - Prof. André Roodt.



Prof. André Roodt.

Overview

The Department of Chemistry experienced a continued revival in quality and excellence in pursuit of the strategic priorities of the University of the Free State (UFS) and the Faculty of Natural and Agricultural Sciences.

Four postdoctoral associates, 27 M.Sc. and 29 Ph.D. students in different sub-disciplines led to sustained research output for 2008. More than 45 research articles were published in international accredited journals and numerous local and international congress presentations were made.

Several prominent scientists visited the departments in Bloemfontein and on the Qwaqwa campus,

such as Profs Ola Wendt (Lund University, Sweden), Daneel Ferreira (University of Mississippi, United States of America (USA)), Dr Ettiene Snyders (Nuclear Energy Corporation of South Africa (NECSA)), Dr Desmond Young (SASOL), Dr Johann Nel (NECSA), Dr Cassie Carstens (NECSA), Prof. Albrecht Berkessel (Keulen University, Germany), Dr Johntho Dixon (SASOL Technology), Prof. Roger Hunter (University of Cape Town), Profs Massimo Messori and Paola Fabbri (Department of Materials Engineering, University of Modena and Reggio Emilia, Italy), Prof. Tibor Czigany, Dr Jozef Kovács and Mr Tamás Tábi (all from the Department of Polymer

Engineering, Budapest University of Technology and Engineering, Budapest, Hungary), and Drs Igor Krupa and Igor Novak (Polymer Institute, Slovak Academy of Sciences, Bratislava, Slovak Republic).

These scientists presented lectures and held research discussions with researchers and postgraduate students in the departmental research seminar programme, which continued very successfully with around thirty research presentations during 2008.

Drs Gideon Steyl and Fanie Muller both received Y2 ratings from the National Research Foundation (NRF). Similarly, Prof. Jannie Swarts (C1), Prof. Walter Purcell (C3) and Dr Jeanet Conradie (C3) were rated by the NRF.

The upgrading of the Moerdyk and associated annexed building, which houses the department, continued, and the overall project, to the value of more than R50 million, will be completed over a three-year period. This unprecedented investment in Chemistry by university management and the commitment to create a highly competitive teaching and research unit, made good progress during 2008, in spite of several unfortunate delays. The first two phases of the total upgrade were completed and occupied in May 2008.

The further upgrading of the department's research equipment contributed to a sustained high research output. This new equipment strategy forms part of the university's vision to be inter-

nationally visible with quality research outputs in niche areas, to provide leadership in advanced training to the African continent student corps and to be an important player amongst South African universities as well as a competitor internationally.

The interruptions due to the renovation of the entire building posed a range of unique problems in terms of practical classes, theory and research, and placed significant stress on the department. In spite of these challenges, the enthusiasm of the staff was illustrated by the fact that most activities were continued without any significant interruptions throughout the year.

The support of senior management, particularly on faculty level by Prof. Herman van Schalkwyk, Dean of the Faculty of Natural and Agricultural Sciences, as well as faculty colleagues, in providing office and laboratory space and other support for Chemistry under- and postgraduate students, is again gratefully acknowledged.

A new agreement between the UFS and SASOL, worth R6 million for the 2008/2009 year, according to which process technology and research development catalysis reside in the department, was continued and supported by the continued seconding of Prof. Ben Bezuidenhout to the department.

Teaching aspects on undergraduate level have been a prime focus of the department. The continued teaching in parallel medium on the Main Campus was demanding on individuals, and challenged the lecturers to improve constantly, also with respect to using more sophisticated teaching methods and computers during class. The enthusiasm in terms of lecturing in Chemistry theory and practical classes on both the Main and Qwaqwa campuses is noted and gratefully acknowledged.

To fulfill the need especially of previously disadvantaged students in the use of computers to work up and present experimental results scientifically, Dr Conradie presented courses in computer skills for undergraduate and postgraduate

students in Chemistry. She continued WebCT which provides question and answer quizzes for computer-guided first-year chemistry revision.

Advanced topics in a number of courses in the B.Sc. honours programme were further introduced and refined by outside scholars, exposing the chemistry students to international teachers. These included lectures on natural product chemistry by Prof. Ferreira, industrial and organometallic chemistry by Prof. Bezuidenhout, and computational chemistry by Drs Jan-Albert van der Berg from SASOL and Gideon Steyl from the UFS in the standard honours courses in Organic and Inorganic Chemistry. The special honours course saw the refining of advanced topics in bioanalytical chemistry by Profs Ken Swart and Thinus van der Merwe from FARMOVS-PAREXEL, and on heterogeneous catalysis by Dr Thys Botha from SASOL.

The 14th successive science quiz competition, MINQUIZ, one of the faculty's community service flagships and jointly sponsored by the UFS and MINTEK, was successfully presented by Ms Ina du Plessis and Prof. Jannie Swarts. A group of 200 pupils, comprising the three top physical science learners of each secondary school in the Free State province, visited the Main Campus during March 2008 where they were exposed to information on career opportunities in Chemistry, Physics and Geology. Six winning schools in two categories were awarded monetary prizes to enhance their school science laboratories.

Colleagues in the department were involved in various committees, notably Prof. Jannie Swarts, who continued to contribute significantly in planning and negotiations to expand the equipment infrastructure of the faculty. Specifically, towards the end of 2008, Prof. Swarts negotiated support from the National Research Foundation (NRF) to the value of more than R10 million to expand the surface and physical chemistry/physics thrust, in collaboration with the Department of Physics at the UFS.



Ph.D. students in the laboratory synthesizing new compounds: Ms Marietjie Schutte (left), and Ms Truidie Venter.

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

Most lecturers were involved in continuous career guidance and laboratory demonstration sessions to individual and groups of school learners, and colleagues at both the campuses contributed to UFS open and Expo days.

Ten oral presentations were made on invitation at international conferences and venues as well as eighteen poster presentations at local and international venues, with more than 45 research papers published (see list below).

The NRF's Technology and Human Resource for Industry Programme (THRIP) application in Applied Process Chemistry from combined inputs of Inorganic, Physical and Organic Chemistry (Profs Roodt, Swarts, and Bezuidenhout) was successful and sourced an additional R1.2 million



The recipients of the National Science and Technology Forum (NSTF) award are, from the left: Dr Susan Bonnet, from the department, Prof. Thinus van der Merwe, FARMOVS-PAREXEL, Prof. Jan van der Westhuizen, from the department, and Prof. Ken Swart, FARMOVS-PAREXEL.

for the upgrade of equipment and extended capacity building.

Special honours were bestowed on groups in the department on two occasions.

Firstly, the organic section continued on the division's THIRP project, in collaboration with FARMOVS-PAREXEL, which undertakes the synthesis of isotope-labeled internal standards and metabolites in the support of novel bio-analytical clinical trials for the registration of new medicines (locally and internationally). With this project, the FARMOVS-PAREXEL team at the Department of Chemistry, received the prestigious National Science and Technology Forum (NSTF) award for innovation and an outstanding contribution to Science, Engineering and Technology during the past ten years. The team consisted of Prof. Jan van der Westhuizen (team leader) and Dr Susan Bonnet from the Department of Chemistry and Prof. Kenneth Swart (co-leader) and Prof. Thinus van der Merwe from FARMOVS-PAREXEL. The NSTF awards give recognition to outstanding contributions of individuals and groups to science, engineering

and technology. The NSTF represents government, the science councils (Agricultural Research Council (ARC), Medical Research Council (MRC) and the Council for Scientific and Industrial Research (CSIR)), the NRF, professional bodies, higher education (universities and the Department of Education), business and civil society. This is a most prestigious award to a scientist or team (in this case the FARMOVS-PAREXEL team at the Department of Chemistry at the UFS) in South Africa and represents recognition by the wider science and technology community in South Africa.

Secondly, Prof. Riaan Luyt received an honorary medal and certificate from the Polymer Institute, Slovak Academy of Sciences for long-standing and fruitful research collaboration with members of the institute.

On a sad note, Drs Reinout Meijboom and Fanie Muller left the UFS after appointment to senior lecturing positions at the University of Johannesburg.

The **Process Chemistry thrust**, which was established in early 2006, is headed by Prof. Ben Be-

zuidenhoudt, SASOL-seconded Chair in Organic Chemistry.

Prof. Bezuidenhoudt attended the 10th International Symposium on Dioxygen Activation and Homogeneous Catalytic Oxidation (ADHOC-08) in Venice, Italy. Furthermore, five students accompanied him to the 10th Frank Warren Organic Conference of the South African Chemical Institute in the Kruger National Park. Apart from the five poster presentations by the students, Prof. Bezuidenhoudt also gave a lecture, the only one from the UFS. Prof. Bezuidenhoudt also acted as reviewer for the *Journal of Natural Products*, and sat on the Chemistry Evaluation Committee of the NRF.

The group acquired a new gas chromatograph worth R120 000, as well as a Maldi-Toff mass spectrometer worth R1.8 million, which was delivered in August, and for which Dr Charlene Marais and Ms Dudu Saku attended a week-long training course in Germany during December. Despite a lack of experience in the use of the Maldi-Toff instrument, important results in solving difficult research problems have already been obtained.

The **Polymer Science research area** is headed by Prof. Riaan Luyt at the Qwaqwa Campus. His group comprises five masters and six Ph.D. students, and the research focuses on physical properties of polymer/wax mixtures, polymer/natural fibre composites and polymer nanocomposites. Chemistry at the Qwaqwa Campus again did exceptionally well in terms of research, given the infrastructure shortage and relatively heavy work load.

Collaboration on a national level was undertaken with Prof. Walter Focke, Institute for Applied Materials, University of Pretoria. Combined research resulted in two papers submitted to international peer-reviewed journals. Further collaboration exists with Dr Suprakas Sinha Ray, Nanotechnology Research Group, CSIR. Prof. Luyt is co-supervisor of three Ph.D. students working under the supervision of Dr Sinha Ray and Dr Andrew de Vries, Polymers and Bioceramics

Research Group, CSIR. Prof. Luyt is co-supervisor of one Ph.D. student working under the supervision of Dr De Vries.

International collaboration exists, via a formal SA-India bilateral agreement on latex-based nanocomposites, with Prof. Sabu Thomas, Institute for Macromolecular Science and Engineering, Mahatma Gandhi University, Kottayam, India. Furthermore, there is a formal SA-Slovakia inter-governmental project on phase change materials, in collaboration with Dr Igor Krupa, Polymer Institute, Slovak Academy of Sciences, Bratislava, Slovak Republic, and a formal SA-Italy inter-governmental project on nanoparticles for polymers reinforcement with Prof. Massimo Messori, University of Modena and Reggio Emilia, Modena, Italy. Finally, there is a formal SA-Hungary inter-governmental project on development and investigation of injection moulded, natural fibre reinforced composites using biodegradable matrix with Prof. Tibor Czigany, Department of Polymer Engineering, Budapest University of Technology and Economics, Budapest, Hungary.

The **Analytical division** currently consists of Prof. Walter Purcell, Dr Karel von Eschwege and Ms Rebotsamang Shago and is supported by five M.Sc. students.

Researchers in the analytical section are currently involved the establishment and evaluation of different digestion methods (microwave and fluxes) of plasma dissociated and natural occurring zircon as well as the quantification of the different elements in these minerals. Inductively coupled plasma optical emission (ICP OES), atomic absorption (AA) and ultraviolet/visible spectroscopy are mainly employed in the research. Cooperation with NECSA was established and currently they are funding three students to do research on the establishment of digestion methods and element quantification in plasma dissociated and natural zircon as well as tantalite minerals.

Preliminary investigations, in collaboration with Soil Sciences, are also involved to determine the possible pollution of irrigation

water by agricultural activities in the Vaalharts Irrigation system.

Another study involves the investigation of photochromic reactions in different transition metal complexes, with potential applications in high density optical molecular switching mechanisms. Instrumental techniques such ultraviolet/visible, infrared, nuclear magnetic resonance, Cyclic-Voltammetry, Quantum Computational Chemistry (Amsterdam Density Function and Gaussian) and X-ray Crystallography are employed in these studies.

Dr Von Eschwege received research funding from the NRF under the Institution Redress and Development Programme (IRDP): Nanotechnology section, and successfully negotiated a research agreement with Prof. Heinrich Schwoerer of the Laser Institute (laser and ultra high speed spectroscopy) at the University of Stellenbosch to study rapid intra-molecular processes in light sensitive molecular processes. A number of mutual visits originated from this collaboration. Dr Von Eschwege further attended a Centre for High Performance Computing (CHPC) workshop at the University of KwaZulu-Natal: Quantum Computational Chemistry: Gauss-View. Prof. Purcell attended a workshop on ISO 17025: 2005 – Implementation for Testing Laboratories, held in Bloemfontein at the end of October 2008.

Mr Steven Lötter (M.Sc. student) gave an oral presentation at the "Studente Simposium van die Akademie vir Wetenskap en Kuns" that was held at the University of Pretoria in October 2008 and also at the Advanced Metals Initiative Conference presented by Department of Trade and Industry (DTI) in Johannesburg in November 2008. He also attended the TechnoX workshop held in Sasolburg at the end of July 2008, while Prof. Purcell and Dr Von Eschwege contributed to different Eskom Science Expo projects that were held at the UFS in July/August 2008.

The **Physical Chemistry division** has two research groups, one headed by Prof. Jannie Swarts, and



Prof. Riaan Luyt (right) receives his honorary medal from the director of the Polymer Institute, Slovak Academy of Sciences, Dr Jozef Rychly.

the other by Dr Jeanet Conradie. Mr Ernie Langner is in the final stages of his Ph.D. studies.

Prof. Swarts and Dr Conradie are rated researchers by the NRF, and both held NRF research grants, while Mr Langner is holder of a Thuthuka NRF grant. The Swarts group was also funded by the Cancer Association of South Africa (CANSA), THRIP and industrially by research grants from SASOL.

Dr Conradie and Prof. Swarts both acted as reviewers for the NRF in evaluating the quality of the research outputs of other researchers and for advanced bursary applications. Prof. Swarts also serves in this capacity for the Irish Health Board. Both also frequently evaluate international publications as peer reviewers, are external examiners for M.Sc. and Ph.D. degrees of candidates at other universities, and act as moderators for third-year and honours courses at other universities.

The main research question of Prof. Swarts' research group concerns synthetic and physical chemistry aspects of multinuclear metallocenes. The group currently focuses on five projects, i.e., por-

phyrin and phthalocyanine compounds bearing metallocene substituents; titanocene, zirconocene, hafnocene, ferrocene, ruthenocene and osmocene derivatives especially in association with rhodium, iridium, silver, gold and copper; electrochemical, kinetic and thermal analyses of these complexes; medicinal aspects of these complexes; and industrial studies on carboxylato complexes in collaboration with SASOL.

The research group of Dr Conradie focuses on the characterisation of known and unknown transition metal complexes and intermediates by means of synthetic and computational chemistry. The following classes of compounds are presently investigated: 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.

The Swarts and Conradie groups have international collaboration with Prof. Abhik Ghosh (Department of Chemistry and Centre for Theoretical and Computational Chemistry, University of Tromsø, Norway) and Prof. Penelope J. Brothers (Department of Chemistry, The University of Auckland, New Zealand); Prof. Mike Cook at the University of East Anglia, Norwich, United Kingdom (UK) on phthalocyanine chemistry, Prof. Manuel Aquino at the Saint Francis Xavier University, Antigonish, Canada on metal carboxylates, and Prof. Bill Geiger at the University of Vermont, Vermont, USA on electrochemistry.

During 2008, Prof. Swarts paid research visits to Prof. Mike Cook, University of East Anglia, UK (phthalocyanine electrochemistry) and Prof. Alexei Vinkelstein from Moscow University in Russia (protein physics). Mr Chris Joubert visited Prof Henry Lang from Chemnitz, Germany (carboxylate chemistry). Dr Conradie paid a six week research visit to the Department of Physical Chemistry, University of Tromsø, Norway during October-November and gained advanced skills in the

computational chemistry software Gaussian. Mr Langner visited Moscow, Russia and presented a poster lecture at the 5th International Conference on Porphyrins and Phthalocyanines. Prof. Swarts gave a lecture at the same conference. Two students, Mr Henno Gericke and Ms Nicola Barnard, and post-doc Eleanor Fourie gave poster presentations at the 10th International Symposium on Dioxygen Activation and Homogeneous Catalytic Oxidation (ADHOC-08), in Venice, Italy from 20-25 July and at an organometallic chemistry conference in Rennes, France.

The industrial research collaboration of the Swarts group led to visits by Dr Thys Botha (heterogeneous catalysis), Dr Reinier Nel (carboxylate chemistry) and Dr Frans Prinsloo (aluminium chemistry), all from SASOL, on various industrial research issues.

Highlights from the Physical Chemistry division include the following: Prof. Swarts was Special Guest Editor for a special issue of the medical journal *Metal-Based Drugs* that was dedicated to new methods of anticancer drug delivery to diseased sites, new methods of treating cancer, and the development of new chemotherapeutic drugs. Furthermore, M.Sc. student Henno Gericke's conference contribution at the world's premier organometallic chemistry conference in Rennes, France, the 23rd International Conference on Organometallic Chemistry (ICOMC23), won the prize as best poster contribution of 950 international contributions. Another highlight was the second visit of Dr Conradie to the Scientific Computing and Modeling (SCM) offices in Amsterdam, The Netherlands in November 2008, to discuss and implement advanced applications of the Amsterdam Density Functional (ADF) programme. Ms Marianne Conradie, a Ph.D. student, received the bronze medal for her Afrikaans presentation "*n Eksperimentele en kwantum berekeningschemiestudie van die reaksie tussen die karbonileringskatalisator [Rh((C₄H₃S)COCHC OR)(CO)(PPh₃)] en metieljodied (R = CF₃, C₆H₅, C₄H₃S)]*" at the

Student Symposium on Natural Science in Johannesburg on 31 October 2008.

Mr Langner lectured at a one-day teacher training course held by the university's Centre for Education Development (CED) in Kimberley. His Thuthuka grant also enabled Mr Langner to visit Russia and present a poster at the 5th International Conference on Porphyrins and Phthalocyanines (ICPP-5) in Moscow, Russia from 6-11 July 2008.

Research in **Inorganic Chemistry** concentrates on Coordination Chemistry with the primary focus on an integrated investigation of reaction mechanisms through the use of crystallography, spectroscopy, computational chemistry and reaction kinetics. Two research thrusts focus on industrial reactions/homogeneous catalysis/applied process chemistry and applications to medicine (radiopharmaceutical and chemotherapeutic agents). This research in the group of Prof. Roodt continued and the infrastructure was expanded, supported by Dr Deon Visser, three contracted researchers at senior lecturer level, namely Drs Alfred Muller (crystallography), Reinout Meijboom (synthesis) and Gideon Steyl (computational chemistry), as well as Drs Thato Mtshali, Johan Venter and 14 post-graduate students. Altogether 24 research articles and more than 20 conference contributions, of which ten were invited oral presentations, were produced.

Dr Gideon Steyl gave an invited lecture at the world's premier organometallic chemistry conference in Rennes, France, the 23rd International Conference on Organometallic Chemistry (ICOMC23), while Dr Johan Venter made a poster presentation on this occasion. Mss Noline Cloete and Alice Brink gave poster presentations at the 16th International Symposium on Homogeneous Catalysis (ISHC16) in Florence, Italy, partly sponsored by the organising committee (under the leadership of Dr Mike Green from SASOL) of the 15th ISHC, held at Sun City, South Africa, during 2006. Dr Deon Visser gave an invited lecture at

the 6th International Symposium on Technetium and Rhenium in Port Elizabeth during October 2008.

Prof. Roodt, as principal applicant, successfully obtained funding of R700 000 under the NRF's Economic Growth and International Competitiveness (EGIC) for the next four years.

The homogeneous catalysis research in the Roodt 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 research focus is on the conversion of simple feedstock molecules into value-added products and includes studies of classical reaction types such as carbonylation (synthesis of acetic acid and other products from methanol and carbon monoxide), hydroformylation (aldehydes and alcohols from olefins and synthesis gas) and oligomerisation (ethene). Collaboration with SASOL, the North-West University, the Universities of Johannesburg, Cape Town, Western Cape, and Lund (Sweden) forms part of this thrust.

Similarly, the medical research focus, in collaboration with the Universities of Missouri, USA (Dr Hendrik Engelbrecht), Lund, Sweden (Profs Ola Wendt, Ake Oskarsson and Lars Ivar Elding), Zurich, Switzerland (Prof. Roger Alberto), CANSA (Prof. Connie Medlen, Pharmacology, University of Pretoria) and PETLabs Pharmaceuticals (Dr Gerdus Kemp) showed good progress and several research reports and articles in international accredited journals were published. A spin-off of this research was the synthesis of model chemotherapeutic compounds which again yielded very positive results for future application.

Dr Gideon Steyl visited the group of Prof. Roger Alberto at the University of Zurich and collaborated with Prof. Alberto and Dr Fabio Zobi by providing computational expertise and results obtained at the UFS computer cluster. Two manuscripts were prepared based on these results.



Ph.D. Students collecting data on Apex Kappa single crystal X-Ray diffractometer; Nicoline Cloete (left) and Tania Hill.

The equipment in the inorganic group was further expanded by the acquisition of spectroscopy units with funding obtained from SASOL (Drs Chris Reinecke and Desmond Young) and PETLabs Pharmaceuticals (Dr Kemp), while funding under the THRIP programme, CANSA and the NRF was sourced.

A high-pressure stopped flow spectrometer and other related equipment worth more than R1 million was donated to the Roodt group by Prof. Lars Ivar Elding from the University of Lund, Sweden. This system is extremely important for the determination of intimate reaction mechanisms, and makes the department the only one in South Africa with this equipment, and one of only two in the Southern Hemisphere. The system was installed in December 2008.

The Roodt group took the third-year class, as part of their training in X-ray crystallography, on an excursion to the Kimberley diamond mine.

The **Organic Chemistry division** is headed by Profs Jan van der Westhuizen, Ben Bezuidenhout and Dr Susan Bonnet.

Prof. Daneel Ferreira of the University of Mississippi in the USA gave an honours course in the biosynthesis and organic chemistry of secondary metabolites in plants

(January-February). Moreover, he was recognised for his contributions to organic chemistry, also at the UFS, by an honorary doctorate awarded at the April graduation ceremony.

Dr Rui de Carvalho of the University of Coimbra in Portugal gave an advanced course in structure elucidation with high resolution NMR in February. Mr Anwar Elbushra Mohammed Noreljaleel, lecturer at Omdurman Islamic the University in Sudan, spent 2009 in our Organic section. He used UFS expertise and equipment to complete his Ph.D. (Synthesis of Chalcones substituted by a Mannich side chain). Mr Bashir Elfaki Hamed Elfaki, lecturer at the Blue Nile University in Khartoum in Sudan, spent 2009 in the Organic laboratories to do research towards his Ph.D. thesis (Flavonoids from *Boscia salicifolia*, *Erythrina abyssinica* and *Ficus vasfa*). Dr Louis Ackerman, retired from the CSIR's bioprospecting and essential oils program, visited the division to assist with post-graduate training.

Dr Gabre Kemp received advanced training in triple quadrupole mass spectrometry by Applied Biosystems in Manchester, UK and Darmstadt, Germany during August 2008.

The organic section presented a four-day LCMS course in Novem-

ber 2008 in Bloemfontein, which was attended by 20 mass spectrometry professionals from all over South Africa (including researchers from the Medical Research Council, Agricultural Research Council, National Department of Agriculture, University of Pretoria and University of KwaZulu-Natal), and senior students from the UFS. It covered different aspects of mass spectrometry from ionization techniques, mass filters, detectors, MS/MS

analysis, vacuum systems, LC-MS and LC-MS/MS techniques, quantification, fragmentation analysis, interpretation of spectra, as well as some applications.

Additional research related outputs:

Various researchers of the Department of Chemistry were involved in the university's research cluster initiative, i.e., the Material and Nanosciences Cluster (MNS). Profs Riaan Luyt, Jannie Swarts and André Roodt are three of the four focus area leaders, while Prof. Roodt is the interim cluster coordinator, appointed by the UFS. Seven students were supported from the MNS Cluster during 2008, which yielded more than 20 research papers. Prof. Jan van der Westhuizen participates in the Advanced Biomolecular research cluster of the UFS.

Prof. Roodt, as member of the Executive Committee of the European Crystallographic Association (ECA) and the International Scientific Committee of 25th European Crystallographic Meeting, attended the Executive Meetings in Budapest, Hungary (February 2008) and Osaka, Japan. He further atten-

ded an International Conference on Coordination Chemistry (ICCC) in Jerusalem, Israel as member of the planning committee of the series of these conferences. Prof. Roodt further served on the THRIP panel for 'Process Manufacturing' of the South African NRF, and also acted as co-editor for the International Union of Crystallography (IUCr) journal, *Acta Crystallographica E* and was on the editorial board of the *Journal of Coordination Chemistry*. He also had various consulting sessions with employees of SASOL as part of the agreement between UFS and SASOL.

By special invitation, Profs Roodt, Swarts and Bezuidenhout attended the special launch of the SASOL collaboration with South African university programme in Rosebank, Johannesburg.

Prof. Purcell was invited to serve as a member of the local scientific committee of the 6th International Symposium on Technetium and Rhenium in Port Elizabeth from 7-10 October 2008.

Prof. Luyt was invited to be a member of the international advisory board of the international journal *eXPRESS Polymer Letters*. ■

Staff

Main Campus:

Professors: André Roodt, Jannie Swarts

Affiliated Professors: Profs Daneel Ferreira, Rui Carvalho

Associate Professors: Profs Walter Purcell, Robert Dennis, Jan van der Westhuizen

Affiliated Associate Professor: Prof. Fanie Otto

Senior Lecturers: Drs Jeanet Conradie, Deon Visser, Alfred Muller, Reinout Meijboom, Gideon Steyl

Lecturers: Drs Susan Bonnet, Karel von Eschwege, Johan Venter, Ernie Langner, Thato Mtshali

Subject Co-ordinators: Dr Marietjie Versteeg, Ms Rina Meintjes

Qwaqwa Campus:

Professor: Prof. Riaan Luyt

Lecturers: Dr Buyiswa Jacobs, Ms Moipone Mokoena, Ms Dorine Dikobe, Mr Tsietsi Tsotetsi, Ms Mpondi Molefe

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Research outputs

Research articles

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Viljoen, J.A., Muller, A. & Roodt, A. 2008. Tetrakis(1,1,1-trifluoroacetylacetonato- κ^2O,O')(hafnium(IV) toluene disolvate. *Acta Crystallographica Section E* E64: m838-m839.

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Von Eschwege, K.G., Conradie, J. & Swarts, J.C. 2008. A DFT perspective on the structures and electronic spectra of the orange and blue isomers of photochromic dithi-zonatophenylmercury(II). *Journal of Physical Chemistry A*. 112: 2211-2218.

Chapters in books

Pothan, L., Luyt, A.S. & Thomas, S. 2008. Polyolefin/natural fiber composites. In *Polyolefin Composites*, edited by T. Kyu & D. Nwabunma. New Jersey: Wiley-Interscience. pp. 44-81.

Steyl, G. & Roodt, A. 2008. Tropolone as neutral compound and ligand in palladium complexes. In *Models, Mysteries, and Magic of Molecules*,

edited by J.C.A. Boeyens & J.F. Ogilvie. The Netherlands: Springer. pp. 325-340.

Conference contributions

Achilonu, M.C., Bonnet, S.L. & Van der Westhuizen, J.H. 2008. *Synthesis of proanthocyanidins Part 1: The first oxidative formation of the interflavanyl bond*. Poster presented at the International Union of Pure and Applied Chemistry (IUPAC) Conference on Organic Synthesis (ICOS17), Daejeon, South Korea. 22-27 June.

Achilonu, M.C., Bonnet, S.L., Van der Westhuizen, J.H. 2008. *Synthesis and structure elucidation of novel procathoyanidins. Silver catalyzed C-C-bond formation*. Poster presented at the Bruker NMR User Meeting, Mkhuzi Game Reserve, South Africa. 23-25 July.

Barnard, N.I. & Swarts, J.C. 2008. *Hot Stuff!! Structural, optical and thermal properties of a DSC investigation of metal-carboxylates*. Poster presented at the 16th International Symposium on Homogeneous Catalysis (ISHC16), Florence, Italy. 6-11 July.

Barnard, N.I. & Swarts, J.C. 2008. *Mixed metallocenes: Ferrocene-containing betadiketonato titanium(IV) complexes*. Poster presented at the 23rd International Conference on Organometallic Chemistry (ICOMC23), Rennes, France. 13-18 July.

Bonnet, S.L., Montsho, R.M., Jarak, I. & Van der Westhuizen, J.H. 2008. *One pot synthesis and structure elucidation of free phenolic isoaurones. (Stereochemistry of tri-substituted alkenes)*. Poster presented at the Bruker NMR User Meeting, Mkhuzi Game Reserve, South Africa. 23-25 July.

Brink, A., Roodt, A. & Visser, H.G. 2008. *Steric vs. electronic: Spatial variation of ligands affecting rhodium catalytic reaction*. Poster presented at the 16th International Symposium on Homogeneous Catalysis (ISHC16), Florence, Italy. 6-11 July.

Cloete, N., Roodt, A. & Visser, H.G. 2008. *Ethylene tetramerisation: Structural investigation of the chromium-based catalyst precursors*. Poster presented at the 16th International Symposium on Homogeneous Catalysis (ISHC16), Florence, Italy. 6-11 July.

Cloete, N., Roodt, A. & Visser, H.G. 2008. *Ethylene Tetramerisation: Structural investigation of the chromium-based catalyst precursors*. Poster presented at the Conference of the Catalysis Society of South Africa

(CATSA), Parys, South Africa. 9-12 November.

Dikobe, D.G. & Luyt, A.S. 2008. *Morphology and thermal properties of PP/LLDPE/WP and MAPP/LLDPE/WP polymer blend composites*. Poster presented at the 10th Annual UNESCO/IUPAC (International Union of Pure and Applied Chemistry) Conference on Macromolecules and Materials, Berg-en-Dal Ruskamp, Kruger National Park, South Africa. 7-11 September.

Dikobe, D.G. & Luyt, A.S. 2008. *Thermal and mechanical properties of polymer blend/wood flour composites*. Oral presentation delivered at the 13th European Conference on Composite Materials (ECCM), Stockholm, Sweden. 2-5 June.

Engelbrecht, I., Muller, A.J. & Roodt, A. 2008. *Kinetic investigation of model iridium(acetylacetonato) systems for use in olefin interactions/hydroformylation*. Poster presented at the Conference of the Catalysis Society of South Africa (CATSA), Parys, South Africa. 9-12 November.

Engelbrecht, I., Muller, A.J. & Roodt, A. 2008. *Kinetic investigation of model iridium(acetylacetonato) systems for use in hydroformylation*. Poster presented at the 39th National Convention of the South African Chemical Institute (SACI), Stellenbosch, South Africa. 30 November - 5 December.

Engelbrecht, I., Muller, A.J. & Roodt, A. 2008. *Olefin hydroformylation model reactions: Kinetic reactivity of iridium complexes*. Lecture delivered at the DST-NRF c*change Symposium, Parys, South Africa. 7-9 November.

Enow, C.A., Auger, A., Swarts, J.C. & Bezuidenhout, B.C.B. 2008. *Epoxidation of alkenes through the utilisation of non-peripherally substituted phthalocyanines*. Poster presented at the 10th International Symposium on Dioxygen Activation and Homogeneous Catalytic Oxidation (ADHOC-08), Venice, Italy. 20-25 July.

Enow, C.A., Auger, A., Swarts, J.C. & Bezuidenhout, B.C.B. 2008. *Epoxidation of alkenes through the utilisation of non-peripherally substituted phthalocyanines*. Poster presented at the Bi-National Organic Chemistry Conference (BOCC '08), Berg-en-Dal Ruskamp, Kruger Park, South Africa. 14-19 September.

Fourie, E. & Swarts, J.C. 2008. *Synthesis and electrochemistry of metallocene-containing rhodium(II) complexes*. Poster presented at the 23rd International Conference on Organometallic Chemistry (ICOMC23), Rennes, France. 13-18 July.

- Fourie, E. & Swarts, J.C.** 2008. *Synthesis and kinetic studies of metallocene-containing as well as fluorine-containing rhodium(II) complexes*. Poster presented at the 16th International Symposium on Homogeneous Catalysis (ISHC16), Florence, Italy. 6-11 July.
- Gericke, H. & Swarts, J.C.** 2008. *Synthetic, electrochemistry and structural aspects of ferrocene-containing tris-betadiketonato aluminium(III) complexes*. Poster presented at the 16th International Symposium on Homogeneous Catalysis (ISHC16), Florence, Italy. 6-11 July.
- Gericke, H. & Swarts, J.C.** 2008. *The synthesis and electrochemical communication of ferrocene-containing tris-betadiketonato aluminium(III) complexes*. Poster presented at the 23rd International Conference on Organometallic Chemistry (ICOMC23), Rennes, France. 13-18 July.
- Han, Z., Bonnet, S.L. & Van der Westhuizen, J.H.** 2008. *Syntheses of xanthine derivatives by photolysis of pentoxifylline: An ambident chromophore*. Poster presented at the Bi-National Organic Chemistry Conference (BOCC '08) of the South African Chemical Institute (SACI) and the Gesellschaft Deutscher Chemiker (GDCh), incorporating the 10th Frank Warren Conference in Organic Chemistry, Berg-en-Dal Ruskamp, Kruger Park, South Africa. 14-19 September.
- Hill, T. & Roodt, A.** 2008. *Crystallographic and computational aspects of cyclo-octadiene systems*. Poster presented at the 39th National Convention of the South African Chemical Institute (SACI), Stellenbosch, South Africa. 30 November-5 December.
- Kirsten, L., Steyl, G. & Roodt, A.** 2008. *Carboxylato Rh(II) phosphite complexes as catalyst precursors in hydroformylation*. Poster presented at the 39th National Convention of the South African Chemical Institute (SACI), Stellenbosch, South Africa. 30 November-5 December.
- Kotzé, P.D.R., Brink, A., Roodt, A. & Visser, H.G.** 2008. *Electronic variation of group 15 ligands affecting rhodium catalytic reactions*. Poster presented at the 39th National Convention of the South African Chemical Institute (SACI), Stellenbosch, South Africa. 30 November-5 December.
- Kuo, C-M., Kamara, B.I. & Bezuidenhout, B.C.B.** 2008. *Isolation and synthesis of compounds from scilla natalensis*. Poster presented at the Bi-National Organic Chemistry Conference (BOCC '08) of the South African Chemical Institute (SACI) and the Gesellschaft Deutscher Chemiker (GDCh), incorporating the 10th Frank Warren Conference in Organic Chemistry, Berg-en-Dal Ruskamp, Kruger Park, South Africa. 14-19 September.
- Langner, E.H.G., Conradie, J., Ghosh, A. & Swarts, J.C.** 2008. *A computational study of octa substituted tetrabenzocorrolazines*. Poster presented at the 5th International Conference on Porphyrins and Phthalocyanines (ICPP-5), Moscow, Russia. 6-11 July.
- Luyt, A.S.** 2008. *Paraffin wax in polymer blends and composites: Is it worth investigating?* Keynote lecture presented at the 39th National Convention of the South African Chemical Institute (SACI), Stellenbosch, South Africa. 30 November-5 December.
- Mohomane, S.M. & Luyt, A.S.** 2008. *Morphology and properties of polychloroprene nanocomposites*. Paper presented at the 24th Annual Meeting of the Polymer Processing Society, Salerno, Italy. 15-19 June.
- Mohomane, S.M. & Luyt, A.S.** 2008. *Thermal, mechanical, and morphological properties of polychloroprene/montmorillonite nanocomposites*. Poster presented at the 10th Annual UNESCO/IUPAC (International Union of Pure and Applied Chemistry) Conference on Macromolecules and Materials, Berg-en-Dal Ruskamp, Kruger National Park, South Africa. 7-11 September.
- Mokoena, M.A. & Luyt, A.S.** 2008. *Investigation of fibre reinforced HDPE composites crosslinked/grafted through siloxane linkage*. Poster presented at the 10th Annual UNESCO/IUPAC (International Union of Pure and Applied Chemistry) Conference on Macromolecules and Materials, Berg-en-Dal Ruskamp, Kruger National Park, South Africa. 7-11 September.
- Molefi, J.A., Luyt, A.S. & Krupa, I.** 2008. *Thermal and mechanical properties of phase change conductive polymer composite materials*. Poster presented at the 10th Annual UNESCO/IUPAC (International Union of Pure and Applied Chemistry) Conference on Macromolecules and Materials, Berg-en-Dal Ruskamp, Kruger National Park, South Africa. 7-11 September.
- Monnahela, S.O., Carstens, P.A.B., Wagener, J.B., Moolman, D., De Waal, D. & Roodt, A.** 2008. *Analysis of the ZrO₂ / HF reaction using Raman spectroscopy*. Poster presented at the 21th International Conference on Raman Spectroscopy, (ICORS 2008), Uxbridge, West London, UK. 17-22 August.
- Motaung, T.E., Mishra, S.B. & Luyt, A.S.** 2008. *Morphology and properties of sol-gel prepared LDPE silica nanocomposites*. Poster presented at the 10th Annual UNESCO/IUPAC (International Union of Pure and Applied Chemistry) Conference on Macromolecules and Materials, Berg-en-Dal Ruskamp, Kruger National Park, South Africa. 7-11 September.
- Mtshali, T.N., Purcell, W. & Visser, H.G.** 2008. *Synthesis and structural characterization of [ReN(LL-k²N,O)(CN)₃]²⁻ and [ReN(LL-k²N,N)(CN)₃]²⁻*. Poster presented at the 38th International Conference on Coordination Chemistry (ICCC38), Jerusalem, Israel. 20-25 July.
- Mtshali, T.N., Purcell, W., Visser, H.G. & Basson, S.S.** 2008. *Coordination chemistry of Re(V): Synthesis, characterization and kinetic studies of the formation of [ReN(κ²-LL)(CN)₃]²⁻ ions in aqueous media*. Lecture presented at the 6th International Symposium on Technetium and Rhenium-Science and Utilization (IST2008), Conference Centre of the Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 7-10 October.
- Muller, T.J., Roodt, A. & Steyl, G.** 2008. *Copper based building blocks for oxidation catalysis*. Poster presented at the Conference of the Catalysis Society of South Africa (CATSA), Parys, South Africa. 9-12 November.
- Muller, T.J., Roodt, A. & Steyl, G.** 2008. *Copper based building blocks for oxidation catalysis*. Poster presented at the 39th National Convention of the South African Chemical Institute (SACI), Stellenbosch, South Africa. 30 November-5 December.
- Nhlapo, L.P. & Luyt, A.S.** 2008. *Thermal and mechanical properties of the LDPE/sisal fibre composites compatibilized with modified paraffin waxes*. Poster presented at the 10th Annual UNESCO/IUPAC (International Union of Pure and Applied Chemistry) Conference on Macromolecules and Materials, Berg-en-Dal Ruskamp, Kruger National Park, South Africa. 7-11 September.
- Purcell, W., Mtshali, T.N. & Visser, H.G.** 2008. *A structural and kinetic comparison between [ReO(H₂O)(CN)₄]⁻ and [ReN(H₂O)(CN)₄]²⁻*. Paper presented at the 6th International Symposium on Technetium and Rhenium-Science and Utilization (IST2008), Conference Centre of the Nelson Mandela Metropolitan

- University, Port Elizabeth, South Africa. 7-10 October.
- Roodt, A. & Muller, A.J.** 2008. *Solid state packing behaviour in pseudo Vaska-type complexes*. Poster presented at the 21st General Assembly and Congress of the International Union of Crystallography, Osaka, Japan. 23-31 August.
- Roodt, A., Venter, G.J.S. & Meijboom, R.** 2008. *Supramolecular coordination chemistry of silver(I) complexes with group 15 ligands*. Poster presented at the 38th International Conference on Coordination Chemistry (ICCC38), Jerusalem, Israel. 20-25 July.
- Roodt, A., Venter, G.J.S. & Meijboom, R.** 2008. *Supramolecular coordination chemistry of silver(I) complexes with group 15 ligands*. Poster presented at the 38th International Conference on Coordination Chemistry (ICCC38), Jerusalem, Israel. 20-25 July.
- Schutte, M., Visser, H.G. & Roodt, A.** 2008. *Crystallographic investigation of different $[Re(CO)_3(L_1)(L_2)]^n$ complexes*. Poster presented at the 6th International Symposium on Technetium and Rhenium-Science and Utilization (IST2008), Conference Centre of the Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 7-10 October.
- Schutte, M., Visser, H.G. & Roodt, A.** 2008. *Crystallographic investigation of different $[Re(CO)_3(L_1)(L_2)]^n$ complexes*. Poster presented at the 39th National Convention of the South African Chemical Institute, Stellenbosch, South Africa. 30 November-5 December 2008.
- Steyl, G., Muller, T. & Roodt, A.** 2008. *Copper oxidase catalysis: Oxidation of organic chemicals by direct dioxygen coupled turnover*. Invited lecture presented at the 23rd International Conference on Organometallic Chemistry (ICOMC23), Rennes, France. 13-18 July.
- Steyn, M., Steyl, G. & Roodt, A.** 2008. *Speciation and interconversion mechanism of mixed halo O,O'- and O,N-bidentate ligand complexes of zirconium*. Paper presented at the Advanced Metals Initiative Conference 2008, Oppenheimer Conference Centre, Gold Reef City, Johannesburg, South Africa. 18-19 November.
- Sunil, C.A., Langner, E.H.G., Marais, C. & Bezuidenhoudt, B.C.B.** 2008. *Mechanism of the copper catalysed rearrangement of toluic acids to meta-cresol*. Poster presented at the Bi-National Organic Chemistry Conference (BOCC '08) of the South African Chemical Institute (SACI) and the Gesellschaft Deutscher Chemiker (GDCh), incorporating the 10th Frank Warren Conference in Organic Chemistry, Berg-en-Dal Ruskamp, Kruger Park, South Africa. 14-19 September.
- Swarts, J.C.** 2008. *Unusual scrambling reactions, atropisomerisation and electrochemical quantification of meso substituent polarization effects in ferrocene-containing porphyrins*. Paper presented at the 5th International Conference on Porphyrins and Phthalocyanines (ICPP-5), Moscow, Russia. 6-11 July.
- Swarts, J.C., Auger, A. & Muller, A.J.** 2008. *Unusual scrambling reactions and electrochemical quantification of meso substituent polarization effects of ferrocene-containing porphyrins*. Poster presented at the 23rd International Conference on Organometallic Chemistry (ICOMC23), Rennes, France. 13-18 July.
- Van Tonder, B. & Bezuidenhoudt, B.C.B.** 2008. *Synthesis of 4-arylflavan-3-ol lactones*. Poster presented at the Bi-National Organic Chemistry Conference (BOCC '08) of the South African Chemical Institute (SACI) and the Gesellschaft Deutscher Chemiker (GDCh), incorporating the 10th Frank Warren Conference in Organic Chemistry, Berg-en-Dal Ruskamp, Kruger Park, South Africa. 14-19 September.
- Van Tonder, J.H., Robb, L.M., Bezuidenhoudt, B.C.B. & Cole-Hamilton, D.J.** 2008. *Selective hydrogenation of α,β -unsaturated ketones*. Poster presented at the Bi-National Organic Chemistry Conference (BOCC '08) of the South African Chemical Institute (SACI) and the Gesellschaft Deutscher Chemiker (GDCh), incorporating the 10th Frank Warren Conference in Organic Chemistry, Berg-en-Dal Ruskamp, Kruger Park, South Africa. 14-19 September.
- Venter, G.J.S., Steyl, G. & Roodt, A.** 2008. *$[Rh(bid)(CO)_2]$ complexes and their PX_3 derivatives: an oxidative addition study*. Poster presented at the 39th National Convention of the South African Chemical Institute (SACI), Stellenbosch, South Africa. 30 November-5 December.
- Venter, J.A., Basson, S.S. & Purcell, W.** 2008. *Unravelling the effect of phosphine ligands and solvents on the oxidative addition of rhodium(I) cupferrate complexes*. Poster presented at the 23rd International Conference on Organometallic Chemistry (ICOMC23), Rennes, France. 13-18 July.
- Venter, J.A., Basson, S.S. & Purcell, W.** 2008. *Unravelling the effect of phosphine ligands and solvents on the oxidative addition of rhodium(I) cupferrate complexes*. Poster presented at the 23rd International Conference on Organometallic Chemistry (ICOMC23), Rennes, France. 13-18 July.
- Versteeg, M., Bezuidenhoudt, B.C.B. & Ferreira, D.** 2008. *Stereoselective synthesis of isoflavonoids*. Lecture delivered at the Bi-National Organic Chemistry Conference (BOCC '08) of the South African Chemical Institute (SACI) and the Gesellschaft Deutscher Chemiker (GDCh), incorporating the 10th Frank Warren Conference in Organic Chemistry, Berg-en-Dal Ruskamp, Kruger Park, South Africa. 14-19 September.
- Viljoen, J.A., Muller, A.J. & Roodt, A.** 2008. *Speciation and interconversion mechanism of mixed halo O,O'- and O,N-bidentate ligand complexes of Hafnium*. Lecture delivered at the Advanced Metals Initiative Conference 2008, Oppenheimer Conference Centre, Gold Reef City, Johannesburg, South Africa. 18-19 November.
- Visser, H.G., Schutte, M., Roodt, A. & Brink, A.** 2008. *Rhenium(I) compounds in nuclear medicine. Crystallographic and kinetic investigation of different $[Re(CO)_3(L_1)(L_2)]^n$ complexes*. Poster presented at the 6th International Symposium on Technetium and Rhenium-Science and Utilization (IST2008), Conference Centre of the Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 7-10 October.
- Wilhelm, A., Bonnet, S.L. & Van der Westhuizen, J.H.** 2008. *Photochemistry of (+)-catechin and (-)-epicatechin*. Poster presented at the International Union of Pure and Applied Chemistry (IUPAC) Conference on Organic Synthesis (ICOS17), Daejeon, South Korea. 22-27 June.
- Wilhelm, A., Bonnet, S.L. & Van der Westhuizen, J.H.** 2008. *Photochemistry of aromatic flavanoid derivatives*. Poster presented at the Bi-National Organic Chemistry Conference (BOCC '08) of the South African Chemical Institute (SACI) and the Gesellschaft Deutscher Chemiker (GDCh), incorporating the 10th Frank Warren Conference in Organic Chemistry, Berg-en-Dal Ruskamp, Kruger Park, South Africa. 14-19 September.

Department of Computer Science and Informatics

“A variety of research is done with the eye-tracking equipment. This includes a study to determine whether viewers notice advertisements, either consciously or subconsciously, while they are watching sport on television” - Prof. Janse Tolmie.

Overview

The Department of Computer Science and Informatics produces graduates that are highly sought after by Free State-based and national companies. Academic staff and students engage in a wide variety of research endeavours that cover both theoretical and applied areas of the field.

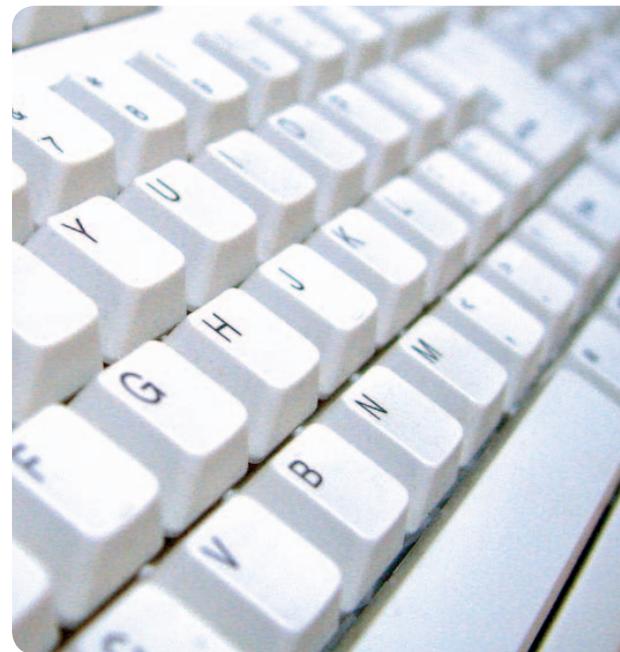
During 2008, just under 300 students were registered on the Main Campus of the University of the Free State (UFS) for the mainstream information technology (IT) courses on first-year level, about 70 students on second year level and 50 students on third-year level. A further 100 first-year students, 20 second-year students and eight third-year students were registered on the Qwaqwa Campus. On postgraduate level, two Ph.D. students, ten master's students and 40 honours students were registered.

Besides the mainstream IT courses, the department also trained more than 2 500 students on the Main Campus and 1 100 students on the Qwaqwa Campus in basic and advanced computer literacy. A number of short computer literacy courses were offered to members of the community, and staff from the department took part in a project aimed at training previously disadvantaged learners.

The department's research is primarily focused on various aspects of human-computer interaction (HCI), data warehouses and teach-



Prof. Janse Tolmie.



ing and learning. Publications were presented at international conferences in the United States of America (USA), Korea, France and South Africa.

The department is the proud owner of eye-tracking equipment that enables researchers to determine the gaze patterns of a person while he/she is looking at a computer screen (refer to the photos). This technology is particularly valuable in usability studies of computer software and websites. *Inter alia*, a project was done in 2008 to determine the effectiveness and efficiency with which users can execute tasks on the WOMF website of OFM, a regional radio station. The

eye-tracking equipment is also used in an ongoing project which endeavours to determine whether there is a difference in the way novices and masters look at a chess board – thereby assisting chess coaches to identify perceptual shortcomings of their students. Another study was done to determine whether viewers notice advertisements, either consciously or subconsciously, while they are watching sport on television.

Besides using the eye-tracking equipment for applied research, basic eye-tracking research is also done. The validity and accuracy of algorithms with which fixations are identified have been investigated while a research



Students at work during a practical session in one of the department's undergraduate laboratories.

project is underway to develop a multimodal interface which will integrate automatic speech recognition (ASR) and eye gaze. As a final outcome of the study, it is envisaged that a multimodal interface, which can be used by a wide range of users to increase productivity, will be recommended. This interface will initially be tested within the environment of a word processor but will ideally be practical enough to extend to other office applications.

Another thread of the HCI research focuses on the effect of search strings while people use search engines such as Google

or Yahoo. One project focuses specifically on the way in which search engines handle ambiguous queries and whether users make use of suggestions as provided by search engines. Another project endeavours to determine the representativeness of South African web sites in the indexes of search engines and how Afrikaans sites compare with English (South African) sites in this regard.

A data warehouse has been developed to provide integrated strategic information for the management of the antiretroviral (ARV) programme in the Free State Province. This data warehouse enables the

provision of a longitudinal patient record for ARV patients. Another project focused on the status of business intelligence of subsidised bus companies in South Africa.

In the area of teaching and learning, research was done regarding the use of blended learning to encourage student contact/interaction and enhance the student learning experience as a whole. Various active teaching and learning strategies were tested in an attempt to increase IT students' level of engagement in face-to-face lectures. A set of guidelines were also devised for the use of electronic feedback instruments. ■



A specific frame during a television broadcast of the Comrades Marathon. Viewers are particularly attracted by gestures although some read the text at the bottom of the screen while others observe the corner logos.

About the department's programmes

The department is involved in two major undergraduate learning programmes, viz. B.Com.(IT) and B.Sc.(IT). B.Com.(IT) is ideal for those who plan to specialise in management of information technology (IT), computer information systems, computer programming and applications. The B.Sc.(IT) programme delivers highly trained information technologists with technical skills in programming, system design and analysis as well as database and network management.

During the course of the three-year programme, students

are trained to develop complete, usable software solutions through modules in hardware, programming, web site development and internet programming, database and network management, software engineering and user interfaces.

Within the B.Sc.(IT) learning programme, students can specialise to apply their IT skills in Mathematics, Industry and Mining, Geographical Information Systems or IT Management. The powerful combination of Computer Science with Mathematics and/or Mathematical Sta-

tistics provides the student with a solid knowledge base and excellent background for a career as information technologist in the IT industry or at research institutions such as universities, the Council for Scientific and Industrial Research (CSIR), the Agricultural Research Council (ARC) and Mintek.

For specialisation in Industry and Mining, the student can combine IT with the physical and/or geosciences to open up a career in industry, for example in the manufacturing sector, chemical industry, mining, geology or mineralogy sectors. The connection of geographical

information and computer technology simplifies the storage, processing, modelling and presentation of information and expedites decision making. A GIS scientist is prepared for a challenging career in diverse directions such as defence, planning, agriculture, tourism, the environment and resource management. Specialisation in IT management enables individuals in the science and commercial sectors to understand and speak one another's language. It is directed towards preparing a student for a career as IT manager in both the public and private sectors.

Research outputs

Research articles

Blignaut, P.J. & Naudé, A. 2008. The influence of temperament style on a student's choice of and performance in a computer programming course. *Computers in Human Behavior* 24: 1010-1020.

Nel, E. & Wilkinson, A.C. 2008. Establishing a preliminary framework for effective blended learning practices in the undergraduate classroom: A South African perspective on selected aspects. *South African Journal of Higher Education* 22(1): 146-176.

Reports

Blignaut, P.J. 2008. *Eye-tracking study on the viewing behaviour during broadcasting of high profile sports events*. Report to IFM Sports Marketing Surveys SA (Pty) Ltd (SMS), Johannesburg, South Africa.

Blignaut, P.J. 2008. *Usability study of the website of WOMF*. Report to OFM, Bloemfontein, South Africa.

Conference contributions

Beelders, T.R., Blignaut, P.J., McDonald, T. & Dednam, E. 2008. *No-vice word processor user performance with pictorial and text icons*. Paper presented at the Computer-Human Interaction: 8th Asia-Pacific Confe-

rence (APCHI 2008), Seoul, Korea. 6-9 July.

Blignaut, P.J., Beelders, T.R. & So, C-Y. 2008. *The visual span of chess players*. Paper presented at the Association for Computing Machinery (ACM) Conference on Eye-Tracking and Research Applications, Savannah, Georgia, USA. 26-28 March.

McDonald, T. & Blignaut, P.J. 2008. *Language aspects of web searching: An African perspective*. Paper presented at the 6th International Conference on Cultural Attitudes towards Technology and Communication (catAc08), Université de Nîmes, France. 24-27 June.

Mosebi, M. & McDonald, T. 2008. *Application of business intelligence in South African subsidised bus companies*. Paper presented at the Annual South African Telecommunication Networks and Applications Conference (SATNAC 2008), Wild Coast Sun, South Africa. 6-10 September.

So, C-Y., Blignaut, P.J. & Beelders, T.R. 2008. *Content analysis and usability inspection on international city tourism websites*. Poster presented at the 10th Annual Conference on World Wide Web Applications (WWW 2008), Cape Peninsula University of Technology, Cape Town, South Africa. 3-5 September.

Staff

Main Campus:

Professors: Profs Pieter Blignaut, Theo McDonald, Hans Messerschmidt, Janse Tolmie

Senior Lecturer: Dr Lizette de Wet

Lecturers: Drs Liezel Nel, Anelize Van Biljon, Mss Tanya Beelders, Engela Dednam, Messrs Andries Burger, Deon du Plessis, Dana Kotze, Eduan Kotze, Wynand Nel, Casper Wessels

Junior Lecturers: Messrs Rouxan Fouche, Jaco Marais

Administrative Officers: Mss Marina Botha, Erna Dippenaar, Coreen Human, Tokkie van Loggerenberg

Technical Officer: Mr Jacob Buys

Qwaqwa Campus:

Junior Lecturers: Mss Nidhi John, Ruth Wario, Messrs Ben Mase, Thabo Mosia, Frederick Mudavanhu, Fani Radebe, Benedict Sebastian

Administrative Officer: Ms Bless

Technical Officer: Mr Teboho Lesesa

South Campus:

Lecturer: Ms Nancy de Sousa

Junior Lecturer: Mr Timothy Mahloko

Contact details

Prof. Pieter Blignaut

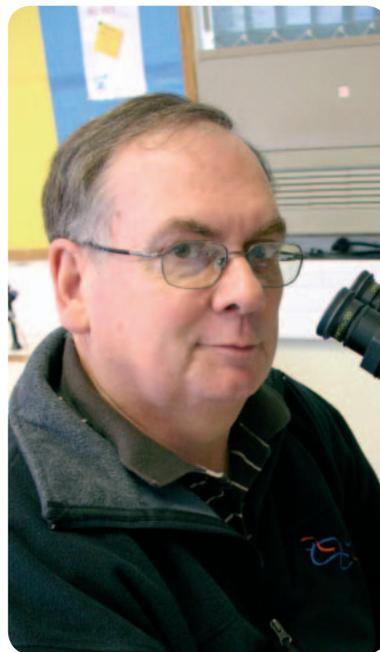
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Department of

Genetics

“The re-establishment of the department was a proud moment for us” - Prof. Johan Spies.



Prof. Johan Spies.

Overview

The Department of Genetics aims to acquire and disseminate knowledge of Genetics to the benefit of all. This is done by research and education on undergraduate and postgraduate levels.

The re-establishment of the department was celebrated on 12 September 2008 by means of a mini-conference held on the Main Campus of the University of the Free State (UFS) in Bloemfontein. At this conference lectures were presented on the history of the department by Prof. Herman van Schalkwyk, Dean of the Faculty of Natural and Agricultural Sciences, the current research and possible future focus areas in

animal genetics by Prof. Paul Grobler, Associate Professor in the department, human genetics by Prof. Chris Viljoen, Associate Professor in the Department of Haematology and Cell Biology at the UFS and plant genetics by Prof. Johan Spies, Chairperson of the Department of Genetics.

During 2008 Ms Paula Spies joined the department as lecturer in Molecular Systematics and Cytogenetics. She completed her M.Sc. thesis in the department and replaced Dr Adèle Strydom who moved to Pretoria.

The department received a visit from a Hungarian delegation from the University of Kaposvár during

July 2008. This visit forms part of a South African-Hungarian research collaboration initiative and is done in collaboration with the National Zoological Gardens. The visit was followed by a visit in August to Hungary by Profs Spies, Grobler, Antoinette Kotzé and Ms Karen Ehlers, all from the Department of Genetics, as well as two representatives from the National Zoological Gardens of South Africa.

Staff members were active in various organisations and Prof. Spies is currently the Chairperson of the Clivia Society. Prof. Grobler acts as Adjunct Associate Professor for the Department of Fisheries and Wildlife Sciences at Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, United States of America (USA). He is also a Council Member of the South African Genetics Society and the Southern African Wildlife Management Association (SAWMA).

Prof. Antoinette Kotzé is currently a Council Member of SAWMA, Chair of the African Association of Zoos and Aquariums Research and Monitoring Working Group and Chair of the National Zoological Gardens of South Africa's Research and Ethics Committee. She also serves on the Board of Directors of the Mabula Ground Hornbill Research and Conservation Project, she is Member of the National Cheetah Conservation Forum and a Management Member of the Vulture Conservation Programme.

Various national and international congresses were attended during the year. On international level, Prof. Johan Spies delivered the keynote address at the Annual General Meeting of the Clivia Society. In February, Prof. Grobler visited the Virginia Tech campus and presented an invited lecture. During the same visit to the USA, he also travelled to the Coriell Institute for Medical Research and presented an invited lecture at that institution. Ms Paula Spies presented an invited paper at the fourth Monocot Symposium in Copenhagen, Denmark, during August 2008. This paper concentrated on chromosomal evolution in the genus *Lachenalia*.

On a national level, Profs Johan Spies and Paul Grobler, Mr Frank Maleka, Ms Spies and three post-graduate students attended the bi-annual Congress of the South African Genetics Society in Pretoria where two lectures and a poster were presented. At this occasion Prof. Spies was awarded with a fellowship of the society for his contribution to the society and to genetics. Prof. Grobler attended the Annual Meeting of the SAWMA in the Eastern Cape from 16-19 September 2008 where he chaired one session. He was also placed second in the compe-



Prof. Paul Grobler, Ms Karen Ehlers and Prof. Antoinette Kotzé with a sedated rhinoceros calf.

dition for the best senior presentation. Prof. Antoinette Kotzé also attended this meeting, as well as the 19th Annual Conference of the African Association of Zoos and Aquariums (PAAZAB) at uShaka Seaworld, Durban and the 3rd Animal Keepers Association of Africa Conference (CangoAKAACon2008) in Oudtshoorn.

The animal genetics team (Profs Paul Grobler and Antoinette Kotzé

and Ms Karen Ehlers) are busy with a number of projects, including the following: a project that aims to investigate the nature and extent of hybridization between blue and black wildebeest in South Africa (in collaboration with the University of Pretoria, the National Zoological Gardens, the National Museum in Bloemfontein, and conservation officers from the Free State and KwaZulu Natal Provinces); DNA profiling of black rhino in the Weenen Game Reserve (with KZN Wildlife); conservation and environment: the genetic management of baboon populations (Gauteng Department of Agriculture); the National Genetic Database for cheetah (National Zoological Gardens, Pretoria; Department of Genetics, University of Pretoria; De Wildt Cheetah and Wildlife Trust, Hillsdale College, USA; University of Vienna, Austria); population management of crane species (National Zoological Gardens, Pretoria; Endangered



At the celebration on the establishment of the Department of Genetics are, from the left: Prof. Herman van Schalkwyk, Dean of the Faculty of Natural and Agricultural Sciences at the UFS, Prof. Johan Spies, Department Chairperson of Genetics at the UFS, Prof. Chris Viljoen, associate professor at the department of Haematology and Cell Biology and previously associated with the Department of Genetics; seated: Prof. Paul Grobler, associate professor at the department of Genetics.



Profs Johan Spies (front) and József Lanszki from the Faculty of Animal Sciences at the University of Kaposvár (Hungary) busy feeding tame red deer on the university's experimental farm.

Wildlife Trust); genetic and population studies on ground hornbills (National Zoological Gardens, Pretoria; Endangered Wildlife Trust, Ground Hornbill Working Group; Mabula Ground Hornbill Research and Conservation Project; University of Pretoria; Natural History Museum, Paris, France); and the

compilation of an atlas for haemoglobin profiles (BIORAD, Germany; SANParks; University of Limpopo).

Other projects of the team include white rhino conservation and genetics (Mpumalanga Parks and Tourism Agency), an Amphibian Prioritization Workshop (Johannesburg Zoo, PAAZAB, Henry Doorly Zoo, Amphibian ARK) and an investigation of the geographic genetic structure among vervet monkey populations, to regulate the release of monkeys from sanctuaries (University of Milwaukee-Wisconsin, USA). The vervet monkey project is also about to be expanded to include collaboration with a team at the University of California in the USA involved in a study on the use of vervet monkeys as an integrated genetic and genomic resources model system.

A study on genetic diversity in different *Clivia* species and the pos-

sible application of these results in forensics is currently being done. Research on the genes involved in the formation of flower colour in *Clivia* has already identified four genes in the anthocyanin pathway and tested their expression in different cultivars.

Prof. Trudy Turner from the Department of Physical Anthropology at the University of Milwaukee-Wisconsin, USA, visited the department in January 2008 and again in July 2008. During the February visit she conducted a joint field trip with Prof. Paul Grobler to collect vervet monkey samples near Parys in the Free State Province. In July she accompanied Prof. Grobler and a group of postgraduate students on an extensive field trip to sample vervet monkeys in the Eastern Cape area (Tsolwana and Baviaans-kloof areas).

During the Hungarian visit to South Africa the following lectures were delivered:

- Dr Tamas Molnar: Molecular research at the Kaposvár University.
- Prof. Jozsef Lanszki: Biodiversity of the Drava River with special emphasis on otter research.
- Dr Janos Nagy: Deer farming in Hungary.

Prof. Janice Britton-Davidian from Montpellier University, France visited the department during November and delivered a lecture on "The pygmy mice story".

Prof. Johan Spies acts as information officer for the distribution of knowledge obtained during the research on *Clivia* and handles many enquiries from the *Clivia* breeders. Prof. Antoinette Kotzé participated in a radio and a television programme. ■

Staff

Professor: Prof. Johan Spies

Associate Professor: Prof. Paul Grobler

Affiliated Associate Professor: Prof. Antoinette Kotzé

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

Professional Officer: Ms Susan Reinecke

Contact details

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Research outputs

Research articles

Engelbrecht, G.M., Du Preez, C.C. & Spies, J.J. 2008. Response of *Lachenalia* growing in soil to nitrogen fertilisation during the pot plant phase. *South African Journal of Plant and Soil* 25: 92-98.

Kotze, A., Ehlers, K., Cilliers, D. & Grobler, J.P. 2008. The power of

resolution of microsatellite markers and assignment tests to determine the origin of cheetah (*Acinonyx jubatus*) in southern Africa. *Mammalian Biology* 73: 457-462.

Spies, J.J. & Holder, F. 2008. IAPT/IOPB chromosome data - Poaceae. *Taxon* 57: 211-212.

Spies, J.J., Spies, P., Reinecke, S.M.C., Kleynhans, R., Duncan, G.D. & Edwards, T.J. 2008. IAPT/IOPB chromosome data - *Lachenalia*. *Taxon* 57: 212-213.

Turnbull, P.C.B., Diekman, M., Kilian, J.W., Versveld, W., De Vos, W., Arntzen, L., Wolter, K., Bartels, P. & Kotze, A. 2008. Naturally acquired antibodies to *Bacillus anthracis* protective antigen in cultures of Southern Africa. *Onderstepoort Journal of Veterinary Research* 75: 95-102.

Venter, A.M. & Spies, J.J. 2008. IAPT/IOPB chromosome data - *Lycium*. *Taxon* 57: 213.

Chapters in books

Kotze, A., Allenby, C. & Morgan, D.R. 2008. The role of captive facilities in wildlife ranching. In *Wildlife Ranching in South Africa*, edited by National Department of Agriculture, Pretoria, South Africa. Pretoria: Department of Agriculture. pp. 66-69.

Conference contributions

Allenby, C., Mhlari, H. & Kotze, A. 2008. *Why an environmental accreditation programme: The National Zoological Gardens (NZG) experience*. Poster presented at the 3rd Animal Keepers Association of Africa Conference (CangoAKAACon2008): The Year of the Frog, Cango Wildlife Range, Oudtshoorn, South Africa. 15-18 September.

Bubb, A., Ehlers, K., Grobler, J.P. & Kotze, A. 2008. *Genetic management of the baboon population in the Suikerbosrand Nature Reserve*. Poster presented at the Southern African Wildlife Management Association (SAWMA) Conference: Biodiversity Conservation: The Science Management Interface, Mpekweni Beach Resort, Port Alfred, South Africa. 16-19 September.

Dalton, D.L. & Kotze, A. 2008. *Genetics and genomes – tools for avian conservation*. Paper presented at the 4th Annual Birds of Prey Working Group (EWT-BoPWG) Conference, Sukuza, Kruger National Park, South Africa. 26-30 May.

Grobler, J.P., Ehlers, K. & Kotze, A. 2008. *Application and limitations of assignment methods used to determine the geographic origin of translocated cheetah*. Paper presented at the 20th Biennial Congress of the South African Genetics Society, Sanlam Auditorium, UP Conference Centre, University of Pretoria, South Africa. 27-29 March.

Grobler, J.P., Kotze, A., Ehlers, K. & Turner, T. 2008. *Application and limi-*

tations of assignment methods in conservation genetics: Two case studies from South Africa. Paper presented at the Southern African Wildlife Management Association (SAWMA) Conference: Biodiversity Conservation: The Science Management Interface, Mpekweni Beach Resort, Port Alfred, South Africa. 16-19 September.

Grobler, J.P., Kotze, A., Ehlers, K., Bloomer, P., Rushworth, I., Brink, J. & Vrahimis, S. 2008. *Hybridization between black- and blue wildebeest (Connochaetes gnou and C. taurinus): Approaches to the genetic management of sympatric congeners*. Poster presented at the 20th Biennial Congress of the South African Genetics Society, Sanlam Auditorium, UP Conference Centre, University of Pretoria, South Africa. 27-29 March.

Ingle-Möller, R. & Kotze, A. 2008. *Implementation of the African SPIDER Framework as a sustainable professional and environmental enrichment programme*. Paper presented at the 19th Annual General Meeting and Conference of the African Association of Zoos and Aquaria (PAAZAB), uShaka Seaworld, Durban, South Africa. 7-9 May.

Ingle-Moller, R., Chauke, T., Mpolokeng, R., Du Plessis, E., Goosen, K., Morgan, D. & Kotze, A. 2008. *Year of the frog: Enriching amphibians through a structured environmental enrichment programme at the National Zoological Gardens of South Africa*. Paper presented at the 19th Annual General Meeting and Conference of the African Association of Zoos and Aquaria (PAAZAB), uShaka Seaworld, Durban, South Africa. 7-9 May.

Jonker, L., Kaljee, J., Kotze, A., Ehlers, K. & Grobler, J.P. 2008. *Aspects of genetic diversity within and between wildebeest species (genus: Connochaetes)*. Poster presented at the Southern African Wildlife Management Association (SAWMA) Conference: Biodiversity Conservation: The Science Management Interface, Mpekweni Beach Resort, Port Alfred, South Africa. 16-19 September.

Kleynhans, R., Spies, J.J. & Spies, P. 2008. *Cross-ability in the genus Lachenalia*. Paper presented at the 20th Biennial Congress of the South African Genetics Society, Sanlam Auditorium, UP Conference Centre, University of Pretoria, South Africa. 27-29 March.

Kotze, A. & Allenby, C. 2008. *The year of the frog: Leaping for conservation*. Paper presented at the Southern African Wildlife Management Association (SAWMA) Conference: Biodiversity Conservation: The Science Man-

agement Interface, Mpekweni Beach Resort, Port Alfred, South Africa. 16-19 September.

Kotze, A., Lekgethisho, D., York, D., Van der Spuy, S., Weldon, C. & Du Preez, L. 2008. *Determination of Batrachochytrium dendrobatidis occurrence on amphibians in South Africa based on DNA analysis*. Poster presented at the 20th Biennial Congress of the South African Genetics Society, Sanlam Auditorium, UP Conference Centre, University of Pretoria, South Africa. 27-29 March.

Kotze, A., Lekgethisho, D., York, D., Van der Spuy, S., Weldon, C., Du Preez, L., Dalton, D.L. & Morgan, D.R. 2008. *Evaluation of Batrachochytrium dendrobatidis in amphibian samples from South Africa using a DNA-based assay*. Paper presented at the 19th Annual General Meeting and Conference of the Africa Association of Zoos and Aquaria (PAAZAB), uShaka Seaworld, Durban, South Africa. 7-9 May.

Payn, K.G., Maleka, M.F., Janse, B.J.H., Dvorak, W.S. & Myburg, A.A. 2008. *Population genetic analysis of Eucalyptus urophylla based on chloroplast DNA, microsatellite and single nucleotide polymorphism (SNP) diversity*. Paper presented at the 20th Biennial Congress of the South African Genetics Society, Sanlam Auditorium, UP Conference Centre, University of Pretoria, South Africa. 27-29 March.

Shrestha, J.N.B., Galal, S., Mariante A.d.S., Kotze, A., Delgado, J.V. & Devendra, C. 2008. *Impact of globalization on livestock and poultry genetic resources in the world*. Invited paper presented at the 7th Global Conference of Rare Breeds International (RBI): Impact of the Globalisation on the Animal Genetic Resources, National Institute of Animal Husbandry (NIAH), Hanoi, Vietnam. 15-19 September.

Spies, P., Spies, J.J. & Kleynhans, R. 2008. *Chromosomal evolution in the genus Lachenalia (Hyacinthaceae)*. Invited paper presented at the IVth International Conference on the Comparative Biology of the Monocotyledons, H.C. Ørsted Institute, University of Copenhagen, Copenhagen, Denmark. 11-15 August.

Viljoen, T.E., Van der Linde, T.C. & Ehlers, K. 2008. *Preliminary study: The analysis of blowfly larval crops for the presence of host genomic DNA*. Poster presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.

Department of

Geography

“Staff members were active in a number of diverse research directions” - Prof. Peter Holmes.



Prof. Peter Holmes.

Overview

The Department of Geography continues to draw students in roughly equal proportions from both the natural sciences and the humanities. The growth in undergraduate student numbers which was a feature of 2007 continued into 2008. Environmental issues appear to be driving a new generation of undergraduates to register for degrees in Geography.

On the Geographical Information Systems (GIS) front, the laboratory has reached its maximum capacity with 39 computers. The department holds a site license for 500 GIS seats, thus accommodating an increasing number of users from outside Geography. Data holdings

were increased to more than 600 GB with the addition of more aerial photographs, satellite images and digital maps of southern Africa. Another significant trend is the number of honours and master's students undertaking research dissertations where aspects of environmental management form the focus. Three students were registered for Ph.D. degrees in 2008.

Dr Tabukeli Ruhiiga joined the Qwaqwa Campus as a lecturer at the start of 2008. Dr Ruhiiga's research focus is on land resources, settlement location, and rural poverty. He is also working on comparative profitability in the small business sector. Staff members were active in a number of diverse research

directions. Prof. Gustav Visser received funding from the National Research Foundation's (NRF) Focus Area Research Grants Programme to support research into second home development in South Africa. This grant made possible research visits to universities in South Africa and abroad. Activities included the presentation of a lecture series on identity-based consumption and urban morphological change at Stellenbosch University, and the presentation of a paper at the Annual Conference of the Royal Geographical Society in London, United Kingdom (UK). Prof. Visser was, for two months, a research visitor at the universities of Umeå (Sweden) and Oulu (Finland), where he presented seminars to doctoral students and departmental staff on South African second home development, urban tourism in Africa, and tourism-led gentrification. He also visited Berlin, Helsinki and Stockholm to gain greater insight into the outcomes of state-led urban regeneration. In October 2008, Prof. Visser and Prof. Lochner Marais from the University of the Free State's (UFS) Centre for Development Support launched an edited collection of research essays entitled: *Spatialities of Urban Change: Selected Themes from Bloemfontein at the beginning of the 21st Century*.

Prof. Peter Holmes presented a paper at the 3rd International Southern Deserts Conference in the Kalahari in September. This was organised by Prof. David Thomas of Oxford University, UK, a leading international authority on southern hemisphere deserts. Prof.

Thomas and Prof. Holmes have undertaken collaborative research investigating dryland landforms in the Western Free State. The Kalahari conference was attended by researchers from South Africa, the UK, Australia and Chile. Prof. Holmes and Dr Charles Barker attended the Southern African Association of Geomorphologists Biennial Conference at the University of Pretoria in September. Prof. Holmes presented a paper on aeolian erosion of Free State drylands, and Dr Barker presented a paper on the use of geomorphometric variables as an aid to water allocation management in non-perennial catchments. Mr Alex Adjei attended the Provincial Tourism Conference in Bloemfontein, where he presented two papers on aspects of tourism in the Free State.

Honours student Leroy du Plessis was invited by the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns" to present findings from his research project on the use of remote sensing to determine subsurface flowlines at the Akademie's student symposium at the University of Johannesburg.

With regard to community service, Dr Barker presented short courses in GIS to the staff members of the Maluti-A-Phofung Municipality, the Department of Economic, Environmental Affairs and Tourism (Free State Province) and the Centre for Disaster Management. He was also elected a member of the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns." Ms Sheila Vrahimis was appointed by the Provincial Member of the Executive Council (MEC) for Sport, Science and Culture to the Free State Geographical Names Committee. She continued to drive the four-year degree programme module *Concepts of General Science*.

A local field trip was undertaken to Naval Hill, the South Park landfill, Soetdoring Nature Reserve and the UFS Boyden Observatory. Such trips are invaluable in linking

theory to practice, particularly amongst underprepared students. Ms Tobeka Mehloakulu took undergraduate tourism students on a field trip to the Florisbad archeological site. On the Qwaqwa Campus, Dr Hennie Claassen and Mr Alex Adjei took the third-year environmental management students to the site of the Braamhoek hydro-electric power station, while Mr Pululu Mahasa took the first-year students to Golden Gate in the Eastern Free State. Mr Adjei also took the third-year Urban Studies students to Durban and its surrounds.

The Department of Geography maintains a high profile at national level: Prof. Gustav Visser continues to serve as President of the Society of South African Geographers, while Mrs Sandra Brits keeps the society's books.

Prof. Martha Richmond, Director of Environmental Studies at Suffolk University, Boston, United States of America, visited the Qwaqwa Campus in May. She presented a number of lectures in environmental management and biodiversity to staff and students. Community service again featured strongly on the Qwaqwa Campus, with Drs Claassen and Ruhiiga and Mr Adjei offering Integrated Development Planning training to officials and councillors of the Maluti-A-Phofung Municipality, Mr Adjei offering training in Responsible Tourism to local communities in Ermelo, Secunda; Witbank; Nelspruit and Upington, and Dr Ruhiiga facilitating a workshop on IDP and Poverty Alleviation for the Thabo Mofutsanyane District Municipality in KwaZulu-Natal.

A number of staff benefitted from the university's new Strategic Cluster research initiative. Profs Holmes and Visser, Dr Ruhiiga, and Mss Vrahimis and Mehloakulu received funding to initiate and/or support research. It is apparent that this source of funding will become increasingly important in future. ■



During the launch of the book "Spatialities of Urban Change: Selected Themes from Bloemfontein – at the beginning of the 21st Century" are, from the left, front: Mr Malefetsane Mokoena, General Manager: Housing at the Mangaung Local Municipality and one of the co-authors of the book, Mr Amos Goliath, Executive Director: Corporate Affairs at the Mangaung Local Municipality, Ms Rothea van Biljon, Chairperson of the Afrikaanse Handelsinstituut Bloemfontein; back: Prof. Lochner Marais, of the Centre for Development Support at the UFS and editor of the book, and Prof. Gustav Visser, of the Department of Geography at the UFS and editor of the book.



Malawian Ph.D. student, Dr Golden Msilimba, pictured here at the April 2008 graduation ceremony with his supervisor, Prof. Peter Holmes, Departmental Chairperson.

Research outputs

Research articles

Barker, C.H. & De Villiers, G.duT. 2008. 'n Holistiese beskouing van landskapontwikkeling in Geomorgologie: 'n Wetenskapsfilosofiese basis. *Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 27: 165-82.

Bateman, M.D., Carr, A.S., Murray-Wallace, C.V., Roberts, D.L. & Holmes,

P.J. 2008. A dating intercomparison study on Late Stone Age coastal midden deposits, South Africa. *Geoarchaeology* 23: 715-741.

De Villiers, G. du T., Viljoen, M.F. & Booyesen, H.J. 2008. Aardverwarming en klimaatsverandering met spesifieke verwysing na Suid-Afrika: Enkele perspektiewe. *Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 27: 294-306.

Holmes, P.J., Bateman, M.D., Thomas, D.S.G., Telfer, M.W., Barker, C.H. & Lawson, M.P. 2008. A holocene - Late quaternary aeolian record from lunette dunes of the western Free State panfield, South Africa. *The Holocene* 18: 1193-1205.

Hoogendoorn, G., Visser, G., Lenka, M., Marais, L., Van Rooyen, D. & Venter, A. 2008. Revitalizing the

Bloemfontein CBD: Prospects, obstacles and lost opportunities. *Urban Forum* 19: 159-174.

Kotze, N. & Visser, G. 2008. Sport tourism: Comparing participant profiles and impact of three one-day events in South Africa. *Africa Insight* 38: 61-72.

Roberts, D.L., Bateman, M.D., Carr, A.S., Murray-Wallace, C. & Holmes, P.J. 2008. Last interglacial fossil elephant trackways in coastal aeolianites, Still Bay, South Africa. *Palaeogeography, Palaeoclimatology, Palaeoecology* 257: 261-279.

Visser, G. 2008. Exploratory notes on the geography of black gay leisure spaces in Bloemfontein, South Africa. *Urban Forum* 19: 413-423.

Visser, G. 2008. The homonormalisation of white heterosexual leisure spaces in Bloemfontein, South Africa. *Geoforum* 39: 1347-1361.

Visser, G. & Kotze, N. 2008. The state and new-build gentrification in central Cape Town, South Africa. *Urban Studies* 45: 2565-2593.

Books

Marais, L. & Visser, G. (eds). 2008. *Spatialities of urban change: Selected themes from Bloemfontein at the beginning of the 21st century*. Stellenbosch: African Sun Media.

Chapters in books

Hoogendoorn, G. & Visser, G. 2008. The evolution of Bloemfontein's Westdene: The changing anatomy of a neighbourhood. In *Spatialities of Urban Change: Selected Themes from Bloemfontein at the Beginning of the 21st Century*, edited by G. Visser & L. Marais. Stellenbosch: African Sun Media. pp. 75-95.

Hoogendoorn, G., Visser, G., Lenka, M., Marais, L., Van Rooyen, D. & Venter, A. 2008. CBD revitalising in Bloemfontein: Prospects, obstacles and lost opportunities. In *Spatialities of Urban Change: Selected Themes from Bloemfontein at the Beginning of the 21st Century*, edited by G. Visser & L. Marais. Stellenbosch: African Sun Media. pp. 35-52.

Marais, L. & Visser, G. 2008. Bloemfontein and its future development: Towards a research agenda. In *Spatialities of Urban Change: Selected Themes from Bloemfontein at the Beginning of the 21st Century*, edited by G. Visser & L. Marais. Stellenbosch: African Sun Media. pp. 183-195.

Marais, L. & Visser, G. 2008. Preface. In *Spatialities of Urban Change: Selected*

Themes from Bloemfontein at the Beginning of the 21st Century, edited by G. Visser & L. Marais. Stellenbosch: African Sun Media. pp. iii-xi.

Visser, G. 2008. The Volksblad Arts Festival: Product, people and impacts. In *Spatialities of Urban Change: Selected Themes from Bloemfontein at the Beginning of the 21st Century*, edited by G. Visser & L. Marais. Stellenbosch: African Sun Media. pp. 135-153.

Visser, G. 2008. Urban tourism and Bloemfontein: Progress and prospects. In *Spatialities of Urban Change: Selected Themes from Bloemfontein at the Beginning of the 21st Century*, edited by G. Visser & L. Marais. Stellenbosch: African Sun Media. pp. 115-134.

Conference contributions

Adjei, A. 2008. *Tourism product development initiatives to support tourism routes in the Free State province*. Paper presented at the Free State Provincial Tourism Conference, Bloemfontein, South Africa. 5 May.

Adjei, A. 2008. *Tourism route development in the Free State province*. Paper presented at the Free State Provincial Tourism Conference, Bloemfontein, South Africa. 5 May.

Barker, C.H. 2008. *Using geomorphometric variables as an aid to managing water allocation in a non-perennial catchment*. Paper presented at the Biennial Conference of the Southern African Association of Geomorphologists (SAAG), University of Pretoria, Pretoria, South Africa. 26-28 September.

Holmes, P.J. & Wiggs, G.F.S. 2008. *Living on the edge: Environmental change in the western Free State, South Africa*. Paper presented at the 3rd Southern Deserts Conference - Kalahari 2008: Climate change and the peopling of the Southern deserts, Molopo Lodge, Kalahari, South Africa. 16-19 September.

Holmes, P.J. & Wiggs, G.F.S. 2008. *Living on the edge: Environmental change in the western Free State, South Africa*. Paper presented at the Biennial Conference of the Southern African Association of Geomorphologists (SAAG), University of Pretoria, Pretoria, South Africa. 26-28 September.

Visser, G. 2008. *Lesbian spaces of sex and desire: The case of Bloemfontein*. Paper presented at the Annual Conference of the Royal Geographical Society and Institute of British Geographers (RGS-IBG), London, UK. 27-29 August.

Staff

Main Campus:

Professor: Prof. Peter Holmes

Associate Professor: Prof. Gustav Visser

Senior Lecturer: Dr Charles Barker

Lecturers: Mss Eldalize Kruger, Tobeka Mehlomakhulu, Sheila Vrahimis

Professional Officers: Mss Sandra Brits, Liesel Cronjé

Qwaqwa Campus:

Associate Professor: Prof. Willie van Zyl (on secondment in 2008)

Senior Lecturer: Dr Hennie Claassen

Lecturers: Dr Tabukeli Ruhuiga, Mr Alex Adjei

Junior Lecturer: Mr Pululu Mahasa

Contact details

Prof. Peter Holmes

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Department of

Geology

“The Mineral Resource Management programme continues to contribute to the South African mining industry.” - Prof. Willem van der Westhuizen.

Overview

The past year was yet another progressive year in the history of the Department of Geology. Two new lecturers with international experience joined the department and postgraduate students from Germany and South Africa conducted research on a variety of topics. Staff and students attended various conferences around the globe to present research and build new relationships.

Student numbers again reached record heights and measures were introduced to select students from the second year onward to ensure continued quality teaching. The first-year module, GWS114, which accommodates students from both the Faculty of Natural and Agricultural Sciences and the Faculty of the Humanities at the University of the Free State (UFS), will become two separate modules in 2010, to better serve both faculties and to enable the management of large student numbers. The number of postgraduate students also increased, with new and exotic research topics.

The Mineral Resource Management programme continues to contribute to the South African mining industry. Seven students enrolled in 2008, bringing the total number of students in the programme to 26.

Changes in the staff profile during 2008 included the appointment of Prof. Michael Haschke, igneous petrologist and tectonics specialist. Prof. Haschke has been lecturing at the University of



Prof. Willem van der Westhuizen.

Cardiff in Wales for the past two years and has experience from research in the Alps, Israel and Iran. Another addition to the department was Dr Holger Sommer, a metamorphic petrologist, recently from the University of Botswana. Dr Sommer received his Ph.D. from the Johannes Gutenberg University in Mainz, Germany and he has conducted research in the United States of America (USA), Europe and Africa. Ms Annegret Lombard bade the department farewell, after lecturing in mineralogy for five years. Ms Huibrie Joubert, a former student of the department who directed the outreach programme, was appointed as junior lecturer in mineralogy.



Purchases for 2008 included thin sectioning apparatus to replace equipment that was bought in the late 1970s. Ten more student microscopes were added to bring the total number of student microscopes to 30. A stereo microscope was purchased to satisfy research demands in the department. Another specialised microscope that was bought will be connected to a Fourier Transform Infra Red Spectrometer (FTIR) in the Department of Physics. An A0 plotter was another addition towards the end of 2008. Most of the purchases form part of the faculty equipment acquisition initiative.

Students from universities across the country who are



Prof. Michael Haschke explaining the intricacies of the tectonic history of Spain to a group of students from the Cardiff University and the UFS during an excursion in Spain during April 2008.



Students investigating diamond bearing kimberlite in the Letseng Diamond Mine in Lesotho during an adverse weather spell.

bursary holders from AngloGold Ashanti participate in a symposium each January to report on their vacation work/research. The symposium takes the form of a competition and a student from the UFS, Mr Conrad Pienaar, obtained a second place in the geology section.

The department was represented by a Ph.D., four M.Sc. and three third-year students at the joint conference of the Society of Economic Geologists (SEG) and the Geological Society of South Africa (GSSA) held at Misty Hills, Johannesburg. Ms Janine Kotke-Levine, Ph.D. student, presented a talk on the PGE ratios in the Middle Group chromitites of the Eastern Bushveld Complex, while Mr

Lourens Joubert, M.Sc. student, presented a poster dealing with the Nkomati Ni deposit.

A workshop in basic geology for Humanity students was organised by Mss Annegret Lombard and Alida Litthauer. The course enabled the students to apply aspects of earth science to sculpture courses that they will be presenting to under-privileged learners.

Members of the department (second- and third-year students Messrs Jannie Schabort and Alex Munro respectively, and Prof. Willem van der Westhuizen) were invited to join a geological field trip to Spain by the Cardiff University during April. Prof. Michael Haschke and Dr Lesley

Cherns supervised the two-week field mapping course in Cantabria Spain for Cardiff University students and afforded the students a unique opportunity to experience and learn about mountain-forming mechanisms and the anatomy of a now eroded ancient mountain range constructed some 450 million years ago.

During April a student workshop on diamond history was presented by Dr Holger Sommer at Kimberley. This was attended by students from the UFS and the University of Botswana. Two third-year students, Jessica Potgieter and Megan Purchase, accompanied Dr Sommer to the conference of the American Geophysical Union (AGU) in San Francisco in the USA where both presented posters on research that they conducted under the supervision of Dr Sommer. This group also attended a workshop about volcanic processes presented by the Mineralogical Society of America.

A tragic event occurred during the geological excursion to the Northern Cape when second-year student L Ntwawagae drowned in the Orange River near Augrabies. Our heartfelt sympathies are extended to his family, friends and fellow students.

AEON EarthWise, now managed from the UFS, is an outreach programme under the supervision of Prof. Marian Tredoux and Ms Huibrie Joubert, who was appointed AEON EarthWise manager from April 2008. Their first event was presented in the Northern Cape in the form of a science weekend consisting of a teacher's workshop, with 19 participating teachers, and a family Maths & Science workshop for 225 parents and learners. Displays were from departments within the Faculty of Natural and Agricultural Science. A very enthusiastic response was received from all participants and facilitators.

The following students completed their M.Sc. degrees:

- **Michael P van den Heever** with a thesis entitled "A sedimentological investigation of the B-Reef at Masimong 5 Shaft. Mr L Nel acted as supervisor.

- Gideon P du Plessis with his thesis entitled "The relationship between geological structures and dolerite intrusions in the Witbank Highveld Coalfield, South Africa". Dr H E Praekelt acted as supervisor.
- Johannes J du Plessis with a thesis entitled: "Petrochemical characterisation of dolerites and their influence on coal in the Witbank Highveld Coalfield, South Africa". Prof. WA van der Westhuizen acted as supervisor.
- DB Masinge (Harmony) and Mark T G Button (Anglo Coal) were awarded degrees in MRM (Mineral Resource Management).

The following M.Sc. studies were initiated during 2008:

- J Globig: Phase relationships of Iherzolites from the Rovic Mine, South Africa: A pilot study of extensive and intensive parameters using mineralogical phase equilibria. Supervisor: Dr H Sommer.
- C Hocks: Phase relationships of eclogites from the Rovic Mine, South Africa: A pilot study of extensive and intensive parameters using mineralogical phase equilibria. Supervisor: Dr H Sommer.
- TB Lekgetho: Investigation of the relative geochemical behaviour of PGE and BMS during flotation. Supervisor: Prof. M Tredoux.
- A Litthauer: The geochemistry of intrusive dykes in the Carletonville Gold Fields. Supervisor: Prof. WA van der Westhuizen and co-supervisor Prof. M Tredoux.
- SW van der Merwe: The Lebtheinia Banded Iron Formation in Mauritania; genesis and economic significance. Supervisor: Prof. WA van der Westhuizen and co-supervisor: Prof. CDK Gauert.

Students in the process of completing their theses are Ulrike Rantzsch, Sebastian Fuchs, Jens Kirste, Lourens Joubert, Arnold Joubert, Mark Burnett, Hunter Kennedy and Annegret Lombard.

The following students completed their Ph.D. degrees:



Students on an excursion to the Vredefort Impact Structure near Parys in the Free State. The background consists of a rock type called pseudotachylite that resulted from the tremendous impact of a meteorite two billion years ago.

- Janine Kottke-Levin: A geochemical study of the Middle Group chromitites, Helena mine, Bushveld complex, South Africa. Promotors: Prof. M Tredoux and Dr CD Gauert.
- Rodney M Douglas: A new perspective on the geohydrological and surface processes controlling the depositional environment at the Florisbad Archaeozoological site. (Departments of Geology and Geography). Promotors: Profs M Tredoux & P Holmes.

The department is busy with several research projects. They include among others:

Uranium research: Uranium research is continuing with mining companies in South Africa. One postgraduate student is in the process of completing her Magister degree on the Dominion Group. Another student is doing research on uranium deposits in the Free State.

Witwatersrand gold deposits: One student involved in research on these deposits has completed his research and another project will commence in 2009.

Mantle research and metamorphic petrology: Research is conducted to distinguish between pro-

ductive and barren kimberlites. An important question that is being addressed is the amount of water that is stored in minerals in the earth's mantle. Metamorphic research is aimed at understanding the formation of orogenic belts through the history of the earth.

Namaqua Metamorphic Complex: Staff members conducted research in the Rosh Pinah area during 2008 and are also involved in research on the interesting geology of Bushmanland.

Ventersdorp Supergroup: The Ventersdorp Supergroup is still being researched and current research includes high-magnesium lavas at the base of the Allanridge Formation.

Bushveld Igneous Complex: Research is concentrated on the investigation of recent neotectonic activity related to the sagging of this complex.

Sedimentological research on the Karoo Supergroup is receiving attention and aspects such as stratigraphy, sedimentology and mineralisation are regarded as priorities. The uranium occurrences in the Karoo Supergroup were also investigated during 2008.



Dr Holger Sommer (back, left) from the department in a meeting with Prof. Haemyeong Jung (front, left) of the University of South Korea and two students, Ms Jessika Potgieter (back, right) and Ms Megan Purchase (front, right), in San Francisco during the AGU fall meeting.

Economic geology research on ore genesis is being conducted by Prof. Christoph Gauert and students.

Platinum geochemistry is being researched by Prof. Marian Tredoux with students.

Meteorites also form part of the research of this department and

currently this aspect forms part of the research of Ms Annegret Lombard under the supervision of Prof. Tredoux.

Research on the Kango Group by Dr Hermann Praekelt resulted in one publication in 2008 and further research is being conducted on the possible discovery of a hitherto unknown fossil.

During the year several distinguished academics visited the department. These included the following:

A multidisciplinary workshop entitled "Rhenish Shield meets Gondwana" was held on 12 March 2008. The purpose was to establish contacts between earth scientists at the University of Bonn in Germany and several South African institutions. Prof. Christoph Gauert chaired the meeting and he presented a talk entitled "Current metallogenic research at Free State University's Geology Department".

The De Beers Alex du Toit Memorial Lecture was presented by Emeritus Professor Tony Naldrett of Toronto in Canada on 24 July 2008 on the topic "From the Mantle to the Bank: The life history of some Ni-Cu sulfide deposits".

Other visitors included Dr Iain MacDonald of Cardiff University (geochemistry of the northern limb of the Bushveld Complex); Profs Vincent Courtillot and Fredric

Fluteau and Dr Martine Gerard from the Institute of Physics of the Globe in Paris, France and Dr Duncan Miller, an independent consultant (archaeometallurgy in Africa). Dr Sospeter Muhongo was yet another high profile visitor to the department during November.

Another event hosted by the department was the Rainbow Rally arranged by UFS Marketing to raise funds for paediatric cancer patients (teams had to answer a questionnaire on geology using clues from the exhibits in the department's museum).

Prof. Wayne Colliston attended the 33rd International Geological Congress in Oslo, Norway. As a national delegate of the International Union of Geological Sciences (IUGS) for South Africa, he contributed to the winning of the South African bid for hosting the 35th International Geological Congress (IGC) in 2016 in Cape Town. He also participated in a field excursion to investigate ore deposits in Bergslagen, Sweden – a mining district for over 1 000 years.

Dr Holger Sommer presented his UFS Mantle Research Group's 2008 results at the AGU conference in San Francisco concerning the petrology of diamond-bearing rocks.

Prof. Marian Tredoux attended the Lunar and Planetary Institute's (LPI) 40th Lunar and Planetary Institution (LPI) Science Conference: Large meteorite impacts and planetary evolution in Parys from 17-21 August 2008.

Geological excursions were undertaken to the following localities:

- Prof. Marian Tredoux accompanied Prof. Michael Haschke and 40 third-year students to the Vredefort Impact Structure near Parys in the Free State Province.
- The annual structural geology honours field course was held at Masimong 5 Shaft in the Free State Goldfields. Students were taught to do underground mapping and how to present their results. Course instruction and supervision were provided by Prof. Wayne Colliston.

Collaboration

Local

Department of Geology, University of Pretoria
 Department of Geology, University of the Witwatersrand
 Billiton PLC
 Harmony Mining Company
 African Rainbow Minerals
 Eysizwe Coal
 Council for Geosciences, Pretoria
 South African Committee for Stratigraphy

International

Imperial College
 Royal School of Mines Dept. of Geology
 University of Halle
 University of Leipzig
 University of Graz
 University of Innsbruck
 University of Cardiff
 Research Centre Geesthacht, Hamburg
 BGR (German Federal Survey of Geology)
 University of Western Australia
 Kernforschung Zentrum, Karlsruhe

Mineral Resource Management

Kumba Resources
 Exxaro

- An excursion for third-year students was undertaken to the Letseng diamond mine in Lesotho during September. Dr Holger Sommer supervised this excursion.
- Second and third-year students undertook an excursion to the Namaqua Mobile Belt (eastern Namaqualand) where structural features and metamorphic rocks were investigated. Dr Hermann Praekelt and Ms Annegret Lombard accompanied the students.
- Second-year students studying sedimentology visited the Jagersfontein area (two excursions) to become acquainted with the intricacies of Karoo sedimentology and stratigraphy. The excursions were overseen by Messrs Leon Nel and Johan Look.
- The two third-year mine excursions took students to Goldfield's Beatrix Mine in

Welkom. Prof. Christoph Gauert was the responsible lecturer.

- First-year students were entertained on a visit to AVBOB (Afrikaanse Verbond Nywerhede) where they were provided with insights into the dimension stone industry and the manufacture of slabs from igneous rock for cladding, work surfaces and tomb stones. Ms Annegret Lombard and Ms Alida Litthauer were the overseers for this excursion. During the second semester excursions were directed to geologically interesting areas in the Bloemfontein, Thaba 'Nchu and Dewetsdorp areas.

During these excursions the students gained knowledge on aspects of Karoo geology and stratigraphy, dolerite occurrences, sedimentology and geomorphology. Mr Johan Look led these excursions. ■

Research outputs

Research articles

Ahmadian, J., Haschke, M., McDonald, I., Regelous, M., Ghorbani, M. & Emami, M. 2008. High magmatic flux during Alpine-Himalayan collision: Constraints from the Kal-e Kafi complex, central Iran. *Geological Society of America Bulletin* 121(5/6): 857-868.

Colliston, W.P. & Schoch, A.E. 2008. Comments: Paper by Lacassie *et al.* (Journal of Geochemical Research 91: 81-98). *Journal of Geochemical Research* 99: 61-65.

Colliston, W.P., Schoch, A.E. & Praekelt, H. 2008. Comments on the papers by Baillie *et al.* concerning the age and deposition of the Bushmanland group (*South African Journal of Geology* 110: 59-86) and single zircon ages of the Aggeneys Granite Suite (*South African Journal of Geology* 110: 87-110). *South African Journal of Geology* 111(1): 109-111.

De Waal, S., Schweitzer, J., Graham, I., Gauert, C. & Ripley, E. 2008. A Bushveld-related high-Ti igneous suite (HITIS) derived from an alkali to transitional basaltic magma, South Africa. (South African Journal of Geology special issue in celebration of the centennial of the Department of

Geology at the University of Pretoria). *South African Journal of Geology* 111(2-3): 201-224.

Muundjua, M., Galdeano, A., Carporzen, L., Gilder, S.A., Hart, R.H., Andreoli, M.A.G. & Tredoux, M. 2008. Reply to comment by W.U. Reimold, R.L. Gibson and H. Henkel on Muundjua *et al.* (2007): Magnetic imaging of the Vredefort impact crater, South Africa. *Earth and Planetary Science Letters* 261: 456-468.

Praekelt, H.E., Germs, G.J.B. & Kennedy, J.H. 2008. A distinct unconformity in the Cango Caves Group of the Neoproterozoic to early Paleozoic Saldania Belt in South Africa: Its regional significance. *South African Journal of Geology* 111(4): 357-368.

Shafiei, B., Haschke, M. & Shahabpour, J. 2008. Recycling of orogenic arc crust triggers porphyry Cu mineralization in Kerman Cenozoic arc rocks, southeastern Iran. *Miner Deposita* 44: 263-283.

Sommer, H., Hauenberger, C.A., Kroener, A. & Muhongo, S. 2008. Isothermal decompression history in the "Western Granulite" terrain, central Tanzania: Evidence from

Staff

Professor: Prof. Willem van der Westhuizen

Associate Professors: Profs Wayne Colliston, Christoph Gauert, Michael Haschke, Marian Tredoux

Senior Lecturers: Drs Hermann Praekelt, Holger Sommer

Junior Lecturer: Ms Annegret Lombard

Part-Time Lecturers: Messrs Johan Look, Leon Nel

EarthWise Officer: Ms Huibrie Joubert

Affiliated Lecturers: Prof. Gerhard Beukes, Messrs PG Laurens, Johann Grobler, Ron Vrijens, André Dunne, Derek Hall, Mss Daleen Diedericks, Vanessa Lickfold

Senior Officer: Ms Rina Immelman

Secretary: Ms Petro Swart

Technician: Mr Andries Felix

Officer: Professional Services: Mr Peet Roodt

Assistant Officer: Mr Jonas Choane

Technical Officer: Mr Daniël Radikgomo

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reaction textures and trapped fluids in metapelites. *Journal of African Earth Science* 51: 123-144.

Sommer, H., Regenauer-Lieb, K., Gasharova, B. & Siret, D. 2008. Grain boundaries: A possible water reservoir in the Earth's mantle? *Mineralogy and Petrology* 94: 1-8.

Conference contributions

Fuchs, S., Glaesser, W., Reichhardt, F. & Gauert, C. 2008. *Petrological investigation of the Main Zone and platiniferous upper Critical Zone rocks of the north-eastern Bushveld Complex at Phoshiri, based on mineralogical and geochemical variations.* Paper delivered at the Joint Conference of the Society of Economic Geologists (SEG) and the Geological Society of South Africa (GSSA) (SEG-GSSA 2008): Africa uncovered - Mineral resources for the future. Misty Hills, Johannesburg, South Africa. 7-10 July.

Gauert, C., Colliston, W. & Mouton, E. 2008. *Mineralization model for the deformed base-metal bearing exhalative iron formations at Spitskop, Gariep Belt, southern Namibia.* Paper delivered at the Joint Conference of the Society of Economic Geologists (SEG) and the Geological Society of South Africa (GSSA) (SEG-GSSA 2008): Africa uncovered - Mineral resources for the future. Misty Hills, Johannesburg, South Africa. 7-10 July.

Haschke, M., Jacobson, L., Van der Westhuizen, W.A. & Steenekamp, S. 2008. *Recent flexural slip and rift-branch propagation into the Bushveld Complex, South Africa.* Paper delivered at the American Geophysical Union (AGU) Conference, San Francisco, California, USA. 14-18 December.

Jacobson, L. & Van der Westhuizen, W.A. 2008. *The chemical composition of Khoisan coastal pottery between Saldanha Bay and Port Nolloth.* Paper delivered at the Association of Southern Africa Professional Archaeologists (ASAPA) Meeting, Cape Town, South Africa. 25-28 March.

Jacobson, L. & Van der Westhuizen, W.A. 2008. *Provenancing pottery from northern Botswana and northeastern Namibia.* Paper delivered at the Association of Southern Africa Professional Archaeologists (ASAPA) Meeting, Cape Town, South Africa. 25-28 March.

Joubert, P.L. & Gauert, C. 2008. *Chemical variation of chrome spinels in the Uitkomst Complex – Significance*

for petrogenesis and deformation? Paper delivered at the Joint Conference of the Society of Economic Geologists (SEG) and the Geological Society of South Africa (GSSA) (SEG-GSSA 2008): Africa uncovered - Mineral resources for the future, Misty Hills, Johannesburg, South Africa. 7-10 July.

Kirste, J., Glaesser, W., Davidson, M. & Gauert, C. 2008. *Reconstruction of the contact metamorphic aureole around the Ni-Cu-PGE-bearing Uitkomst Complex, near Badplaas, Mpumalanga Province, South Africa.* Paper delivered at the Joint Conference of the Society of Economic Geologists (SEG) and the Geological Society of South Africa (GSSA) (SEG-GSSA 2008): Africa uncovered - Mineral resources for the future, Misty Hills, Johannesburg, South Africa. 7-10 July.

Kottke-Levin, J. & Tredoux, M. 2008. *PGE ratios in the Middle Group chromitites of the eastern Bushveld complex.* Paper delivered at the Joint Conference of the Society of Economic Geologists (SEG) and the Geological Society of South Africa (GSSA) (SEG-GSSA 2008): Africa uncovered - Mineral resources for the future, Misty Hills, Johannesburg, South Africa. 7-10 July.

Potgieter, J., Sommer, H., Regenauer-Lieb, K. & Gasharova, B. 2008. *OH and CO diffusion profiles in garnets from eclogitic xenoliths from the Victor diamond mine, South Africa.* (UNESCO IGCP 557 Project: Diamonds, Xenoliths and Kimberlites: A window into the Earth's interior). Paper delivered at the American Geophysical Union (AGU) Conference, San Francisco, California, USA. 14-18 December.

Purchase, M., Sommer, H., Regenauer-Lieb, K. & Gasharova, B. 2008. *Diffusion profiles of OH towards melt inclusions in garnets in Iherzolite xenoliths from the Victor diamond mine, South Africa.* (UNESCO IGCP 557 Project: Diamonds, Xenoliths and Kimberlites: A window into the Earth's interior). Paper delivered at the American Geophysical Union (AGU) Conference, San Francisco, California, USA. 14-18 December.

Rantzsch, U., Glaesser, W., Stewart, R., Gauert, C. & Van der Westhuizen, W. 2008. *Mineralogical and geochemical investigation of conglomerate-hosted Uranium-Gold ores of the Dominion Group, Western Witwatersrand, South Africa.* Paper delivered at the Joint Conference of the Society of Economic Geologists

(SEG) and the Geological Society of South Africa (GSSA) (SEG-GSSA 2008): Africa uncovered - Mineral resources for the future, Misty Hills, Johannesburg, South Africa. 7-10 July.

Regenauer-Lieb, K., Sommer, H. & Gaede, O. 2008. *Weertman cracks and the fast extraction of diamonds from the Earth's mantle.* (UNESCO IGCP 557 Project: Diamonds, Xenoliths and Kimberlites: A window into the Earth's interior). Paper delivered at the American Geophysical Union (AGU) Conference, San Francisco, California, USA. 14-18 December.

Sommer, H., Regenauer-Lieb, K. & Gasharova, B. 2008. *Multi-stage water enrichment processes in the wake of the Farralon slab.* (UNESCO IGCP 557 Project: Diamonds, Xenoliths and Kimberlites: A window into the Earth's interior). Paper delivered at the American Geophysical Union (AGU) Conference, San Francisco, California, USA. 14-18 December.

Sommer, H., Regenauer-Lieb, K., Hauzenberger, C.A.H. & Gasharova, B. 2008. *Rapid uplift of the Jwangeng kimberlite, South Botswana: Caused by mantle metasomatism and documented by OH-diffusion profiles in garnet from eclogitic xenoliths.* (UNESCO IGCP 557 Project: Diamonds, Xenoliths and Kimberlites: A window into the Earth's interior). Paper delivered at the 18th Annual Goldschmidt Conference, Vancouver, Canada. 13-18 July.

Sommer, H., Regenauer-Lieb, K., Hauzenberger, C.A.H. & Gasharova, B. 2008. *Rapid uplift of the Victor kimberlite, South Africa: caused by mantle metasomatism and documented by OH-diffusion profiles in eclogites.* (UNESCO IGCP 557 Project: Diamonds, Xenoliths and Kimberlites: A window into the Earth's interior). Paper delivered at the 33rd International Geological Congress (33IGC) and the Geoscience World Congress 2008: Earth Systems Science - Foundation for Sustainable Development, Oslo, Norway. 6-14 August.

Tredoux, M. & Keller, G. 2008. *Is the KTB iridium anomaly a unique cosmic marker?* Paper delivered at the American Geophysical Union (AGU) Conference, San Francisco, California, USA. 14-18 December.

Tredoux, M. 2008. *PGE enrichment at the KTB: A sign of cause or a sign of effect?* Paper delivered at the 40th Lunar and Planetary Institution (LPI) Science Conference: Large meteorite impacts and planetary evolution, Parys, South Africa. 17-21 August.

Department of

Mathematical Statistics and Actuarial Science

“We are in the process of upgrading our actuarial programme.” - Prof. Daan de Waal.

Overview

The Department of Mathematical Statistics and Actuarial Science has about 4 000 undergraduate and 30 post-graduate students. Because of the growth in popularity of Actuarial Science, the department changed its name to include this field of study in 2008. The Actuarial programme is offered up to level 1 and the department is in the process of upgrading it to level 2. One student, Mr Warren Henning, completed his Actuarial studies in 2008, while 29 students received their doctorates during the year.

The department had three international students – one from Botswana and two from Lesotho. Mr Martin Khutsoane submitted his dissertation entitled “Risk Modelling: The Acceptable risk and losses due to additional risk” and Ms Lieketseng Masenyetse submitted her dissertation entitled “Aspects of stochastic modelling for biological systems”. Mr Wilson Thupeng completed a Ph.D. degree entitled “Measures of Goodness of fit in extreme modelling”.

Staff members are involved in several national and international associations and institutions. Prof. Daan de Waal, Departmental Chairperson, is a member of the South African Statistical Association (SASA) as well as the International Statistical Institute (ISI). Prof. Max Finkelstein was a visiting researcher at the Max Planck Institute for Demographic Research in Rostock, Germany



Prof. Daan de Waal.

from July to August 2008. He also he paid a research visit to the St. Petersburg Elektropribor Institute, Russia during December 2008. Prof. Robert Schall is the Associate Editor of the *South African Statistical Journal*.

Research is an important part of the department’s activities. Prof. De Waal conducted research on risks in the energy market, which is an Eskom project. Prof. Finkelstein did research on stochastic models for biological aging with a grant from the National Research Foundation (NRF) as well as research on engineering applications of reliability theory and mixture failure rate modelling.



The department received several national and international visitors, namely Prof. Pieter van Gelder from the University of Technology in Delft, The Netherlands who delivered a presentation on “Robust detection of discordant sites in regional frequency analysis, based on L-Moments, with applications to flood defence design” in January 2008. Prof. Subha Chakraborti of the Department of Information Systems, Statistics and Management Science at the University of Alabama, United States of America (USA), gave a presentation on “Statistical Process Control - Parametric and Nonparametric” in July



Staff of the department in 2008.

Staff

Professors: Profs Daan de Waal, Max Finkelstein, Abrie van der Merwe, Robert Schall

Senior Lecturers: Dr Martin van Zyl, Ms Linda van der Merwe

Lecturers: Drs Inet Kemp, Andréhette Verster, Delson Chikobvu, Messrs Dries Naudé, Kobus Bekker, Michael von Maltitz, Sean van der Merwe, Mss Wallina Oosthuizen, Elizabeth Girmay

Part-Time Lecturers: Messrs Frans Koning, GJ Mellet

Secretary: Ms Elize Mathee

Assistant Officer: Ms Ella Hayes

Messenger: Mr William Baranye

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2008, and Prof. Edward George from the Wharton School of the University of Pennsylvania, USA did a presentation on "Practical Im-

plementation of Bayesian Model Selection by using Bayesian Additive Regression Trees" in November 2008. Local visitors included Dr Renalde Huysamen from the Centre for Higher Education Studies and Development (CHESD) at the UFS who made a presentation on Leadership Development in October 2008 and Mr Justin Harvey of the UFS who discussed "Credibility intervals for the ratio of means from two populations that contain zero and lognormal observations" in October 2008.

Prof. Finkelstein published a book entitled *Failure Rate Modelling for Risk and Reliability*, which was published by Springer in London. He was also appointed as the Editor-in-Chief of the *South African Statistical Journal* and as the Associate Editor of *Applied Stochastic Models in Business and Industry*. Mr Delson Chikobvu completed his Ph.D. degree with the title, "Bayesian Analysis of Process Capability Indices for Single and Multiple Sources of Variability". ■

Research outputs

Research articles

Booyesen, F., Van der Berg, S., Burger, R., Von Maltitz, M.J. & Du Rand, G. 2008. Using an asset index to assess trends in poverty in seven Sub-Saharan African Countries. *World Development* 36(6): 1113-1130.

De Waal, D.J., Beirlant, J. & Dierkx, G. 2008. Predicting high quantiles through the Dirichlet process on extreme modelling. *South African Statistical Journal* 42(2): 89-99.

Dierkx, G., Beirlant, J., De Waal, D.J. & Gillou, A. 2008. A new estimation method for Weibull-type tails based on the mean excess function. *Journal of Statistical Planning and Inference* 139(6): 1905-1920.

Finkelstein, M.S. 2008. Reliability modelling for biological aging. *Journal of Risk and Reliability* 222(1): 1-7.

Finkelstein, M.S. & Esaulova, V. 2008. On asymptotic failure rates in bivariate frailty competing risks models. *Statistics and Probability Letters* 78(10): 1174-1180.

Van Zyl, J.M. 2008. The use of ratios to compare volatilities and VaRs. *Communications in Statistics-Simulation and Computation* 37(10): 2089-2095.

Books

Finkelstein, M. 2008. *Failure rate modelling for risk and reliability*. London: Springer.

Chapters in books

Du Burger, R., Booyesen, F., Van der Berg, S. & Von Maltitz, M.J. 2008. Marketable wealth in a poor African country: Wealth accumulation by households in Ghana. In *Personal wealth from a global perspective*, edited by J.B. Davies. New York: Oxford University Press. pp. 248-268.

Finkelstein, M.S. 2008. Degradation and shock models. In *Encyclopedia of quantitative risk assessment and*

analysis, edited by E. Melnick & B. Everitt. Chichester, UK: John Wiley & Sons. pp. 481-489.

Finkelstein, M.S. & Esaulova, V. 2008. Asymptotic properties of bivariate competing risks models. In *Advances in mathematical modelling for reliability*, edited by T. Bedford; J. Quigley; L. Wals; B. Alkali; A. Daneshkhah & G. Hardman. Amsterdam: IOS Press. pp. 96-102.

Reports

De Waal, D.J. & Beirlant, J. 2008. *Comparing tail probabilities from different models on extremes*. Technical report number 387 to the University of the Free State, Bloemfontein, South Africa.

Naude, A.M., Chikobvu, M. & Chandran, T.M. 2008. *Caring for the carers: Emotional and social impact on health professionals caring for the HIV/AIDS patients in Free State Province*. Technical report number 382 to the University of the Free State, Bloemfontein, South Africa.

Oosthuizen, W. & Lombaard, C.S. 2008. *Methods for the assessment of the assumption of normality of data*. Technical report number 383 to the University of the Free State, Bloemfontein, South Africa.

Van der Merwe, A.J. & Chikobvu, D. 2008. *Process capability indices the balanced random effects model*. Technical report number 390 to the University of the Free State, Bloemfontein, South Africa.

Van der Merwe, A.J. & Harvey, J. 2008. *Credibility intervals for the ratio of means of two populations that contain zero and lognormally distributed observations*. Technical report number 389 to the University of the Free State, Bloemfontein, South Africa.

Van der Merwe, A.J. & Hugo, J. 2008. *Tolerance intervals for averages of observations from new or unknown batches in the case of the random effects model*. Technical report number 388 to the University of the Free State, Bloemfontein, South Africa.

Van der Merwe, L. 2008. *Students' perceptions of statistics as field of study - A phenomenological study: A qualitative research study to explore the different ways in which a group of students experience statistics*. Technical report number 385 to the University of the Free State, Bloemfontein, South Africa.

Van Zyl, J.M. 2008. *A likelihood ratio test for White Noise using Laplace Distribution*. Technical report number

386 to the University of the Free State, Bloemfontein, South Africa.

Van Zyl, J.M. 2008. *Improved estimation of the location parameter of symmetric stable data*. Technical report number 380 to the University of the Free State, Bloemfontein, South Africa.

Van Zyl, J.M. 2008. *Modeling inflows into the Gariep Dam using Bayesian Dynamic Models*. Technical report number 384 to the University of the Free State, Bloemfontein, South Africa.

Van Zyl, J.M. & Liyambo, P.T. 2008. *Basic theory of eigenvalues of a wishart matrix with some of the applications in economics and finance*. Technical report number 381 to the University of the Free State, Bloemfontein, South Africa.

Conference contributions

Bekker, K.N. & Van der Merwe, A.J. 2008. *A nonparametric bayesian approach applied to the Bühlmann-Straub Credibility Model*. Paper delivered at the 9th World Meeting of the International Society for Bayesian Analysis (ISBA2008), Hamilton Island, Australia. 21-25 July.

Chikobvu, D. & Van der Merwe, A.J. 2008. *A bayesian simulation solution to the supplier selection problem using capability indices*. Invited paper delivered to the Department of Marketing, Monash University, Victoria, Australia. 15 July.

Chikobvu, D. & Van der Merwe, A.J. 2008. *A process capability index for averages of observations from new batches in the case of the balances random effects model*. Poster presented at the 9th World Meeting of the International Society for Bayesian Analysis (ISBA2008), Hamilton Island, Australia. 21-25 July.

Chikobvu, D. & Van der Merwe, A.J. 2008. *A process capability index for averages of observations from new batches in the case of the balances random effects model*. Paper delivered at the 51st Annual Conference of the South African Statistical Association (SASA), University of Pretoria, Pretoria, South Africa. 27-31 October.

Chikobvu, D. & Van der Merwe, A.J. 2008. *Bayesian simulation of process capability indices*. Invited paper delivered to the Department of Marketing, Monash University, Victoria, Australia. 14 July.

Finkelstein, M.S. 2008. *On some approaches to defining virtual age of non-repairable objects*. Paper delivered at the Conference of the European Safety and Reliability

Association (ESRA) and the 17th Annual Conference for the Society for Risk Analysis Europe (SRA-E), Valencia, Spain. 21-26 September.

Finkelstein, M.S. 2008. *On some approaches to defining virtual age of non-repairable objects*. Proceedings of the Conference of the European Safety and Reliability Association (ESRA) and the 17th Annual Conference for the Society for Risk Analysis Europe (SRA-E), Valencia, Spain. 21-26 September. pp. 1909-1913.

Finkelstein, M.S. & Cha, J.H. 2008. *On shock processes with independent wear increments*. Paper delivered at the 51st Annual Conference of the South African Statistical Association (SASA), University of Pretoria, Pretoria, South Africa. 27-31 October.

Schall, R. 2008. *Outliers in replicate design cross-over studies*. Paper delivered at the 51st Annual Conference of the South African Statistical Association (SASA), University of Pretoria, Pretoria, South Africa. 27-31 October.

Thupeng, W.M. & De Waal, D.J. 2008. *The deviance information criterion as a bayesian measure of model assessment for extreme value model*. Paper delivered at the 51st Annual Conference of the South African Statistical Association (SASA), University of Pretoria, Pretoria, South Africa. 27-31 October.

Verster, A. & De Waal, D.J. 2008. *The spectral distribution expressed in terms of a mixture of Dirichlets for modeling multivariate extremes*. Poster presented at the 9th World Meeting of the International Society for Bayesian Analysis (ISBA2008), Hamilton Island, Australia. 21-25 July.

Von Maltitz, M.J. 2008. *An application of sequential regression multiple imputation on panel data*. Paper delivered at the Sample Surveys and Bayesian Statistics (SSBS2008) Conference and Workshop, Southampton, Hampshire, UK. 25-29 August.

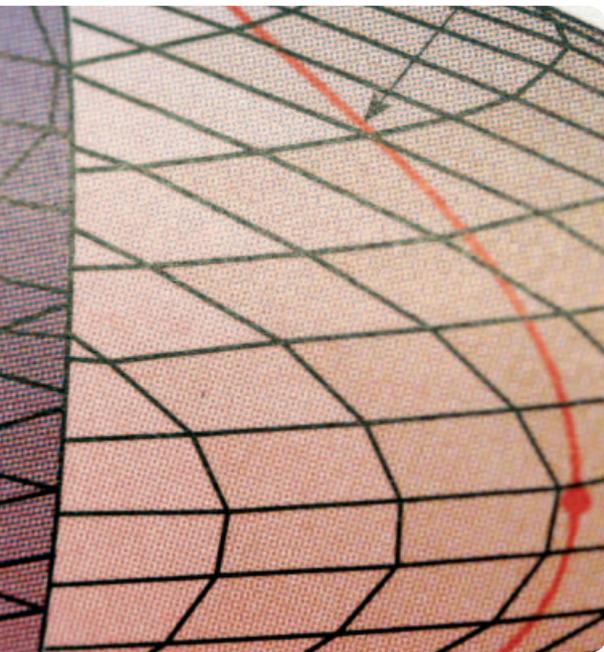
Von Maltitz, M.J. 2008. *An application of sequential regression multiple imputation on panel data: Further research*. Paper delivered at the 51st Annual Conference of the South African Statistical Association (SASA), University of Pretoria, Pretoria, South Africa. 27-31 October.

Von Maltitz, M.J. & Van der Merwe, A.J. 2008. *An application of SRMI on panel data - Results and further research*. Paper delivered at the 51st Annual Conference of the South African Statistical Association (SASA), University of Pretoria, Pretoria, South Africa. 27-31 October.

Department of

Mathematics and Applied Mathematics

"Members of staff are actively involved in research and have excelled in their respective fields" - Prof. Alain Clout.



Prof. Alain Clout.

Overview

The Department of Mathematics and Applied Mathematics offered a wide range of courses, at both undergraduate and postgraduate level. Many of the staff members were actively involved in research and community service.

Among the various accomplishments obtained in their respective fields, the outstanding research achievements of Prof. Johan Meyer were acknowledged by the management of the University of the Free State (UFS) who promoted him to the rank of Senior Professor in March 2008.

Prof. Schalk Schoombie, in collaboration with Mr Christiaan Venter,

continued with a project funded by the National Research Foundation (NRF) on the use of computational adaptive dynamics in the modelling of evolution and adaptive processes in population modelling.

Furthermore, Prof. Schoombie, in collaboration with Prof. Eben Maré of the Department of Mathematics and Applied Mathematics at the University of Pretoria, continued his investigation of non linear instabilities induced by spurious high frequency components in the numerical solution of certain non linear ordinary differential equations. In particular, the effect of using third and fourth order Nyström methods on the Van der Pol equation was

investigated. A research article on this topic was published in the Society for Industrial and Applied Mathematics' (SIAM) *Journal of Numerical Analysis*.

Prof. Johan Meyer paid a research visit to Prof. J Szigeti at the University of Miskolc in Hungary in May 2008 as well as to Prof. W-F Ke at the National Cheng Kung University in Tainan, Taiwan in November 2008. Prof. Meyer gave two invited lectures. The first one took place at the Alfréd Rényi Institute of Mathematics, Budapest, Hungary in June, and the second was given in November at the Nelson Mandela Metropolitan University in Port Elizabeth, South Africa.

Prof. Meyer received a research visit from Prof. CJ Maxson of Texas A&M University in the United States of America (USA) in April 2008.

Prof. Alain Clout continued his fundamental research on the topic of partial derivatives of non-integer orders and their applications in groundwater modelling. He and his colleagues, Mr Willem van Wyk and Dr William Rae of the Department of Medical Physics at the UFS, presented some of their results at the congress of the South African Association of Physicists in Medicine and Biology (SAAPMB) in June 2008. The presentation was awarded the prize for the most insightful presentation.

Prof. Thomas Acho was the external examiner for two M.Sc. dissertations, namely, the work of Mr KB Mfumadi entitled "Variation

Viscosity Arterial Blood Flow: Its Nature and Stability” and the dissertation of Mr T M Kgasago on the subject: “Modelling the Transmission Dynamics of Infectious Diseases with Vaccination and Temporary Immunity”. Both candidates were from the University of Limpopo.

Prof. Acho was also invited by the editor of the *Journal of the American Mathematical Society* to act as a reviewer for one of their articles.

In the area of community service, Prof. Johan Meyer and Mr Christiaan Venter were closely involved in the activities offered by the Nautilus Mathematics Project. ■



Staff members of the department during a meeting with Prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences.



Prof. CJ Maxson (right) of Texas A&M University in the United States of America visited the department in April 2008.

Research outputs

Research articles

Schoombie, S.W. 2008. High frequency induced instability in Nystrom methods for the van der Pol equation. *SIAM Journal of Numerical Analysis* 46(3): 1147-1165.

Groenewald, N.J., Juglal, S. & Meyer, J.H. 2008. Prime ideals in group near-rings. *Algebra Colloquium* 15(3): 501-510.

Conference contributions

Schoombie, S.W. 2008. *Doing non linear analysis with Ron Mitchell.*

Paper delivered at the South African Symposium on Numerical and Applied Mathematics (SANUM 2008), Stellenbosch, South Africa. 26-28 March.

Van Wyk, W.P., Rae, W.I.D. & Cloot, A. 2008. *Fractional order calculus in medical imaging processing.* Paper delivered at the 48th Annual Congress and Winter School of the South African Association of Physicists in Medicine and Biology (SAAPMB), Durban, South Africa. 24-28 March.

Staff

Main Campus:

Professors: Profs Johan Meyer, Schalk Schoombie, Dana Murray, Alain Cloot

Associate Professor: Prof. Thomas Acho

Senior Lecturer: Dr Hubertus Bargenda, Ms Julia van Niekerk

Lecturers: Dr Samantha Dorfling, Mr Christiaan Venter, Ms Ansa Kleynhans

Temporary Lecturers: Mss Magrietha Theron, Martie Calitz, Anita Swart, Marina Botha

Administrative Officer: Ms Marinda Venter

Qwaqwa Campus:

Associate Professor: Prof. Jo Schröder

Lecturer: Mr Patrick Mbambo

Temporary Lecturers: Messrs Nallapan Sebastian, Neo Tsosane, Ms Christa Faber

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Department of

Microbial, Biochemical and Food Biotechnology

“Staff and students received national and international recognition for their achievements.” - Prof. James du Preez.



Prof. James du Preez.

Overview

The year 2008 was marked by an exceptional number of awards and other forms of national and international recognition of academic excellence of staff and students of this department.

At the year-end function of the Faculty of Natural and Agricultural Sciences, three members of the department received awards: probably the first time so many faculty awards went to members of one department. The recipients were Dr André van Tonder for service to the faculty, in recognition of his numerous contributions related to teaching; Prof. Esta van Heerden for academic entrepreneurship, in recognition of her successful ef-

forts in establishing and running the BioPAD Platform for Metagenomics in the department; Prof. Hugh Patterson for research, in recognition of the excellence of an article titled “*The Saccharomyces cerevisiae linker histone Hho1p is essential for chromatin compaction in stationary phase and is displaced by transcription*” in the prestigious international journal *Proceedings of the National Academy of Sciences of the USA*, which has a high impact factor of 10. He was the main author of this paper on how the change in the packaging of the DNA with cell development influenced the expression of genes. The South African Society for Microbiology

(SASM) awarded the silver medal for exceptional research achievement in any branch of microbiology to Prof. James du Preez, departmental chairperson, at the biennial congress of the society in Grahamstown.

Prof. Koos Albertyn improved his rating from the National Research Foundation (NRF) to a C2, and Prof. Garry Osthoff obtained a C3 rating, bringing the number of NRF-rated scientists in the department to a total of 12. Prof. Albertyn was invited to act as the opponent for a Ph.D. thesis defence that took place at the Department of Applied Microbiology, Lund University, Sweden in April. He and Prof. Rob Bragg were appointed to serve on the subcommittee of the Advisory Committee of the Genetically Modified Organisms Act (Act 15 of 1997). The function of this subcommittee is the evaluation of applications for the importation, use and development of genetically modified organisms (GMOs).

Students of the department also excelled academically. As usual, we had a good output of graduates in 2008: four Ph.D., 15 M.Sc. and 19 B.Sc. Honours degrees were conferred. A team comprising students from the Veterinary Biotechnology research group under the supervision of Prof. Rob Bragg won the prize for the best exhibit at the recent finals of the National Innovation Fund competition in Stellenbosch. A presentation by Ms Chantel Swart, a Ph.D. student under the supervision of Prof. Lodewyk Kock and Dr

Carlien Pohl-Albertyn, at the 46th annual meeting of the Microscopy Society of Southern Africa (MSSA) held in Gaborone, Botswana won the Leica prize for the best presentation on confocal microscopy. Lastly, Mr Ruan Ells had part of his M.Sc. dissertation accepted for publication in the high-ranking *Journal of Antimicrobial Chemotherapy* (impact factor 4,038). His study, concerning a procedure whereby the efficacy of antifungal drugs could be enhanced by using in combination with a fatty acid, was done under the supervision of Dr Pohl-Albertyn and Prof. Kock.

Another indicator of the high level of research activities and international involvement in the department is the fact that this year a record number of academics and students travelled beyond the borders of South Africa to participate in congresses or to undertake research visits to foreign countries. The number totalled 15 academics (some of whom travelled on more than one occasion), seven students and four post-doctoral fellows. The countries visited included Australia, Belgium, Botswana, Denmark, the United Arab Emirates (Dubai emirate), France, Germany, Greece, Mauritius, Mozambique, the Netherlands, Spain, Sweden, Switzerland, Turkey, Ukraine and the United States of America (USA). The combined national conference (Bio-08) of, respectively, Biotech SA, the South African Society for Microbiology and the South African Society of Biochemistry and Molecular Biology held in Grahamstown in January was well attended, with numerous poster and oral presentations by members of the department.

Representing the South African Fryer Oil Initiative (SAFOI, housed in the department), Prof. Lodewyk Kock and Dr Carlien Pohl-Albertyn presented the Steward's Principle Practitioner Award for 2007 to Felda Foods at their national product launch function on 2 July 2008 at Monte Casino, Gauteng. The award is based on the continuous involvement of Felda Foods in promising care of their edible oil products from "cradle to grave", i.e. from manufacturing to final dis-



A research team from the Department of Microbial, Biochemical and Food Biotechnology won the prize for the best exhibit at the finals of the National Innovation Fund competition in Stellenbosch. The same team had won the UFS leg of the competition. At the prize-giving ceremony are, from the left: Dr Eugene Lottering, Executive Director: Innovation Fund, students Kasweka Kakoma, Jay Lee and Lehlohonolo Mathengtheng, all from the Veterinary Biotechnology research group, and Minister of Science and Technology, Mr Mosibudi Mangena.

posal after use by food establishments, thereby also protecting the environment. These activities are in the process of being expanded to other Felda Food products that they will also display SAFOI's seal of approval. This will guide the consumer to make an informed choice when buying various foodstuffs.

On 28 and 29 September 2008, a total of 29 third-year microbiology students accompanied by Profs James du Preez and Stephanus Kilian undertook an excursion to South African Breweries Ltd (SAB), Gauteng. On the SAB side the excursion was facilitated by Prof. Bettie Lodolo, who is the SAB consultant: brewing science and hygiene as well as an affiliate associate professor of the department. The excursion comprised a lecture by Prof. Lodolo at the SAB Training Institute at Kyalami, a tour of the Alrode brewery and finally a visit to the SAB World of Beer in Johannesburg. The feedback from the students was very positive and this excursion will become an annual event.

A highlight of 2008 in terms of infrastructure was the completion of the Bioinformatics Laboratory adjacent to the Biotechnology

building. This 30-workstation lecturing facility for bioinformatics at under- and postgraduate levels and for providing computational support to research projects resulted from a grant to Prof. Pat-



Mr Ruan Ells, M.Sc. student whose article from his M.Sc. dissertation was accepted for publication in the *Journal of Antimicrobial Chemotherapy* (impact factor 4,038), with his supervisor, Dr Carlien Pohl-Albertyn.



Mrs Olufunke Awoyele, lecturer at the University of Ibadan, Nigeria setting up bioreactors for cultivating a yeast on an enzymatic hydrolysate of cassava peel. The aim of her project was the protein enrichment of waste from the cassava industry for use as animal feed.

terton for the establishment of a bioinformatics node at the UFS as a faculty facility that will link with the National Bioinformatics Network. Another highlight was the completion of the architect plans for the new two-storey wing to be added to the existing biotechnology building; only the interior detail planning remains to be done. This building will be erected on the northern side of the biotechnology building and will house the division of Food Science (ground floor) and large new undergraduate laboratories plus analytical labs, as well as a large seminar room on the second floor. An application for funding has been submitted to the Department of Education and it is likely that construction will commence within two or three years. This project also includes the general upgrading of the current biotechnology building.

The department received several visitors in 2008. Ms Olufunke Awoyele, lecturer at the University of Ibadan, Nigeria, worked for three months in the fermentation biotechnology laboratory to complete an essential part of her Ph.D. research (see photograph). Providing expertise, resources and

training towards the development of microbiological sciences in Africa is part of the mission of the department, which was appointed as an Industrial Biotechnology MIRCEN (Microbiological Resources Centre) by UNESCO in 1996. Prof. Emile van Zyl (Stellenbosch University) and Prof. Bärbel Hahn-Hägerdal (Lund University, Sweden, also a professor extraordinary in the department), visited the UFS in May and July, respectively. Each presented a lecture to the faculty on aspects of biofuel production from renewable feedstocks. Prof. Hahn-Hägerdal also presented a short course on yeast physiology and metabolic engineering related to bioethanol production to a group of our B.Sc. Honours students. In June a National Geographic team arrived to shoot a documentary film in the TauTona Mine, entitled "Naked Science: Journey through the Crust", while in September a documentary entitled "Inside Planet Earth" was filmed within the Beatrix Mine by a team from the Discovery Channel. Both of these documentaries centred around the research conducted in the BioPAD Metagenomics Platform in the department. Another visitor to the Metagenomics Platform was Prof. Gaetan Borgonie from the University Ghent, Belgium who spent a couple of months here to investigate the taxonomy of nematodes in the deep subsurface.

A major change in staff was brought about by the reinstatement in November of the Consumer Science division as a separate department. The multidisciplinary nature of Consumer Science did not fit in with the nature and modus operandi of the larger department; furthermore, within such a large department the identity of Consumer Science disappeared. By operating as a separate department from 1 January 2009 with its own identity and greater visibility, it will be possible to position and market Consumer Science better in respect of postgraduate students and research grants.

Mr Piet Botes, first professional officer who had been in charge of the department's analytical labora-

tory for 30 years, passed away in September. This was a great loss for the department, especially for those staff members who had worked with Mr Botes as a friend and colleague over many years. Mr Sarel Marais was appointed as senior professional officer in December to fill this important position. Other changes in staff also occurred during 2008. Dr Lizelle Piater resigned at the end of the year to take up a position at the University of Johannesburg. This vacancy has been filled by the appointment of Dr Dirk Opperman as lecturer. He is a former student who is currently a post-doctoral research associate at the Max Planck Institute in Germany and will only be able to take up the position in January 2010. Ms Jacqueline van Marwijk was therefore appointed as temporary junior lecturer in biochemistry for 2009 to assist with the lecturing. Dr Manjusha Joseph, senior professional officer in the lipid biotechnology group, resigned in August to take up a position as science communicator/project coordinator at the NRF, Pretoria. Drs Arno Hugo and Esta van Heerden were promoted to Associate Professor.

The department celebrates its 50th birthday in 2009. Festivities are planned for 12 and 13 March. This links with a series of events, starting at the end of 2008 and continuing in 2009, in celebration of the former Faculty of Agriculture turning 50 in 2008.

The department comprises three divisions, namely Microbiology and Biochemistry, Food Science and Consumer Science. Within these divisions there are various research groups. Although the overall research theme of the department is the broad field of microbial, biochemical and food biotechnology, the heterogeneous departmental composition results in some activities falling outside this field. Activities of some of these research groups not reported above are indicated below.

In the **Food Science division**, the dairy chemistry research of Prof. Garry Osthoff, head of the division, is expanding dramatically. He presented results on the role

of enzymes from yeast adjuncts in proteolysis during Cheddar cheese ripening at the International Dairy Federation (IDF) Symposium on "Ripening Characterization and Technology of Cheese" in Bern, Switzerland. The ongoing research is focused on protein and amino acid catabolism by these enzymes in cheese ripening. Prof. Osthoff is also researching milk evolution, which involves the study of the milk composition of non-dairy species, an area in which South Africa has much to offer. New oligosaccharides have been discovered in the milk of the African elephant and research collaboration on prebiotic oligosaccharides with the Obihiro University in Japan has been fruitful. The fat composition of the African species yielded interesting results and research on the milk proteins has been initiated. Further collaboration with researchers in Ireland and Germany was necessary to exploit these fields. The last word on cow's milk is also not out yet; the lactose content and fatty acid composition of the milk of indigenous African cattle breeds deviate from the norm and further investigation is required to provide a nutritional explanation.

Dr Maryna de Wit received funding to research the food quality aspects of cactus pears. There are more than 40 cactus pear cultivars in South Africa. No other country in the world has so many available; not even the countries of origin, the USA and Mexico. This is a hardy plant and suitable to be cultivated in arid regions. Although a few cultivars are currently economically exploited as fresh fruit, they do not perform equally well in all the regions of South Africa. In the past two years Dr de Wit and her students have shown how the food quality of cactus pears may vary over different geographic locations in South Africa. Apart from its use as fresh fruit, the high content of pectin and mucilage should render it an ideal fruit for juice and jam production. A comparative study on the contents of these polysaccharides in various cactus pear cultivars is currently under way.



UFS Microbiology students undertook an academic excursion to South African Breweries Ltd, Gauteng. The group is shown here at the SAB Alrode brewery.

The work of Ms Carina Bothma and Prof. Arno Hugo on pork quality was presented at the XXI World Congress of the International Federation for Home Economics in Lucerne, Switzerland. Their work focused on the improvement of the nutritional quality and sensory profile of pork by the inclusion of conjugated linoleic acid (CLA) in the diet of the animal. The sensory profile is important for acceptance by the consumer.

The Food Science division is also active in community development by presenting short courses in dairy processing. For the 9th year running, Drs Maryna de Wit and Celia Hugo presented a one-day short course in the production of value-added dairy products, focusing on the production of Gouda, feta and cottage cheese, Amazi and yoghurt. The aim of the short courses is to enable milk producers and entrepreneurs (mainly farmers) to add value to their product. Adding value to farm products has become the order of the day in the recent economic climate, and the commercial success of several past attendees has resulted from these courses.

During the month of August, several staff members and students of the **BioPAD Metagenomics Platform** represented the UFS in visits to various research institutions and conferences abroad. Dr Lizelle Pieter

and Ph.D. students Ms Nathlee Abbai and Kamini Gounder visited the Institut für Mikrobiologie und Genetik, Georg-August-Universität, Göttingen, Germany, to respectively acquire knowledge on the construction of large-insert metagenomic libraries and complete the genome sequencing of a unique South African mine bacterial isolate. Due to the substantial progress made to date with the genome project, Ms Gounder was invited to stay for a further two months. Also, the library construction results of Ms Abbai will now lead to a joint collaborative project between the UFS and the group in Germany, with the possibility of an international exchange of students.

Profs Esta van Heerden and Derek Litthauer attended a prokaryotic gene annotation workshop at the J Craig Venter Institute in Rockville, Maryland, USA after which they moved on to San Diego, California for the Instruments, Methods, and Missions for Astrobiology XI Conference where Prof. Van Heerden presented an invited talk and submitted a publication on the group's work. Prof. Litthauer also joined the group in Göttingen to plan future collaboration with the Göttingen genomics laboratory and the Institut für Mikrobiologie und Genetik, before returning to South Africa. Prof. Van Heerden, accom-



Staff and students of the Department of Microbial, Biochemical and Food Biotechnology who participated in international conferences, workshops and research visits to foreign countries during 2008. Here are, from the left, front: Prof. Hugh Patterton, Dr Lizelle Piater, Prof. Lodewyk Kock, Dr Carlien Pohl-Albertyn, Prof. Rob Bragg, Ms Sonia van Zyl, and Prof. Martie Smit; middle: Profs Garry Osthoff, Esta van Heerden, James du Preez, Departmental Chairperson, Hester Steyn, Ms Carina Bothma, Profs Koos Albertyn, Bennie Viljoen, and Derek Litthauer; back: Ms Liezl Renz, Mr Ruan Ells, Ms Chantal Smith, Mr Walter Müller, Dr Elsabé Botes, Ms Ntsoaki Leeuw, Nathlee Abbai, Dr Khajamohiddin Syed, Ms Kamini Gounder, Dr Suman Pradhan.

panied by post-doctoral fellow Dr Elsabé Botes, subsequently visited GeoSyntec Consultants and was hosted by one of their principal investigators, Dr Mary DeFlaun (who also is an affiliate associate professor of the department). The aim was to investigate and learn field techniques associated with specialised *in situ* bioremediation technologies. The site investigations regarding remedial strategies for chromium included a naval air station that utilises bioaugmentation for remediation and two other sites using biostimulation as well as chemical and physical remediation strategies. The investigators are now forming a consultation unit for site investigations, remediation and environmental management.

Mr Errol Cason, M.Sc. student, paid a visit to Prof. TC Onstott at the Department of Geosciences at Princeton University, New Jersey, USA. Under the tutelage of Prof. Onstott, a world leader in his field, Mr Cason was taken through the process of microbial applications of geochemical modelling of geochemical water data taken from sites in South Africa. This trip was made possible by means of financial support provided by the NRF through a KIC free-standing travel grant. On the opposite side of the

world, Dr Antonio Garcia-Moyano, a post-doctoral fellow, presented a poster at the 12th International Symposium on Microbial Ecology, Microbial Diversity - Sustaining the Blue Planet Conference, organised by the International Society for Microbial Ecology (ISME) in Cairns, Australia.

Prof. Van Heerden and two Ph.D. students, Messrs Armand Bester and Godfrey Tlou, visited research collaborators at the Centro de Biología Molecular, University of Autónoma, Madrid, Spain, where the students also conducted experimental work. Prof. Van Heerden also visited the prestigious Centro de Astrobiología (CAB) to give a seminar and an overview of her group's research. CAB is the first astrobiology research institute outside of the USA to be associated with the National Aeronautics and Space Administration (NASA).

On the local scene, eight students of the Metagenomics Platform together with Profs Litthauer, Van Heerden and Dr Piater attended the Bio-08 Conference in Grahamstown in January where they gave five oral and three poster presentations. In September, the International Extremophiles 2008 conference held in Cape Town was attended by several members of the Metagenomics Platform. Prof.

Esta van Heerden gave both the keynote and an oral presentation and three post-doctoral fellows and one Ph.D. student presented posters.

Other highlights in the Metagenomics Platform this year include Dr Dirk Opperman accepting a post-doctoral fellowship at the Max Planck Institute in Mülheim, Germany and the student exchange with Spain, which included a post-doctoral fellow (Dr Daniel Vega Mendoza) and Ph.D. student (Mr Eloy Ferreras Puente) coming to work in the Metagenomics Platform.

Prof. Lodewyk Kock, who heads the **Lipid Biotechnology research group**, presented research on invitation at the 1st International Conference on Drug Design & Discovery held in Dubai, which was chaired by a Nobel Laureate, with the International Advisory Board comprising 14 Nobel Laureates. Prof. Kock, Dr Carlien Pohl-Albertyn and students delivered in total eight presentations at international conferences in Dubai, Botswana, Ukraine, and Greece. Dr Pohl-Albertyn and her M.Sc. student, Ruan Ells, were invited to present lectures at the 12th International Congress on Yeasts held in Kiev, Ukraine in August. Prof. Kock, in collaboration with the South African

Breweries, published a review article in one of the world's foremost specialised yeast journals, namely *FEMS Yeast Research*. Results from the M.Sc. study of student Mr Desmond Ncango were displayed on the cover page of all 2008 issues of the ISI-accredited *Canadian Journal of Microbiology*. This student also received the JP van der Walt prize for best M.Sc. dissertation in Yeast Science, the Andries Brink-Sasol prize for best M.Sc. dissertation in Microbiology, the Chris Small prize for an outstanding master's dissertation and the S₂A₃ bronze medal for an outstanding master's dissertation on original research in the Natural and Agricultural Sciences. In addition, the discovery of yeast biomechanics in micron space by this group was successfully applied in a graduate biology practical course by the top mycologist, Prof. John Taylor, from the University of California in Berkeley, USA. The Lipid Biotechnology group also contributed to South African and international scientific communities. They partially sponsored the 12th International Congress on Yeasts held in Kiev, Ukraine and presented a workshop for the North West Health Department on 27 June 2008 in Mafikeng. Six articles were published in the popular press and three radio interviews concerning this group's community services were broadcast.

The research facilities in the **Molecular Biology research group**, led by Prof. Koos Albertyn, received a boost by the acquisition of a state-of-the-art DNA sequencer through a grant awarded to Prof. Albertyn by the NRF National Equipment Programme. This grant covered 70% of the cost of the sequencer, which was in excess of R1.3 million, and the remaining funds were obtained from the Faculty of Natural and Agricultural Sciences and the UFS Directorate of Research Development. One aspect this research group is investigating is the development of highly efficient expression systems for the production of heterologous proteins, for both industrial and academic purposes. Dr Michel Labuschagne joined the research group as a post-doctoral research

fellow to further the development of such expression systems. Their other major research programme is on the regulation of alcohol dehydrogenases of *Saccharomyces cerevisiae* (baker's yeast) in collaboration with Prof. James du Preez of the **Fermentation Biotechnology research group**. Following the completion of the Ph.D. study of Dr Olga de Smidt, we now have a better understanding of the regulation of each of the five alcohol dehydrogenase isozymes. Dr De Smidt gave an oral presentation of results from her investigation at the 15th Biennial congress of the South African Society for Microbiology (SASM) held in Grahamstown in January. In addition, Prof. Du Preez gave an oral presentation of part of this research at the joint meeting of the divisions of the International Union of Microbiological Societies (IUMS) in Istanbul, Turkey in August. These findings will soon be submitted for publication. A review article titled "*The alcohol dehydrogenases of Saccharomyces cerevisiae: a comprehensive review*" has already been published in the prestigious journal *FEMS Yeast Research*. Dr Labuschagne and Ph.D. student, Ms Yolande Roodt, both of the Molecular Biology group, also presented results of their research at the Biennial SASM conference.

In the **Fermentation Biotechnology research group**, led by Profs Du Preez and Stephanus Kilian, further research on the physiological role of alcohol dehydrogenases, in collaboration with Prof. Albertyn (see above), focused on aerobic ethanol-limited chemostat cultures of a quadruple deletion mutant strain (Q1) of *S. cerevisiae* to determine to what extent Adh1 could substitute for the other alcohol dehydrogenase isozymes during growth on ethanol. Researcher Ms Laurinda Steyn showed that the growth of mutant strain Q1 (in which Adh1 was the only functional alcohol dehydrogenase) was comparable to the wild type strain, although the data suggested that the glyoxylate shunt was not fully functional in strain Q1, which influenced the biomass yield coefficient. Prof. Kilian's recent research on prebiotics showed that a sugar pre-

viously identified in our laboratory promoted the growth of probiotic yeasts that are used in pharmacological preparations to improve the intestinal microbial population. Prebiotics beneficially modify the intestinal microbial population when ingested, resulting in an improvement of the individual's health. New potential prebiotics produced by yeasts have also been identified. These results may be used to formulate synbiotics, which are combinations of prebiotics and probiotics. The research project on the fermentation of agave juice extract, in collaboration with Agave Distillers (Pty) Ltd., the only company outside Mexico that produced agave spirit (similar to the Mexican tequila), was concluded due to the liquidation of the company. An interesting finding of this research was that the ethanol productivity and yield of *Kluyveromyces marxianus* strains were comparable to commercial *Saccharomyces cerevisiae* strains. This highlighted the potential of *K. marxianus* for use in the agave fermentation, especially in view of its superior performance in batches of juice containing inhibitory compounds.

The **Biocatalysis research group** of Prof. Martie Smit focuses on the terminal hydroxylation of alkanes and alkylbenzenes by cytochrome P450 monooxygenases, but benzylic hydroxylation of alkyl phenols by vanillyl alcohol oxidases is also receiving attention. The Biocatalysis group started an eventful 2008 with all ten members of the group presenting their results at the Bio-08 Conference in Grahamstown in January. In May the group acquired the first SpectraMax2 plate reader in South Africa, bought with funding from the NRF, UFS and the Department of Science and Technology - NRF Centre of Excellence in Catalysis. Prof. Smit also obtained funding from the SA National Bioinformatics Network (NBN) and the UFS for the creation of a 3D-Molecular-Class-Specific Information System (3D-MCSIS) for the cytochrome P450 superfamily by Dr Henk-Jan Joosten of Bioproduct, Wageningen, the Netherlands. During June 2008 Prof. Smit spent

10 days in the Netherlands to work on the database with Dr Joosten in the laboratory of Prof. Gert Vriend in the Centre for Molecular and Biomolecular Informatics of the Nijmegen Centre for Molecular Life Sciences at Nijmegen University. In June Prof. Smit and post-doctoral fellow Dr Khajamohidden Syed also presented posters at the 9th International Symposium on P450 Biodiversity and Biotechnology in Nice, France. In November Prof. Smit organised a one and a half day Biocatalysis Breakaway at CATSA2008, the annual meeting of the Catalysis Society of South Africa. Three visitors from Germany presented talks at CATSA2008 and at the Biocatalysis Breakaway. They were Prof. Karl-Heinz Drauz from Evonik-Degussa, Dr. Vlada Urlacher from the Institute for Technical Biochemistry of Stuttgart University and Prof. Jürgen Pleiss, also from the Institute for Technical Biochemistry. At the end of November Prof. Smit hosted a visit by a four-man delegation from the Department of Science and Technology of the Ministry of Industry and Trade of Vietnam, who came to South Africa to investigate future collaboration on biodiversity. One of the members of the delegation, Dr. Vu Nguyen Thanh, was a post-doctoral fellow in the laboratory of Prof. Smit during 1994 – 1996.

Prof. Rob Bragg, who heads the **Veterinary Biotechnology research group**, was invited to a Mentofin Symposium in May that was held in Cappodocia, Turkey. He was one of the four invited speakers at this congress where he presented results from various contract projects involving the product Mentofin. Mentofin is a herb-based product that is produced in Germany and is now marketed worldwide for use in the poultry industry. This product reduces the severity of vaccination reactions in poultry vaccinated with live virus vaccines and reduces the impact of various bacterial diseases in poultry, thus reducing the reliance on antibiotics in this industry. In August he undertook a second visit to Turkey to attend the Virology congress of the joint meeting of the divisions of the International Union of Microbiolo-

gical Societies (IUMS) which was held in Istanbul, where he presented two talks and a poster. Two research teams from the Veterinary Biotechnology group entered the NRF national innovation fund competition. One team, consisting of Ms Alta Hattingh and Dr Kulsum Kondiah, submitted a business plan on the development of a vaccine for beak and feather disease virus. The other team, consisting of Mr Lehloholo Mathengtheng, Mss Kacey Kakoma and Jay Lee submitted a proposal on the use of bacteriophages for the control of bacterial diseases in poultry. This team won the University of the Free State leg of the competition and went on to compete at the finals in Stellenbosch, where they won the prize for the best exhibit at the show. On the research side, the development of a DNA vaccine for the control of beak and feather disease was successfully completed and tested in budgies, where an immune response was demonstrated.

The **Epigenomics and DNA Function research group** of Prof. Hugh Patterson is rapidly gaining momentum and improving its research facilities. January 2008 witnessed the installation of the

4000QTRAP mass spectrometer, fitted with an inline nanoflow HPLC, in the Facility for Genomics and Proteomics (FGAP). This instrument has expanded the capabilities of FGAP to allow protein identification, quantification and analyses of protein post-translational modifications, providing advanced proteomics capabilities on the UFS campus. Prof. Patterson attended two training workshops in Brussels, Belgium on the European Union Framework 7 funding schemes and also visited collaborators at the École Nationale Supérieure de Lyon in France in July. In September he attended a five-day training workshop on Quantitation in Mass Spectrometric Proteomics at the University of Southern Denmark in Odense, Denmark. In October three students from Prof. Patterson's group attended and presented posters as the MSSA2008 congress organised by the South African Association for Mass Spectrometry in Bela-Bela. December saw the delivery of a 3200QTRAP mass spectrometer, which will be placed in FGAP where it will be used for research by the UFS and also for demonstration purposes by Applied Biosystems in an agreement with the UFS. ■

Research outputs

Research articles

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Staff

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Professors: Profs James du Preez, Rob Bragg, Stephanus Kilian, Lodewyk Kock, Derek Litthauer, Hugh Patterson, Martie Smit, Bennie Viljoen

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Lecturer: Ms Ismarie van der Merwe

Junior Lecturers: Mss Sonia van Zyl, Petro Swart, Minnie Ras

Assistant Professional Officer: Ms Doretha Jacobs

Messenger: Ms Mary Makhapela

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Conference contributions

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Albertyn, J., De Smidt, O., Ntlhokoa, K. & Du Preez, J.C. 2008. *The role of alcohol dehydrogenase isozymes in the yeast Saccharomyces cerevisiae*. Lecture presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.

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- García-Moyano, A., Piater, L.A., Raji, A., Möller, C., Fuku, S.L., Litthauer, D. & Van Heerden, E.** 2008. *Microbial ecology of biofilms found in South African deep mines.* Poster presented at the International Extremophiles 2008 Conference, Cape Town, South Africa. 7-11 September.
- Goldblatt, M.E., Van Wyk, P.W.J., Pohl, C.H. & Kock, J.L.F.** 2008. *Ascospore release and oxylipin production in the yeast Dipodascopsis.* Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Gounder, K., Piater, L.A., Van Heerden, E. & Litthauer, D.** 2008. *Pyrosequencing of the extremophile Thermus scotoductus SA-07.* Lecture presented at the BIO-08 Combined Conference of the South African Society for Microbiology (SASM), Biotech SA and the South African Society for Biochemistry and Molecular Biology (SASBMB), Grahamstown, South Africa. 21-25 January.
- Gumede, S.P., Du Preez, J.C., Harrison, S.T.L. & Smit, M.S.** 2008. *Dicarboxylic acid production from n-alkane using Candida tropicalis ATCC20962 and Yarrowia lipolytica MTL37 and FT120.* Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
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- Joseph, M., Reid, V.J., Pohl, C.H., Hugo, A., Van Wyk, A. & Kock, J.L.F.** 2008. *The quality of fried foods in South Africa.* Poster presented at the 6th Euro Fed Lipid Congress: Oils, Fats and Lipids in the 3rd Millennium, Athens, Greece. 7-10 September.
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- Lee, J-Y. & Bragg, R.R.** 2008. *Investigating methods of isolating and identifying possible unknown poultry viruses.* Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Leeuw, N.J., Joseph, M., Pohl, C.H. & Kock, J.L.F.** 2008. *Utilization of palm breakdown products by *Cryptococcus curvatus*.* Poster presented at the 6th Euro Fed Lipid Congress: Oils, Fats and Lipids in the 3rd Millennium, Athens, Greece. 7-10 September.
- Leeuw, N.J., Swart, C.W., Ncango, D.M., Pohl, C.H., Sebolai, O.M., Strauss, C.J., Botes, P.J., Van Wyk, P.W.J. & Kock, J.L.F.** 2008. *Acetylsalicylic acid as antifungal in *Eremothecium* and other yeasts.* Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Lippmann-Pipke, J., Erzinger, J., Zimmer, M., Kujawa, C., Van Heerden, E., Bester, P.A., Moller, H., Boettcher, M. & Reches, Z.** 2008. *Direct observation of blasting triggered goegas transport through an inactive fault system at 3.6 km depth, Tau Tona gold mine, South Africa.* Poster presented at the International Continental Scientific Drilling Program (ICDP) and the Integrated Ocean Drilling Program (IODP) Joint Colloquium, Hannover, Germany. 12-14 March.
- Mabwe, S., Theron, C., Syed, K., Albertyn, J. & Smit, M.S.** 2008. *Exploring hydrolase activity of recombinant *Pseudomonas putida* transformed with CYP102A1.* Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Mathengtheng, L. & Bragg, R.R.** 2008. *Molecular characterization of *Mycoplasma gallisepticum* strains from South Africa.* Lecture presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Mayne, S. & Patterson, G-H.** 2008. *Software for analysis of cross-linked proteins by mass spectrometry.* Poster presented at the South African

- Association for Mass Spectrometry Conference, Bela Bela, South Africa. 12-16 October.
- Mfenyana, N.O. & Bragg, R.R.** 2008. *Isolation and characterization of a psittacine adenovirus from diseased parrots*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Mfenyana, N.O. & Bragg, R.R.** 2008. *Isolation and characterization of a psittacine adenovirus from diseased Cape parrots in South Africa*. Lecture presented at the 14th International Congress of Virology and the Joint Meeting of the Divisions of the International Union of Microbiological Societies (IUMS), Istanbul, Turkey. 10-15 August.
- Müller, W.J., Smit, M.S., Van Heerden, E. & Piater, L.A.** 2008. *A novel archaeal cytochrome P450 isolated from a South African saltern*. Poster presented at the International Extremophiles 2008 Conference, Cape Town, South Africa. 7-11 September.
- Müller, W.J., Van Heerden, E. & Piater, L.A.** 2008. *Isolating a novel thermostable cytochrome P450 from the extremophile Thermus scotoductus SA-01*. Lecture presented at the BIO-08 Combined Conference of the South African Society for Microbiology (SASM), Biotech SA and the South African Society for Biochemistry and Molecular Biology (SASBMB), Grahamstown, South Africa. 21-25 January.
- Myburg, J., Osthoff, G., Hugo, A., De Wit, M. & Nel, J.** 2008. *Milk composition of South African beef cattle*. Poster presented at the 41st Annual General Meeting and Symposium of the South African Society of Dairy Technology (SASDT), Champagne Sports Resort, Central Drakensberg, South Africa. 14-16 April.
- Ncango, D.M., Kock, J.L.F., Swart, C.W., Pohl, C.H., Strauss, C.J., Van Wyk, P.W.J. & Botes, P.J.** 2008. *Oxylipin and mitochondrion probes to track asci of Ascoidea*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Ncango, D.M., Kock, J.L.F., Swart, C.W., Pohl, C.H., Strauss, C.J., Van Wyk, P.W.J. & Botes, P.J.** 2008. *Oxylipin and mitochondrion probes to track asci of Ascoidea*. Poster presented at the 12th International Congress on Yeasts, Kiev, Ukraine. 23-27 August.
- Nel, J.F. & Steyn, H.J.H.** 2008. *The evaluation of mixed yarn fabrics of Gonometa postica silk, acrylic and wool*. Lecture presented at the 9th International Biannual Conference of the South African Association of Family Ecology and Consumer Science (SAAFECs), Pretoria, South Africa. 13-16 May.
- Nel, S., Albertyn, J., Labuschagne, M., De Kock, P., Du Preez, J.C. & Smit, M.S.** 2008. *Heterologous gene expression in non-conventional yeasts*. Lecture presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Ngubo, M. & Patterton, G-H.** 2008. *Post-translational modifications of histone tails during exit of stationary phase*. Poster presented at the South African Association for Mass Spectrometry Conference, Bela Bela, South Africa. 12-16 October.
- Ojo, A.O., Van Heerden, E. & Piater, L.A.** 2008. *Extremophiles from copper bioreactors and subsequent characterization of copper resistance genes*. Poster presented at the BIO-08 Combined Conference of the South African Society for Microbiology (SASM), Biotech SA and the South African Society for Biochemistry and Molecular Biology (SASBMB), Grahamstown, South Africa. 21-25 January.
- Onstott, T.C., Chan, E., Van Heerden, E., Litthauer, D., Bester, P.A., Reches, Z., Van Aswegen, G., Moller, H. & Lippmann-Pipke, J.** 2008. *An in situ bioseismicity experiment 3.6 km beneath the surface at NELSAM*. Lecture presented at the American Geophysical Union (AGU) Conference, San Francisco, California, USA. 14-18 December.
- Opperman, D.J., Piater, L.A., Litthauer, D. & Van Heerden, E.** 2008. *An Old Yellow Enzyme homologue from Thermus scotoductus SA-01*. Poster presented at the International Extremophiles 2008 Conference, Cape Town, South Africa. 7-11 September.
- Opperman, D.J., Sewell, T., Piater, L.A., Litthauer, D. & Van Heerden, E.** 2008. *An Old Yellow Enzyme homologue from Thermus scotoductus SA-01*. Lecture presented at the Conference of the Catalysis Society of South Africa (CATSA), Parys, South Africa. 9-12 November.
- Osthoff, G.** 2008. *Enzymes from yeast adjuncts in proteolysis during cheddar cheese ripening*. Poster presented at the 5th International Dairy Federation (IDF) Symposium on Cheese Ripening, Characterization and Technology, Berne, Switzerland. 9-14 March.
- Osthoff, G.** 2008. *The role of enzymes of yeast adjuncts in cheese ripening*. Lecture presented at the 41st Annual General Meeting and Symposium of the South African Society of Dairy Technology (SASDT), Champagne Sports Resort, Central Drakensberg, South Africa. 14-16 April.
- Osthoff, G., Hugo, A., De Wit, M. & Nguyen, M.** 2008. *Milk of other species: Blesbok milk*. Poster presented at the 41st Annual General Meeting and Symposium of the South African Society of Dairy Technology (SASDT), Champagne Sports Resort, Central Drakensberg, South Africa. 14-16 April.
- Pohl, C.H., Ncango, M.D., Swart, C.W., Van Wyk, P.W.J., Lodolo, E. & Kock, J.L.F.** 2008. *Oxylipin studies expose aspirin as antifungal*. Lecture presented at the 12th International Congress on Yeasts, Kiev, Ukraine. 23-27 August.
- Pradhan, S., Piater, L.A., Litthauer, D. & Van Heerden, E.** 2008. *Analysis of bacterial diversity and related assemblage of sulphur-reducers associated with South African Goldfield mines*. Poster presented at the International Extremophiles Conference, Cape Town, South Africa. 7-11 September.
- Roodt, Y., Bragg, R.R., Ismail, A. & Albertyn, J.** 2008. *Whole genome sequencing of Avibacterium paragallinarum through the use of GS technology*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Sebolai, O.M., Pohl, C.H., Botes, P.J., Strauss, C.J., Van Wyk, P.W.J. & Kock, J.L.F.** 2008. *Oxylipin release in Cryptococcus neoformans*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Sharma, P. & Patterton, G-H.** 2008. *Binding of H1 in chromatin*. Poster presented at the South African Association for Mass Spectrometry Conference, Bela Bela, South Africa. 12-16 October.
- Shuping, D.S.S., Syed, K., Theron, C., Albertyn, J. & Smit, M.S.** 2008. *Cloning of two cytochrome P450 monooxygenases (CYP13A and CYP17A) from Candida tropicalis ATCC20336 into Yarrowia lipolytica FT120*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Siebrits, F.K., Makgekgenene, A. & Hugo, A.** 2008. *Effect of saponified high fat sunflower oilcake and lipoic acid on fat quality of lambs*. Poster pre-

- sented at the 10th World Conference on Animal Production (WCAP), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.
- Smit, M.S.** 2008. *Alkane and fatty acid hydrolases of alkane degrading yeasts*. Lecture presented at the BIO-08 Combined Conference of the South African Society for Microbiology (SASM), Biotech SA and the South African Society for Biochemistry and Molecular Biology (SASBMB), Grahamstown, South Africa. 21-25 January.
- Smit, M.S.** 2008. *The CYP52 family – terminal hydroxylases from alkane degrading yeasts*. Lecture presented at the Conference of the Catalysis Society of South Africa (CATSA), Parys, South Africa. 9-12 November.
- Smit, M.S. & Mabwe, S.** 2008. *Homology modeling of terminal hydroxylases from alkane utilizing yeasts*. Poster presented at the 9th International Symposium on Cytochrome P450 Biodiversity and Biotechnology, Nice, France. 8-12 June.
- Steyn, H.J.H. & Mafaesa, M.A.M.** 2008. *Solar baking, the environment friendly alternative to conventional retting of Agave americana fibre*. Poster presented at the 21st World Congress of the International Federation for Home Economics (IFHE), Lucerne, Switzerland. 26-31 July.
- Steyn, L., De Smidt, O., Ntlhokoa, K., Albertyn, J. & Du Preez, J.C.** 2008. *The role of alcohol dehydrogenase 1 and 2 in Saccharomyces cerevisiae*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Swart, C.W., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F.** 2008. *Oxylipin accumulation in fermentative and non-fermentative yeasts*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Swart, C.W., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F.** 2008. *Oxylipin accumulation in fermentative and non-fermentative yeasts*. Poster presented at the 12th International Congress on Yeasts, Kiev, Ukraine. 23-27 August.
- Swart, C.W., Van Wyk, P.W.J. & Kock, J.L.F.** 2008. *Electron and confocal microscopic examination of oxylipin accumulation in fermentative and non-fermentative yeasts*. Lecture presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), University of Botswana, Gaborone, Botswana. 21-25 July.
- Syed, K., Randell, C., Albertyn, J. & Smit, M.S.** 2008. *Isolation and characterization of hydrocarbon degrading Acidovorax sp. – Implications for hydrocarbon uptake*. Lecture presented at the Conference of the Catalysis Society of South Africa (CATSA), Parys, South Africa. 9-12 November.
- Syed, K., Shiningavamwe, A., Albertyn, J. & Smit, M.S.** 2008. *Molecular cloning and sequence analysis of a novel cytochrome P450 gene CYP 557A1 from Rhodotorula retinophila CBS 8446*. Poster presented at the 9th International Symposium on Cytochrome P450 Biodiversity and Biotechnology, Nice, France. 8-12 June.
- Theron, C., Shiningavamwe, A., Setati, E., Obiero, G., Van Rooyen, N., Syed, K., Ramorobi, L., Mabwe, S., Albertyn, J., Nicaud, J-M. & Smit, M.S.** 2008. *Yarrowia lipolytica as a host for heterologous expression of cytochrome P450 monooxygenases*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Tlou, G., Van Heerden, E. & Piater, L.A.** 2008. *A thermostable lipase from Geobacillus thermoleovorans GE-7 isolated from an ultra-deep South African gold mine*. Poster presented at the International Extremophiles 2008 Conference, Cape Town, South Africa. 7-11 September.
- Van Heerden, E., Litthauer, D., Piater, L.A. & Onstott, T.C.** 2008. *Metabolic promiscuity from the deep subsurface, a story of survival or superiority*. Lecture presented at the SPIE Optical Engineering and Applications Symposium, San Diego, USA. 10-14 August.
- Van Heerden, E., Litthauer, D., Piater, L.A. & Onstott, T.C.** 2008. *Metabolic promiscuity from Thermus scotoductus SA-01: An extensive investigation of the proteins from this thermophile from the deep subsurface*. Lecture presented at the International Extremophiles 2008 Conference, Cape Town, South Africa. 7-11 September.
- Van Heerden, E., Piater, L.A. & Litthauer, D.** 2008. *BioPad - UFS Metagenomics Platform: Endless opportunities!* Lecture presented at the Bio2Biz SA 2008 Conference, Sandton Convention Centre, Johannesburg, South Africa. 15-17 September.
- Van Marwijk, J. & Van Heerden, E.** 2008. *Characterization of nanoparticles produced by Thermus scotoductus SA-01*. Lecture presented at the BIO-08 Combined Conference of the South African Society for Microbiology (SASM), Biotech SA and the South African Society for Biochemistry and Molecular Biology (SASBMB), Grahamstown, South Africa. 21-25 January.
- Van Rooyen, N., Khajamohiddin, S. & Smit, M.S.** 2008. *Characterization of vanillyl alcohol oxidase activity in Fusarium spp.* Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Van Zyl, J.C. & Steyn, H.J.H.** 2008. *Electrochemically activated water as a green alternative to phosphate laundry detergent*. Poster presented at the 21st World Congress of the International Federation for Home Economics (IFHE), Lucerne, Switzerland. 26-31 July.

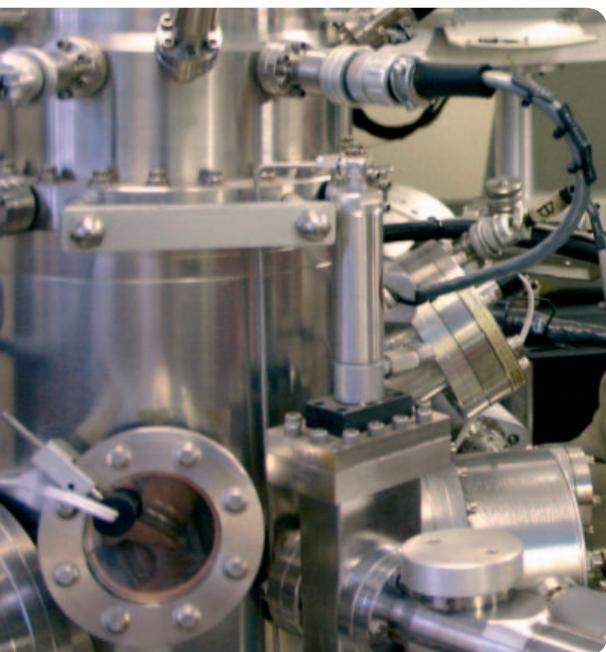
Patents

- Du Preez, J.C. & Van Rensburg, E.** 2007/8. Growth medium for enhanced leukotoxin production. SA Patent no 2006/03853.

Department of

Physics

“We are one of the leaders in nanotechnology research. Our achievements in Physics in particular have made national and international headlines.” - Prof. Hendrik Swart.



Prof. Hendrik Swart.

Overview

The Department of Physics again had a number of highlights in terms of academic excellence in 2008.

Profs Pieter Meintjes and Koos Terblans were promoted to full professor, Dr Matie Hoffman to associate professor and Dr Martin Ntwaeaborwa to senior lecturer. Profs Pieter Meintjes, Koos Terblans and Wiets Roos obtained a C2 evaluation, Dr Martin Ntwaeaborwa a Y2 and Prof Swart a B2 rating from the National Research Foundation (NRF). Both Prof. Hendrik Swart and Dr Martin Ntwaeaborwa were finalists in the National Science and Technology Forum's (NSTF) research capacity developer and black researcher

categories, respectively. The NSTF awards give recognition to the outstanding contributions of individuals and groups to science, engineering and technology. Prof. Swart also received the Faculty of Natural and Agricultural Science honourable award for mentorship.

Dr Martin Ntwaeaborwa spent three months at the University of Florida, United States of America (USA) studying the synthesis of quantum dots by a hot solution method. He also started NRF-supported collaborations with South Korean Universities. He regularly gave invited talks at other universities such as the University of the Witwatersrand. He is a member of the High Resolution Transmission

Electron Microscopy (HRTEM) committee of the NRF (working in partnership with the Department of Science and Technology) to establish a National HRTEM Centre. He also accompanied Prof. Herman van Schalkwyk, Dean of the Faculty of Natural and Agriculture Science at the University of the Free State (UFS), to Virginia Polytechnic Institute and State University (Virginia Tech) for discussion and signing of a memorandum of understanding in terms of research collaboration between Virginia Tech and the UFS.

Prof. Roos and one of his M.Sc. students, Mr Charl Jafta, identified the need for X-ray photo electron spectroscopy results (which gives the chemical state of elements on the surface). They successfully rehabilitated the XPS spectrometer originally obtained from the Max Planck Institute in Germany, which had been out of action for some time because of x-ray- and ion beam alignment problems. The system is at present fully operational. In their specific research on segregation the doping of Cu with Al is a first step in specimen preparation. This experimental part led to an annealing system which provides for power failures and monitoring the non-reactive gas atmosphere in the annealing tube. The success of the annealing system was confirmed by XPS results from specimens annealed for ten days at 900°C.

In December 2008, Prof. Hendrik Swart and Prof. Jannie Swarts from the Department of Chemistry received R10 million

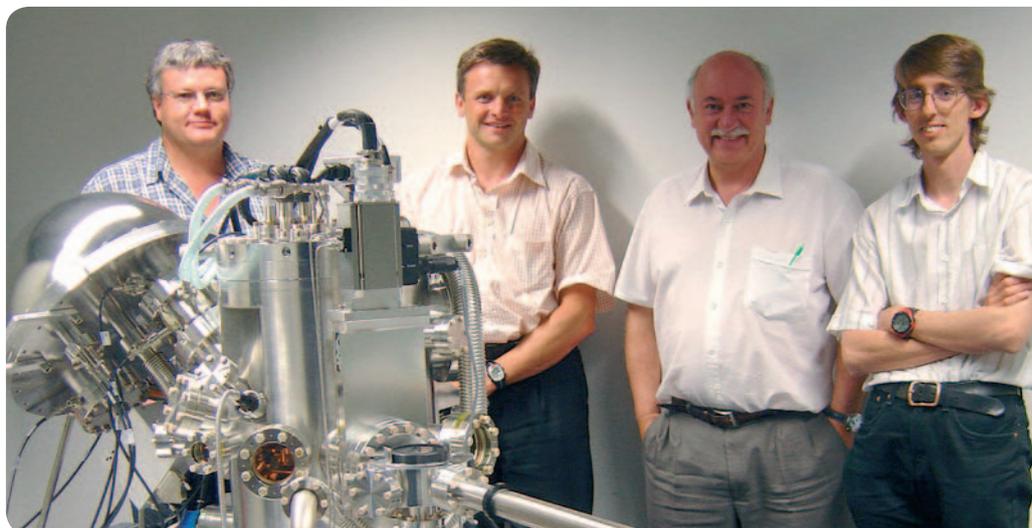
from the National Equipment Programme of the NRF, as well as R3 million from the South African oil giant SASOL, to purchase a nano Scanning Auger Microprobe and an X-ray photoelectron spectroscope to analyse and characterise very small particles. The uniqueness of the system lies in its high resolution capability, which makes it ideal for nanotechnology research. The UFS is one of the leaders in nanotechnology research, and the achievements of Physics in particular have made national and international headlines. The total cost of this equipment package exceeds R23 million and the UFS will be the only institution in Africa, and one of only a few institutions world-wide, that has access to this instrumental array. Profs Hendrik Swart, Jannie Swarts and Koos Terblans have visited several companies in Germany, the United Kingdom (UK) and the USA for live demonstrations on the different systems in order to determine which systems will give us the best performance. Another very valuable addition to the research infrastructure, namely Raman and FTIR spectroscopy, was done from a grant (R1.3 million) obtained from the NRF by Dr Martin Ntwaeaborwa.

Students took part in the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns" competition in Johannesburg, where Mr Charl Jaffa was awarded second prize for his poster. Ms Coetzee again won a software prize with her paper. Ph.D. degrees were awarded to Drs Simon Dhlamini and Edward Jurua. M.Sc. degrees were awarded to Mr Brain van Soelen (cum laude), Hendrik van Heerden and Bosco Oruru.

Staff members and postgraduate students attended several international conferences and summer schools. Mr Edward Jurua attended the School on Astrophysical Fluid Dynamics in Trieste, Italy, while both Messrs Bosco Oruro and Pheneas Nkundubakura attended the High Energy Astrophysics summer school at the University of Urbino, Italy. Mr Nkundubakura also attended the First Middle East-Africa Regional



Prof. Hendrik Swart receiving the faculty's award for mentorship from the Dean of the Faculty of Natural and Agricultural Sciences, Prof. Herman van Schalkwyk.



Profs Hendrik Swart (left) and Jannie Swarts (second from the right) standing at the back of the Versaprobe XPS system during the demo at the SuSoS Laboratorium in Dübendorf, Switzerland. With them are Dr Wolfgang Bets (PHI) (second from the left) and Dr Stefan Zuercher of SuSoS (right).

meeting of the International Astronomical Union (IAU) in Cairo, Egypt. Prof. Pieter Meintjes and two of his Ph.D. students, Bosco Oruro and Pheneas Nkundubakura, gave presentations at the 2008 SKA (Square Kilometre Array) project postgraduate conference in Stellenbosch at the Institute for Advanced Studies.

Profs Swart and Terblans and Dr Dhlamini gave presentations at the 14th International Conference on Solid Films and Surfaces (ICSFS), Trinity College, Dublin, Ireland. Prof. Swart and Dr Ntwaeaborwa both presented their work at the 14th International Workshop on

Inorganic and Organic Electroluminescence and 2008 International Conference on the Science and Technology of Emissive Displays and Lighting, Bagni di Tivoli, Rome, Italy. Profs Swart and Terblans and Mr Heinrich Joubert also made contributions at the 23th International Conference on Atomic Collisions in Solids (ICACS), Phalaborwa. Dr Ntwaeaborwa was sponsored by his American collaborators to present a poster at the American Vacuum Society – 55th International Symposium, Boston, USA. Prof. Matie Hoffman attended the workshop at the Cincinnati Observatory Centre in the USA.

The Research Institute for Education Planning (RIEP) at the UFS trained Grade 12 Science teachers in preparation for the implementation of the National Curriculum Statement for Physical Sciences during the year. The Physical Sciences subject advisors of the Northern Cape Department of Education attended a three-day workshop at the UFS Main Campus where the new Grade 12 subject content was discussed. Prof. Matie Hoffman was involved in the training sessions. Similar training sessions for Physical Sciences teachers in the Northern Cape also took place in Kimberley and Springbok. ■



Prof. Koos Terblans and Mr. Heinrich Joubert on the boat cruise at the 23th ICACS conference in Phalaborwa, South Africa.

Staff

Main Campus:

Professor: Profs Hendrik Swart, Koos Terblans, Pieter Meintjes

Associate Professor: Profs Matie Hoffman, Wiets Roos

Senior Lecturers: Drs Ted Kroon, Martin Ntwaeaborwa

Part-Time Lecturers: Mr Gustav Smit, Dr Rochelle Conradie

Professional Officer: Mr Heinrich Joubert

Administrative Officer: Ms Elsa Pretorius

Owaqwa Campus:

Senior Lecturers: Dr Francis Dejene

Lecturers: Dr Justice Msomi, Messrs Jappie Dolo, Moses Mothudi, Richard Ocaya

Contact details

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Website: www.ufs.ac.za

Research outputs

Research articles

Coetsee, E., Botha, R., Terblans, J.J. & Swart, H.C. 2008. Lumineserende eienskappe van $Y_2SiO_5:Ce$ nanodunlagies. *Die Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 27(2): 146.

Coetsee, E., Terblans, J.J. & Swart, H.C. 2008. $Y_2SiO_5:Ce$ thin films grown by PLD. *Physica Status Solidi C* 5(2): 634-637.

Dhlamini, M.S., Terblans, J.J., Kroon, R.E., Ntwaeaborwa, O.M., Ngaruiya, J.M., Botha, J.R. & Swart, H.C. 2008. Photoluminescence properties of SiO_2 surface passivated PbS nanoparticles. *South African Journal of Science* 104(9-10): 398-400.

Dhlamini, M.S., Terblans, J.J., Ntwaeaborwa, O.M., Joubert, H.D. & Swart, H.C. 2008. Preparations and luminescent properties of PbS nanoparticle phosphors incorporated in a SiO_2 matrix. *Physica Status Solidi C* 5(2): 598-601.

Dhlamini, M.S., Terblans, J.J., Ntwaeaborwa, O.M., Ngaruiya, J.M., Hillie, K.T., Botha, J.R. & Swart, H.C. 2008. Photoluminescence properties of powder and pulsed laser deposited PbS nanoparticles in SiO_2 . *Journal of Luminescence* 128(12): 1997-2003.

Dolo, J.J., Swart, H.C., Terblans, J.J., Coetsee, E., Dhlamini, M.S., Ntwaeaborwa, O.M. & Dejene, B.F. 2008. Degradation of commercial $Gd_2O_2S:Tb$ phosphor. *Physica Status Solidi C* 5(2): 594-597.

Harris, R.A., Swart, H.C. & Terblans, J.J. 2008. Gepulseerde laserdeponering van platinum-gebaseerde allooie. *Die Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 27(2): 149.

Jordaan, W.A., Terblans, J.J. & Swart, H.C. 2008. The effect of nitrogen on the co-segregation with molybdenum in a Fe-3.5wt%Mo-N(100) single crystal. *South African Journal of Science* 104(9-10): 393-397.

Mathe, T.G., Moyo, T. & Msomi, J.Z. 2008. Optical properties of $Zn_{0.5}(Ni, Co)_{0.5}Fe_2O_4$ mixed spinel ferrite thin films. *Physica Status Solidi C* 5(2): 591-593.

Ngaruiya, J.M., Nieuwoudt, S., Ntwaeaborwa, O.M., Terblans, J.J. & Swart, H.C. 2008. Resolution of Eu^{2+} asymmetrical emission peak of $SrAl_2O_4:Eu^{2+}, Dy^{3+}$ phosphor by cathodoluminescence measurements. *Materials Letters* 62: 3192-3194.

Nieuwoudt, S., Terblans, J.J., Ngaruiya, J.M., Ntwaeaborwa, O.M., Coetsee, E., Hillie, K.T. & Swart, H.C. 2008. Luminesseiseienskappe van $SrAl_2O_4:Eu^{2+}, Dy^{3+}$ fosfor. *Die Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 27(2): 154.

Ntwaeaborwa, O.M., Dhlamini, M.S., Botha, J.R. & Swart, H.C. 2008. Characterization of sol-gel $SiO_2:Ce,Tb$ powder and pulsed laser deposited

thin film phosphor. *Physica Status Solidi C*. 5(2): 602-605.

Chapters in books

Ntwaeaborwa, O.M., Swart, H.C., Kroon, R.E., Botha, J.R., Ngaruiya, J.M. & Holloway, P.H. 2008. Enhanced photoluminescence of rare-earth activators in sol-gel derived SiO_2 by energy transfer from ZnO nanoparticles and co-activators. In *Photoluminescence Research Progress*, edited by H.K. Wright and G.V. Edwards. Hauppauge: Nova Science Publishers. pp. 287-306

Conference contributions

Asante, J.K.O. & Roos, W.D. 2008. *Comparing segregation profiles of Sn and Sb in single and polycrystalline Cu*. Poster presented at the 23th Bi-annual International Conference on Atomic Collisions in Solids (ICACS), Hans Merensky Wildlife Estate, Phalaborwa, Limpopo, South Africa. 16-22 August.

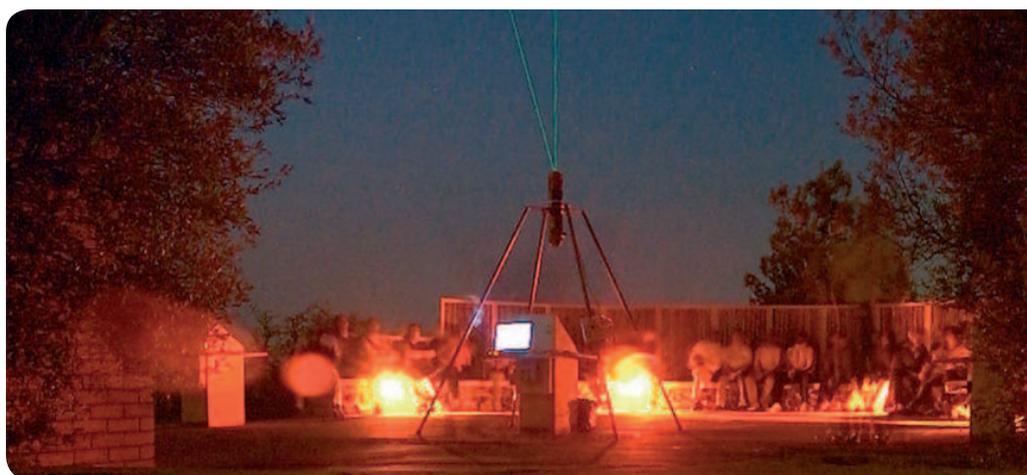
Bem, D.B., Swart, H.C., Luyt, A.S., Coetzee, E. & Dejene, F.B. 2008. *Properties of Blue SrAl₂O₄ Phosphor in LDPE/PMMA Polymers*. Poster presented at the 53rd Annual Conference of the South African Institute of Physics (SAIP), University of Limpopo, Mankweng, South Africa. 9-11 July.

Biggs, M.M., Ntwaeaborwa, O.M. & Swart, H.C. 2008. *The luminescent mechanism of the ZnS:Mn nano-phosphor*. Paper presented at the 53rd Annual Conference of the South African Institute of Physics (SAIP), University of Limpopo, Mankweng, South Africa. 9-11 July.

Biggs, M.M., Swart, H.C., Terblans, J.J. & Ntwaeaborwa, O.M. 2008. *Luminessensie meganisme van gesintetiseerde nanodeeltjies en kommersiële ZnS:Mn²⁺ fosfor*. Paper presented at the Annual Symposium of the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns" (SAAWK), University of Johannesburg, Johannesburg, South Africa. 31 October.

Coetsee, E., Terblans, J.J. & Swart, H.C. 2008. *Luminesserende meganisme van yttriumsillikaat, gedoteer met serium (Y₂SiO₅:Ce), fosfor poeier*. Paper presented at the Annual Symposium of the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns" (SAAWK), University of Johannesburg, Johannesburg, South Africa. 31 October.

Dhlamini, M.S., Ntwaeaborwa, O.M., Ngaruiya, J.M., Terblans, J.J. & Swart, H.C. 2008. *Sol-gel synthesis and luminescent properties of nanoparticulate ZrO₂:PbS powder phosphor*. Poster presented at the 14th International Conference on Solid Films and Surfaces (ICSFS), Trinity College, Dublin, Ireland. 29 June - 4 July.



The new laser pointer installed at the Boyden Observatory.

Dolo, J.J., Terblans, J.J. & Swart, H.C. 2008. *Photoluminescence and structural studies of Gd₂O₂S:Tb phosphor powder*. Poster presented at the 53rd Annual Conference of the South African Institute of Physics (SAIP), University of Limpopo, Mankweng, South Africa. 9-11 July.

Jafta, C.J., Roos, W.D. & Terblans, J.J. 2008. *An argon filled user-friendly annealing system*. Poster presented at the 53rd Annual Conference of the South African Institute of Physics (SAIP), University of Limpopo, Mankweng, South Africa. 9-11 July.

Jafta, C.J., Roos, W.D. & Terblans, J.J. 2008. *'n Gebruikersvriendelike uitgloeisisteam*. Poster presented at the Annual Symposium of the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns" (SAAWK), University of Johannesburg, Johannesburg, South Africa. 31 October.

Joubert, H.D., Terblans, J.J. & Swart, H.C. 2008. *Comparison of inter-diffusion coefficients for Ni/Cu thin films determined from classical heating analysis and linear temperature ramping analysis by means of profile reconstruction and a numerical solution of Fick's law*. Poster presented at the 23th Biannual International Conference on Atomic Collisions in Solids (ICACS), Hans Merensky Wildlife Estate, Phalaborwa, Limpopo, South Africa. 16-22 August.

Joubert, H.D., Terblans, J.J. & Swart, H.C. 2008. *The use of a modified heating method to investigate the Cu/Ni interdiffusion parameters*. Poster presented at the 53rd Annual Conference of the South African

Institute of Physics (SAIP), University of Limpopo, Mankweng, South Africa. 9-11 July.

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- Swart, H.C., Terblans, J.J., Ntwaeaborwa, O.M., Coetsee, E. & Dhlamini, M.S.** 2008. *Photon emission mechanisms of different phosphors.* Poster presented at the 23th Biannual International Conference on Atomic Collisions in Solids (ICACS), Hans Merensky Wildlife Estate, Phalaborwa, Limpopo, South Africa. 16-22 August.
- Terblans, J.J. & Swart, H.C.** 2008. *The segregation of Bi and S from a Cu(Bi,S) ternary crystal.* Poster presented at the 14th International Conference on Solid Films and Surfaces (ICSFS), Trinity College, Dublin, Ireland. 29 June - 4 July.
- Terblans, J.J., Joubert, H.D. & Swart, H.C.** 2008. *Extracting inter-diffusion parameters from Ni/Cu thin films by means of profile reconstruction with the MRI model.* Poster presented at the 23th Biannual International Conference on Atomic Collisions in Solids (ICACS), Hans Merensky Wildlife Estate, Phalaborwa, Limpopo, South Africa. 16-22 August.

Department of Zoology and Entomology

“We started planning the building of an environmental education centre at the Leseding Research Camp in the Okavango Delta, Botswana” - Prof. Jo van As.

Overview

The year 2008 was a time of planning for the Department of Zoology and Entomology. Two major projects were initiated, namely a year-long programme to commemorate the birth of Charles Darwin and the 150th anniversary of his famous book *On the Origin of Species* and the development of plans to build an environmental education centre at the Leseding Research Camp in the Okavango Delta in Botswana, a long-standing dream of the department. The third D.Sc. degree in the history of the University of the Free State (UFS) was also conferred on Prof. Ivan Horak, professor extraordinary in the department.

The department is organised into six 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. Prof. Van As and Ms Deidré West were part of a symposium called “The Orange River Basin – The Resource”, which was held in Bloemfontein



Prof. Jo van As.

from 12-14 November, where Ms West presented a talk.

The annual postgraduate seminar day was held on 13 November at the Paradys Experimental Farm. There were a total of 29 outstanding presentations by postgraduate students, and Prof. Neil Heideman, Vice-Dean of the faculty and a herpetologist, delivered the guest lecture. The following contributions received awards: Ms Andri Erasmus and Mr H Butler “Behavioural aspects of bontebok (*Damaliscus Pygargus Pygargus*) and tsessebe (*D. Lunatus Lunatus*) in the central Free State (Hons); Mr Lucas Janse van Vuuren and Prof. Neil Heideman “A taxonomic



review of the genus *Microaconitias* (Reptilia Acontinae) using DNA and morphometric data” (M.Sc.); and Mr Johan van Niekerk and Prof. Ordino Kok “The activity patterns of birds in the central Free State, South Africa” (Ph.D.).

The **Aquatic Parasitology group** consists of Profs Jo van As and Linda Basson, Dr Liesl van As and the following postgraduate students: Ms Hafeleni Matete, Ms Elindi Jansen van Rensburg, Ms Deidré West and Ms Hanlie Groenewald.

Prof. Jo van As and Dr Liesl van As spent the April 2008 recess at the De Hoop Nature Reserve in the Western Cape with the third-



Field work in the Okavango Delta Panhandle.

year Zoology students as part of the practical requirement of the Marine Ecology course. This has been ongoing for the past 15 years and since 2004 it has become a combined excursion with staff and students of the department of Plant Sciences.

During the excursion, Prof. Van As and Dr Van As spent their time with the third-year students on the rocky shore at De Hoop, while Prof. Linda Basson and the postgraduate students concentrated on collecting and examining fish in the tidal pools of the rocky shore. Two former doctoral students also joined them, i.e. Dr Cecile Reed from the University of Cape Town, who brought a master's student with her, and Dr Kevin Christison from the Department of Environmental Affairs and Tourism in Cape Town.

Prof. Linda Basson spent two weeks in the Okavango, from the end of October to middle November, with a colleague from the University of Limpopo, Prof. PH King, and two postgraduate students. From mid-November 2008 to mid-January 2009, Prof. Jo van As and Dr Liesl van As accompanied postgraduate students on a field trip to the Leseding Research Camp in the Okavango Delta. Just before the end of December they also did a survey at Lake Ngami. For five days, the group had the privilege of hosting Prof. Hennie Van Coller and his

family at the research camp. Prof. Van Coller is the chairperson of the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns". This meant that campfire discussions were of high academic standard, dealing with issues such as environmental pollution and even language pollution.

Profs Jo van As and Linda Basson, Drs Liesl van As and Candice Jansen van Rensburg, as well as Mr Joseph Möller (Zoology honours student) and Ms Deidré West (M.Sc. student) attended the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA), held in Gabarone, Botswana from 21-25 July 2008, where a total of four oral presentations emanated from this group on aquatic parasitology and water ecology.

The **Nematology research group** consists of Dr Candice Jansen van Rensburg and an honours student, Ms Henda Landman. Dr Jansen van Rensburg is at present in Belgium, having left in September to complete her master's degree in Nematology at the University of Gent. She was chosen from many applicants from across the globe and will be finishing her degree in August 2010.

Dr Jansen van Rensburg and Ms Landman also joined Dr Liesl van As on the third-year ecology excursion at the De Hoop Nature Reserve in April. They did a field survey

of nematode species occurring in the fynbos. Ms Landman finished her honours project at the end of 2008, on nematode species associated with a sunflower cultivar in the Free State province. She and Dr Jansen van Rensburg attended the symposium of the 46th Annual Conference of the MSSA in Gaborone (Botswana) from 21-25 July where Ms Landman presented a poster with the title: "Plant-parasitic nematodes associated with a sunflower cultivar in the Free State Province". Ms Landman also attended two other conferences, namely the 23rd International Congress of Entomology (ICE2008) at the ICE in Durban from 6-12 July with members of the Entomology group and the 18th Annual Symposium on Soil-borne Diseases Interest Group of South Africa, held in Stellenbosch from 17-18 September with Profs Schalk Louw, Neal McClaren and Wijnand Swart.

During 2008 the **Eco-Ethology group** researched the behaviour of various animals ranging from mammals and birds to extinct mammals.

With regard to mammals, behavioural aspects of antelope species were the main focus of several studies. The fast-growing game farming industry in South Africa, including the Free State province, has led to an increasing number of non-native game species being introduced into areas outside their natural range. The possible hybridisation between the closely-related bontebok and tsessebe was investigated by Ms Andri Erasmus as part of an honours research project, while Ms Lindi Heyns researched behavioural and genetic aspects of blesbok and bontebok in continuation of her master's degree.

Another master's degree student, Ms Elylia Erasmus, investigated the behaviour of black wildebeest and red hartebeest at Willem Pretorius Nature Reserve. Mr Savvas Vrahimis, associated with the Free State Department of Tourism, Environmental and Economic Affairs, researched aspects of the ecology, behaviour and genetic status of black wilde-

beest in the Free State in continuation of his Ph.D. study. Concerning carnivores, Ms Michelle van As has commenced her master's degree by investigating the behaviour of leopards in Lydenburg.

Behavioural studies of Free State bird species, part of a ten year project, were continued by Mr Johan van Niekerk. The contribution that this long-term study will make to the general knowledge of avifauna in the grassland biome is of inestimable value.

Mr Dewald du Plessis, another master's degree student, has undertaken the investigation of the brain evolution of extinct non-mammalian cynodonts. As part of his study, fossils were scanned and digitally converted to three-dimensional images at the Nuclear Energy Corporation of South Africa (NECSA) near Pelindaba in the North West Province. This study aims to correlate brain size with the physiology and behaviour of these animals.

Mr Hennie Butler and Ms Lindi Heyns attended the fourth European Conference on Behavioural Biology at Dijon, France from 18-20 July 2008 where Mr Butler presented a poster on the feeding association between cattle egrets and their mammal hosts, while Ms Heyns presented a paper on the inter-specific interaction amongst four sympatric carnivore species in the Free State. During the conference contact was established with several leaders in the field of behavioural studies.

Mr Johan van Niekerk attended the 12th Pan-African Ornithological Congress from 7-12 September 2008 at Goudini Spa in the Western Cape, where he presented a paper as well as a poster. The paper concerned a ten-year study on the activity patterns of birds in the central Free State and the poster involved communal roosts of the Lesser Kestrel in the Free State.

The Medical, Veterinary, Forensic Entomology and Agricultural Entomology group has several post-graduate students. Progress of students in Forensic Entomology is as follows:

Mr Kobus Kolver completed the final practical aspects of his research on the influence of burning of a body. He is currently busy processing his results, planning to submit his thesis for assessment by the end of November 2009.

Ms Sonja Brink is doing a taxonomic study of the immature stages of blowflies, of importance in forensic crime investigations. She aims to complete her study by November 2009.

Mr Shaun Hoffman is doing a project in forensic entomology. The subdiscipline is Entomotoxicology. This project is done in collaboration with Dr Piet van der Merwe from the Department of Pharmacology at the UFS. It is expected that Mr Hoffman will complete his study during 2009.

Mr Theo Viljoen is busy with a research project in collaboration with Ms Karin Ehlers from the Department of Genetics. His project deals with the possible differences/similarities between closely-related blowfly species *viz. Lucilia cuprina* and *Lucilia sericata*. These two species are morphologically almost identical and difficult to distinguish from each other. They are very important in criminal investigations.

Mr Viljoen started his research early in 2008, and initially tried to isolate human DNA from the crop content of third instar blowfly larvae. The project was temporarily cancelled due to the high cost of chemicals and genetic markers. Funds were not available to make this project viable.

The progress of students in Veterinary Entomology is as follows:

Dr Gert J Venter, a world-renowned researcher on the bio-ecology and vector potential of *Culicoides* spp. received his Ph.D. degree during the autumn graduation ceremony in 2008. He is currently co-supervisor for Mr Julien Liebenberg, an M.Sc. student in this group.

Ms Ansie Scholtz is an employee of the Department of Agriculture at Elsenburg in the Western Cape. Her project deals



A postgraduate student busy dissecting a fish at the Leseding Research Camp in the Okavango Panhandle.

with various aspects and causes of blowfly strike on sheep. Since she is a full-time employee at the Department of Agriculture, her research project has progressed at a slower rate than was expected. She plans to complete her studies by November 2009, however, and will submit her thesis for assessment at this time. She is currently busy processing her results and writing some of the chapters. In the meantime she is also busy preparing manuscripts from her research for publication in subject-related scientific journals.

Mr Julien Liebenberg is doing an M.Sc. project on the bio-ecology of the *Culicoides* in the Free State. Aspects of the bio-ecology and vector potential of these biting and blood-feeding midges have not been researched extensively in the Free State.

These biting midges are of great veterinary importance, because they can transmit the bluetongue virus to sheep, bovine ephemeral disease virus (three-days-stiffness disease) to cattle and African horse sickness virus to horses. The latter disease can cause large financial losses to the equine breeding and equestrian sport industry, as well as to international trade in horses. Next to the goldmine industry, the equestrian industry is the biggest money spinner for the country.



Prof. Ivan Horak, professor extraordinary at the department, became the third person in the history of the UFS to receive the D.Sc. degree. The degree was awarded to him during the spring graduation ceremony which took place on the Main Campus in Bloemfontein. Here are, from the left: Prof. Jo van As, Departmental Chairperson, Prof. Horak and Ms Ellie van Dalen, Lecturer at the department.

During July 2008 Prof. Theuns van der Linde, Prof. Schalk Louw and Mr Vaughn Swart accompanied a group of 12 postgraduate students to the XXIIIrd International Congress of Entomology in Durban. This congress was hosted by the Entomological Society of Southern Africa. The congress was held in the International Convention Centre (ICC) in Durban from 6-12 July 2008. Papers and posters arising from research done by this group were presented. A number of previous postgraduate students also attended the congress and some of them mentioned their supervisors as co-authors in their presentations.

Prof. Van der Linde acted as co-convenor for the Medical and Veterinary Section and also as organiser of the Forensic Entomology Symposium.

During 2008 Prof. Van der Linde and Mr Shaun Hoffman were requested by the South African Police Services (SAPS) to attend ten crime scenes. Their expertise was needed to help to determine the postmortem interval of the deceased persons.

In 2008 the **Insects on New Crops Programme (INCroP) research group's** cooperative agreement research on pistachio nuts (client: Industrial Development

Corporation - Green Valley Nuts, Prieska), cactus pear (client: SA CactusNet), hoodia (Clients: Phytopharm, United Kingdom and Unilever, United Kingdom) and agave (client: Agave Distillers, Graaff-Reinet) is ongoing and fieldwork and consultation were conducted at all the sites.

Cooperative research on lettuce cultivation under shade house conditions (with the Central University of Technology (CUT), Bloemfontein) was completed and the student submitted an M.Tech. dissertation. Research on mango weevil population dynamics and management (conducted at Bavaria Fruit Estates, Hoedspruit) was also completed and the student submitted a M.Sc. dissertation.

Cooperative research on wheat leaf miner bionomics (with the Agricultural Research Council's (ARC) Small Grain Institute, Bethlehem and Griqualand West Corporation, Douglas), Hemipteran insects as vectors of sorghum diseases (with the division Plant Pathology, at the UFS), navel orangeworm survival on pistachio (with Green Valley Nuts, Prieska) and arboreal insect stratification along the Omaruru River, Namibia (with Polytechnic of Namibia, Windhoek) is ongoing.

Prof. Schalk Louw participated in the 18th Symposium on Soil

Health and Soilborne Plant Diseases hosted at the ARC's Vredenburg Research Centre, Stellenbosch from 16-18 September 2008. He also co-sponsored Ms Henda Landman, the first Nematology postgraduate student in the department, to attend the symposium.

Prof. Louw participates in the UFS's Research Cluster 4, namely: "Technologies for Sustainable Crop Industries in Semi-arid Regions" as far as pest management on new crops and soil health management are concerned.

He also organised and co-ordinated the participation of 12 entomology students from the department at the 23rd International Congress of Entomology that was hosted in Durban during July 2008. Funding received from the Office of the Dean of the Faculty for Natural and Agricultural Sciences made this possible. Prof. Louw was also Deputy Chairperson: Congress Management Committee at the same event.

Prof Louw is the organiser and co-ordinator of the seminar series of the faculty. Five seminars by visiting scientists to the faculty were presented in 2008.

During 2008 field work was conducted by the **Arachnology group** at several localities as part of the South African National Survey of Arachnida (SANSA): in the Western Cape (Sutherland, Anysberg Nature Reserve, Prins Albert, Calitzdorp), the Eastern Cape (Jansenville, Sterkstroom) and KwaZulu-Natal (Ophathe Game Reserve). Several under- and postgraduate students in the department assisted with collecting spiders and other arachnids. The data that is generated through this field work will contribute to the proposed Red Data list of arachnids in South Africa, which is assessing the conservation status of approximately 33% of the Arachnida in the country that have been well studied taxonomically.

During the June-July recess, Mr Haddad paid a three-week visit to the Royal Museum for Central Africa in Tervuren, Belgium. The

aim of the visit was to identify all unidentified Corinnidae spiders, to genus level at least, and to loan specimens for taxonomic studies. The visit was very successful, a variety of new species were discovered, and material from more than 1 200 vials was identified. This includes material forming part of Ph.D. student Domir de Bakker's study of tree canopy-dwelling spiders from African savannas and forests.

Ms Lyle completed her M.Sc. study on the taxonomy of the sac spider subfamily Trachelinae (Araneae: Corinnidae) in June, and passed her degree with distinction. She subsequently started preparing her chapters for publication. During 2008 she also presented several practical modules as part of the undergraduate Entomology curriculum. At the end of 2008 she took up a post as Invertebrate Curator at the Northern Flagship Institute – Transvaal Museum in Pretoria, where she will be responsible for maintaining the wet collection.

Ms Fourie continues her M.Sc. project investigating the ground-, grass- and tree-living spider communities of the Erfenis Dam Nature Reserve. This includes a study on the effects of controlled burning of grassland on succession processes and species diversity of spiders.

The Integrated Pest Management and Environmental Agriculture group's field work during 2008 involved a survey of agricultural management practices associated with new crops on farms in the Western Cape, KwaZulu-Natal and the Northern Cape during March to May, which will be included in Mr Vaughn Swart's Ph.D. Mr Swart is lecturer and researcher in the group.

The new crops include olives, wine grapes, fruit orchards, kenaf, pecan nuts and pistachio nuts. Some of the crops are cultivated in new locations, thus giving them the status of new crops. The main aim was obtain an idea of what agricultural management practices are utilised in terms of overall biodiversity.



The Faculty of Natural and Agricultural Sciences hosted a delegation of Australian agricultural and environmental scientists and farmers at the Paradys Experimental Farm. The group was travelling through Southern Africa on an exploratory fact-finding mission aimed at learning more about local soil conservation practices and agriculture in general. The Dean, Prof Herman van Schalkwyk, and scientists of the faculty as well as members of the Australian delegation made presentations as part of the visit. Pictured from the right, standing, are: Mr Simon Proust, Soil Conservationist, Prof Van Schalkwyk, Mr John Lawrie, Catchment Coordinator and Ms Anne Williams, farmer and President of Central Western Conservation Farming Association. Seated, from the left, are: Mr Ian Packer, Senior Soils Officer, and Robert Goodear, farmer.

During May Mr Swart attended the 2nd National Environmental Management Systems (EMS) Association Forum in Newcastle, New South Wales, Australia.

The 2nd National EMS Forum grew from the success of the first, with 90 delegates attending. The theme of the forum, "Changing our Thinking: Adapting with EMS", reflected the need to embed the concept of environmental management into mainstream business practices. Mr Swart presented a paper on the establishment of an EMS bio-indicator protocol for South African agriculture which is based on new crop case studies. He was hosted by the president of Environmental Management Systems Association (EMSA), Ms Genevieve Carruthers. Ms Carruthers works with Australian farmers and develops and implements EMS on farms. Ms Carruthers is a foundation member of the UN Environmental Program BestPracticeNetwork, established in 2004 and has worked on EMS since 1997 across a wide range of industries.

During August Mr Swart hosted Mr Simon Proust, Mr John Lawrie and several other farmers, consultants and their dependants (about 25 people) for a weekend in Bloemfontein at the Paradys Experimental Farm of the UFS. Mr Swart met Mr Proust at the EMS Forum where they arranged a networking weekend during a planned visit to South Africa. The highlight of the weekend was the seminars which were presented by a group of representatives from the UFS, including Prof. Herman Van Schalkwyk, Dean of the Faculty of Natural and Agricultural Sciences and a group representing the Australians (farmers and consultants). The weekend was sponsored by the Centre for Plant Health Management (CePHMa), the Centre of Environmental Management and Prof. Van Schalkwyk.

During July Mr Swart attended the 23rd International Congress of Entomology (ICE) in Durban, South Africa where over 2,500 delegates from 102 countries participated. He presented a paper on using insects as bio-indicators to establish a protocol for South



Dr Rogier Junte, a final-year veterinary student at the University of Utrecht, The Netherlands, was involved in a research project with the research team of the Pesticides Resistance Testing Facility at the department. The project was coordinated by Ms Ellie van Dalen from the test facility and Prof. Frans Jongejan of the University of Utrecht. Here are, from the left, front: Dr Junte and Ms van Dalen; back: Prof. Neil Heideman, Vice-Dean: Faculty of Natural and Agricultural Sciences, and Prof. Jo van As, Departmental Chairperson.

African agriculture, based on new crop case studies.

In September Mr Swart was approached by Oubaai Golf Estate, George, South Africa, for assistance with a wood borer problem. Mr Swart was accompanied by Dr Léan van der Westhuizen and Mr Theuns Louw to investigate the problem. It was reported that three species of wood borer were found to be causing damage to various structures within the estate. The group recommended that they treat the infected wood with a special preservative.

Mr Tienie Kotze of Kalahari Desert Products found false codling moth larvae ("worms") in nuts that he received in November from pecan growers in several regions and approached the CePHMa to conduct further investigations.

Mr Swart presented a talk at the AGM and Symposium of the South African Pecan Producers Association (SAPPA) about the False Codling Moth and other potential threats with regard to insects and diseases. The feedback from farmers was promising with SAPPA donating R10 000 for research purposes for 2009 and inviting members of CePHMa to the annual general meeting in May 2009 to discuss further potential

research and funding opportunities for CePHMa.

The **Pesticide Resistance Testing and Research Facility** started the year off by hosting a short course on parasites of the Free State, presented by Prof. Ivan Horak and attended by honours students of the department, personnel of ClinVet International and representatives of Bayer, Ceva and Novartis. During this hands-on course, attendees were privileged to experience Prof. Horak's extensive first hand knowledge of both external parasites, especially the different tick species, and internal parasites found in and on animals dwelling on the Free State plains. His unique way of conveying information also led to increased interest in making use of the services provided by this study group by the companies that attended.

During the course of 2008, this interest was displayed in the growing number of samples received from the three companies attending, for testing of tick collections from different parts of South Africa for the presence of resistance to chemical control. A combined effort to shed more light on the ever-increasing problem of tick resistance in South Africa was also undertaken by

our group in collaboration with Bayer, Division Animal Health and a private consultant, Mr Pierre van Niekerk, developer of the Scorpion dip apparatus. In this field study, a visiting veterinary student, Rogier Junte, in his final year of rotation at the University of Utrecht, The Netherlands, joined the group to research the acaricide resistance in the blue cattle tick and use of the Scorpion dip applicator in this collaborative research project as part of his practical obligation to obtain more first-hand knowledge of domestic animals in South Africa and their parasite problems.

During the initial three-month phase of this study, blue ticks, *Rhipicephalis (Boophilus)* species, were collected on three farms each in three different problem-stricken areas of KwaZulu-Natal, Eastern Cape and Limpopo provinces and tested in the laboratory for the presence of resistance to three different acaricides. Results were used to plan short- and long-term management strategies to restrict the further development of already high levels of tick resistance in these areas. The second phase of the study, to determine the efficacy of these strategies, will continue though 2009.

Ms Ellie van Dalen visited the laboratory of Prof. Conrad Mathee, Evolutionary Genetics, Department of Botany and Zoology, Stellenbosch University in July to obtain first hand experience of molecular techniques and the application of polymerase chain reactions for use in identifying resistance mechanisms of ticks at molecular level.

A field trip to nine farms in the Eastern Cape province was undertaken during October 2008 by Ms Van Dalen and her master's student, Ms Octavia Motlogeloa, to collect ticks from cattle and conduct field drags for immature stages of ticks on each of the nine farms. This was done as part of Ms Motlogeloa's study to determine the status of tick resistance to chemical control on neighbouring farms with different management systems, in an area where tick resistance on one farm had been confirmed. This field trip was the first of three collections,



Prof. Jo van As, Departmental Chairperson, and his team were involved in the production of a film by the well-known wildlife film maker Tim Liversedge, about flamingoes in the Makgadigadi Pan in Botswana.

with the next two scheduled to be conducted during 2009.

Ms Van Dalen also attended the VIth International Conference on Ticks and Tick-borne Pathogens (TTP-6), which took place in Buenos Aires, Argentina, from 21-26 September, where she presented a poster on the current status of tick resistance to acaricides used for control in the KwaZulu-Natal and Eastern Cape provinces of South Africa. This meeting also provided the opportunity to analyse the complex world of ticks and the pathogens they transmit, under the general subject: "The challenge of ticks in a warming planet".

The group was also involved in contract research projects for in vitro efficacy studies in collaboration with ClinVet International for two South African clients, Afrivet Business Management, Cipla Vet (Pty) Ltd and Sumitomo Chemical Co., Ltd, from Japan.

The year was concluded by a trade visit during the last week of November by Ms Van Dalen, to re-establish and extend collaboration with clients in the pharmaceutical arena. For this purpose meetings were set up with Dr Patrick Page of Bayer Animal Health in Isando and Mr Ronnie Dawsen of Virbac, Centurion. Both meetings led to renewed interest and enthusiasm and 2009, with its tick resistance problems, will be

tackled with a vengeance as a result of collaboration with these companies.

Mr Whitey Jordaan completed his field collections to determine the geographic distribution of *Ixodes* (Acari: Ixodidae) ticks in the Free State province and the seasonality of those associated with African Buffalo, as part of his M.Sc. studies. The comparative taxonomy of four morphologically very similar ticks from the *Rhipicephalus* genus, done by Ms Sharon Terry as part of her M.Sc. project, was also completed and both plan to hand in their dissertations early in 2009. Ms Terry also assisted in a research project run by Josephus Fourie at Clivet on the role of mating behaviour in the displacement of *Rhipicephalus decoloratus* with *R. microplus*, in the Eastern Cape province during the first semester of 2008. She also lectured the first-year practical course BLG 144 during the second semester.

The following are postgraduate students:

Terry, S. Dissertation: "A Taxonomic description of all stages of four *Ixodes* (Acari: Ixodidae) ticks." Promoter: Horak, IG

Jordaan, A.J. Dissertation: "Geographic distribution of *Ixodes* (Acari: Ixodidae) ticks in the Free State Province and seasonality of those associated with African

Staff

Main Campus:

Professors: Profs Jo van As, Linda Basson, Ordino Kok, Schalk Louw, Theuns van der Linde

Professors Extraordinary: Profs Leon Fourie, Gerhard Prinsloo

Senior Lecturers: Drs Liesl Van As, Léan van der Westhuizen

Lecturers: Dr Candice Jansen van Rensburg, Messrs Hennie Butler, Charles Haddad, Ms Ellie van Dalen

Junior Lecturers: Mr Vaughn Swart, Ms Lindi Heyns

Affiliated Researchers: Profs Dawie Kok, Ivan Horak, Dr Jennifer Botha-Brink

Permanent Non-Academic Staff: Mss Christa du Rand, Ina Erasmus, Isabel Human, Sylvia Teele, Messrs Patrick Mohasi, Emmanuel Palesa, Andreas Tlou, William Lesoana

Qwaqwa Campus:

Senior Lecturer: Dr Michael Cunningham

Lecturer: Ms Constance Nangammbi

Junior Lecturers: Mr Johann van As, Mss Hafeleni Matete, Fumane Nyaile

Contact details

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Buffalo." Promoter: Horak, I.G.; and

Motlogeloa, B.O.O.O. Dissertation: "Investigation of tick resistance to chemical control on nine farms in the Grahamstown area to determine the influence of management strategies on resistance development." Promoter: EMSP van Dalen. ■

Research outputs

Research articles

- Ali, K. & Louw, S.VdM.** 2007. Evaluation of coccinellid predator and entomopathogenic fungus for biological control against the pea aphid on field pea. *Ethiopian Journal of Agricultural Sciences* 19: 103-110.
- Butler, H.J.B. & Kok, O.B.** 2008. Relationship between group size and feeding success of cattle egrets (*Bubulcus ibis*) in the central Free State. *South African Journal of Science and Technology*. 27(3): 216-227.
- Haddad, C.R. & Lyle, R.** 2008. Three new genera of tracheline sac spiders from southern Africa (Araneae: Corinnidae). *African Invertebrates* 49: 37-76.
- Haddad, C.R., Louw, S.VdM. & Pekar, S.** 2008. Commercial pistachio orchards maintain lower density and diversity of spiders (Araneae): A study from South Africa. *African Plant Protection* 14: 24-36.
- Kuntner, M., Haddad, C.R., Aljančić, G. & Blejcek, A.** 2008. Ecology and web allometry of the arboricolous nephilid orb-weaving spider *Clitaetra irenae* in Maputaland. *Journal of Arachnology* 36: 583-594.
- Louw, S.VdM., Parau, J.V. & Olevano, J.C.** 2008. Bio-ecology of sap beetles (Nitidulidae), a new double impact pest on cactus pear in South Africa. *Acta Horticulturae* (In press).
- Ntondini, Z., Van Dalen, E.M.S.P. & Horak, I.G.** 2008. The extent of acaricide resistance in one, two and three-host ticks on communally grazed cattle in the eastern region of the Eastern Cape Province, South Africa. *Journal of the South African Veterinary Association* 79(3):130-135.
- Reed, C., Basson, L., Van As, L. & Dyková, I.** 2007. Four new myxozoans (Myxosporea: Bivalvulida) from intertidal fishes along the south coast of Africa. *Folia Parasitologica* 54: 283-292.
- Swart, V.R. & Louw, S.VdM.** 2008. False codling moth: A potential pest on pecan nuts. *S.A. Pecan Journal* 52: 18-20.
- Van As, L.L. & Van As, J.G.** 2007. *Lamproglana hepseti* n.sp. (Copepoda: Lernaedidae), a gill parasite of the African pike, *Hepsetus odoe* (Bloch) from the Okavango River and Delta, Botswana. *Systematic Parasitology* 67: 19-24.

Reports

- Grobler, A. & Louw, S.VdM.** 2008. *Survival of the navel orangeworm, Amyelois transitella (Walker) (Lepidoptera: Pyralidae), on pistachio nuts in South Africa.* Report to the Industrial Development Corporation – Green Valley Nuts, Prieska, South Africa.
- Louw, S.VdM.** 2008. *Dominant olive pests in the eastern Free State, South Africa.* Report to Mr Oscar de Freitas, DeLuc, Ladybrand, South Africa.
- Louw, S.VdM.** 2008. *Site visit to olive orchards at DeLuc, Ladybrand (December 2008).* Report to Mr Oscar de Freitas, DeLuc, Ladybrand, South Africa.
- Louw, S.VdM. & Fourie, DeV.** 2008. *Towards the management of Paramecopsstapeliae on Hoodia gordonii plants.* Final report (2007-2008) to Phytopharm plc, Godmanchester, United Kingdom & CePHMa, University of the Free State, Bloemfontein, South Africa. (Co-operative Agreement).
- Swart, V.R. & Van der Westhuizen, M.C.** 2008. *The situation analysis of three species of woodborers at Oubaai Golf Estate, George.* Report to Mr William McIntyre, Oubaai Golf Estate, George, Western Cape, South Africa.

Conference contributions

- Basson, L.** 2008. *One fish species, a plethora of ciliophorans.* Proceedings of the Microscopy Society of Southern Africa, 38: 66. Paper presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), University of Botswana, Gaborone, Botswana. 21-25 July.
- Brink, S., Van der Linde, T.C., Basson, L. & Van Wyk, P.W.J.** 2008. *Differentiation between forensic important Central South African Calliphoridae and Sarcophagidae puparia, using puparium specific characteristics.* Poster presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Butler, H.J.B. & Kok, O.B.** 2008. *Feeding association between cattle egrets (Bubulcus ibis) and mammal hosts in the central Free State, South Africa.* Poster presented at the 4th Biennial European Conference on Behavioural Biology (ECBB2008), Dijon, France. 18-20 July.

- Colahan, B.D. & Van Niekerk, D.J.** 2008. *The Lesser Kestrel at communal roosts in the Free State, South Africa – A coordinated survey.* Poster presented at the 12th Pan-African Ornithological Congress: Birds and People - Interaction, Utilisation and Conservation, Goudini Spa, Western Cape, South Africa. 7-12 September.
- Dippenaar-Schoeman, A.S. & Haddad, C.R.** 2008. *The South African National Survey of Arachnida (SANSA).* Paper presented at the 9th Colloquium of the African Arachnological Society, Lajuma Mountain Retreat, Soutpansberg, South Africa. 3-7 February.
- Dippenaar-Schoeman, A.S., Haddad, C.R. & Van den Berg, A.M.** 2008. *Spiders can help the African farmer to combat pests.* Paper presented at the 9th Colloquium of the African Arachnological Society, Lajuma Mountain Retreat, Soutpansberg, South Africa. 3-7 February.
- Dippenaar-Schoeman, A.S., Jones, A., Haddad, C.R. & Lotz, L.N.** 2008. *SANSA surveys in the Free State: The spider fauna of the Mpetsane Conservation Estate (Arachnida: Araneae).* Poster presented at the 9th Colloquium of the African Arachnological Society, Lajuma Mountain Retreat, Soutpansberg, South Africa. 3-7 February.
- Foord, S.H., Dippenaar-Schoeman, A.S., Van Rensburg, B.J. & Haddad, C.R.** 2008. *Preliminary patterns of spider (Araneae) diversity in the savanna biome of South Africa.* Poster presented at the 9th Colloquium of the African Arachnological Society, Lajuma Mountain Retreat, Soutpansberg, South Africa. 3-7 February.
- Fourie, DeV. & Louw, S.VdM.** 2008. *In situ identification of powdery stinkbug egg package status as a management practice in pistachio orchards in South Africa.* Poster presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Fourie, R. & Haddad, C.R.** 2008. *Diversity and abundance of spiders (Arachnida: Araneae) in the field and tree layers of the Erfenis Dam Nature Reserve, Free State Province.* Poster presented at the 9th Colloquium of the African Arachnological Society, Lajuma Mountain Retreat, Soutpansberg, South Africa. 3-7 February.

- Fourie, R. & Haddad, C.R.** 2008. *Diversity and abundance of spiders (Arachnida: Araneae) in the field and tree layers of Erfenis Dam Nature reserve, Free State Province, South Africa*. Poster presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Haddad, C.R. & Dippenaar-Schoeman, A.S.** 2008. *Oonopidae survey in Southern Africa*. Poster presented at the 9th Colloquium of the African Arachnological Society, Lajuma Mountain Retreat, Soutpansberg, South Africa. 3-7 February.
- Haddad, C.R., Bonaldo, A.B., Ramirez, M.J. & Labarque, F.** 2008. *A revision of the Afrotropical spider genus Mandaneta Strand, 1932 (Araneae: Corinnidae)*. Paper presented at the 9th Colloquium of the African Arachnological Society, Lajuma Mountain Retreat, Soutpansberg, South Africa. 3-7 February.
- Haddad, C.R., Dippenaar-Schoeman, A.S. & Cumming, M.** 2008. *Termitophily and termitophagy in spiders: An African phenomenon?* Paper presented at the 9th Colloquium of the African Arachnological Society, Lajuma Mountain Retreat, Soutpansberg, South Africa. 3-7 February.
- Haddad, C.R., Lyle, R., Bosselaers, J. & Ramirez, M.J.** 2008. *A revision of the endemic South African spider genus Austrachelas Lawrence, 1938, with its transfer to the Gallieniellidae (Arachnida: Araneae)*. Paper presented at the 9th Colloquium of the African Arachnological Society, Lajuma Mountain Retreat, Soutpansberg, South Africa. 3-7 February.
- Hoffman, S., Van der Linde, T.C. & Van der Merwe, P.J.** 2008. *The use of blowfly larvae in entomotoxicology - The influence of gunshot residue on insect succession and the development of Chrysomya chloropyga (Diptera: Calliphoridae) larvae*. Poster presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Jansen van Rensburg, C. & Van As, J.G.** 2008. *Protoeces sp. (Trematoda: Digenea) in the brown mussel, Perna perna*. Paper presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), University of Botswana, Gabarone, Botswana. 21-25 July.
- Jordaan, F. & Louw, S.VdM.** 2008. *The management of Scyphophorus acupunctatus Gyllenhal (Coleoptera: Curculionidae) on Agave americana (Agavaceae) in South Africa*. Paper presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Kok, O.B. & Heyns, L.** 2008. *Interspecific interaction amongst four sympatric carnivore species in the Free State, South Africa*. Paper presented at the 4th Biennial European Conference on Behavioural Biology (ECBB2008), Dijon, France. 18-20 July.
- Kolver, J.H. & Van der Linde, T.C.** 2008. *A forensic anomaly: Decomposition in the fast lane*. Paper presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Kolver, J.H. & Van der Linde, T.C.** 2008. *A forensic conflict: What happened to Sarcophaga cruentata?* Paper presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Landman, H. & Jansen van Rensburg, C.** 2008. *Plant-parasitic nematodes associated with a sunflower cultivar in the Free State Province*. Poster presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), University of Botswana, Gabarone, Botswana. 21-25 July.
- Landman, H. & Jansen van Rensburg, C.** 2008. *Plant-parasitic nematodes associated with a sunflower cultivar in the Free State Province*. Poster presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), University of Botswana, Gabarone, Botswana. 21-25 July.
- Liebenberg, J.E., Van der Linde, T.C. & Venter, G.J.** 2008. *The species composition and bio-ecology of Culicoides spp frequenting livestock in the Bloemfontein district*. Poster presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Lyle, R. & Haddad, C.R.** 2008. *A taxonomic revision of the Afrotropical tracheline sac spider genus Trachelas L. Koch, 1872 (Araneae: Corinnidae), with emphasis on southern Africa*. Poster presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Lyle, R. & Haddad, C.R.** 2008. *Tracheline sac spiders of the Afrotropical Region, with a revision of the genus Cetonana Strand, 1929 (Araneae: Corinnidae)*. Paper presented at the 9th Colloquium of the African Arachnological Society, Lajuma Mountain Retreat, Soutpansberg, South Africa. 3-7 February.
- Muller, B., Louw, S.VdM., Prinsloo, G.L. & Nesper, S.** 2008. *Morphological identification of Chalcidoidea wasps occurring on Erythrina caffra and E. lysistemon and the impact of nutrient availability and concentration on survival rates*. Paper presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Pretorius, J., Louw, S.VdM. & Venter, P.** 2008. *Occurrence and seasonality of Aphididae and Coccinellidae species associated with lettuce cultivated under variable shade house conditions in the central Free State (South Africa)*. Poster presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Prinsloo, G.J., Ninkovic, V. & Van der Linde, T.C.** 2008. *Could semiochemicals enhance parasitism of aphids on Russian wheat aphid cultivars?* Paper presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Prinsloo, G.J., Ninkovic, V. & Van der Linde, T.C.** 2008. *The effects of semiochemicals and aphid resistant cultivars on Russian wheat aphid control*. Paper presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Richter, J., Prinsloo G.J. & Van der Linde, T.C.** 2008. *The potential use of plant extracts as control option for Russian wheat aphid*. Poster presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Swart, V.R., Seaman, M.T. & Louw, S.VdM.** 2008. *Establishing a protocol for South African agriculture, based on*

new crop case studies. Paper presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.

Swart, V.R., Seaman, M.T. & Louw, S.VdM. 2008. *Establishing a protocol for South African agriculture, based on new crop case studies*. Paper presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.

Swart, V.R., Seaman, M.T. & Louw, S.VdM. 2008. *Establishing an EMS bio-indicator protocol for South African agriculture, based on new crop case studies*. Paper presented at the 2nd National Environmental Management Systems (EMS) Association Forum, Newcastle City Hall, Newcastle, New South Wales, Australia. 19-22 May.

Van As, L. & Van As, J.G. 2008. *Tadpole ciliophorans of Lake Ngami, Botswana*. Paper presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), University of Botswana, Gabarone, Botswana. 21-25 July.

Van Dalen, E.M.S.P. 2008. *Current status of tick resistance against Acaricides used for control in the Kwa-zulu Natal and Eastern Cape Provinces, South Africa*. Poster presented at the VIth International Conference on Ticks and Tick-borne Pathogens (TTP-6): The Challenge of Ticks in a Warming Planet, Buenos Aires, Argentina. 21-26 September.

Van der Linde, T.C., Kolver, K. & Hoffman, S. 2008. *To be at the crime scene with the police investigation team is vital: Two case reports*. Paper presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.

Van Niekerk, D.J. 2008. *A 10-year study on the activity patterns of birds in the central Free State, South Africa*. Paper presented at the 12th Pan-African Ornithological Congress: Birds and People - Interaction, Utilisation and Conservation, Goudini Spa, Western Cape, South Africa. 7-12 September.

Venter, G.J., Wright, I.M. & Van der Linde, T.C. 2008. *A multi-vector potential for transmitting African horse sickness virus (AHSV) in South*

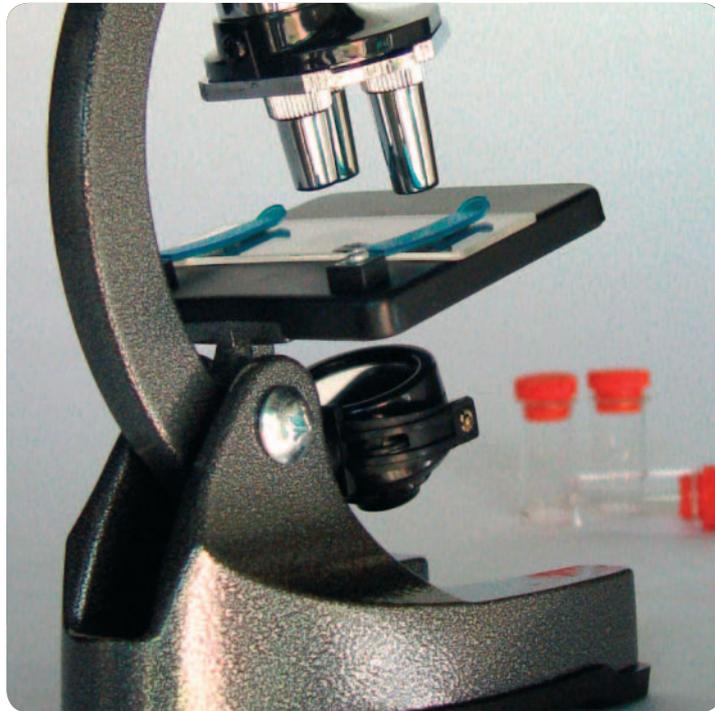
Africa. Paper presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.

Viljoen, T.E., Van der Linde, T.C. & Ehlers, K. 2008. *Preliminary study: The analyses of blowfly larval crops for the presence of host genomic DNA*. Poster presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.

West, D. & Van As, J.G. 2008. *Succession of zooplankton re-establishment in Lake Ngami, Botswana*. Paper presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), University of Botswana, Gabarone, Botswana. 21-25 July.

West, D., Van As, J.G. & Dennis, I. 2008. *The conservation condition of the unprotected Okavango Delta, Botswana*. Paper presented at the 1st Annual Orange River Basin Symposium, The Orange River Basin: The Resource, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 12-14 November.

Centres



Disaster Management Training and Education Centre for Africa (DiMTEC)

“Memoranda of understanding have been agreed upon with a university in Serbia and the United Nations University” - Mr Andries Jordaan.



Mr Andries Jordaan.

Overview

2008 was a year packed with new projects and developments for the Disaster Management Training and Education Centre for Africa (DiMTEC). Student numbers reached a record of 122 for 2008 (including first- and second-year students) and, for the first time, 54 students enrolled for the Higher University Diploma in Disaster Management. The popularity of the master's degree programme in Disaster Management has also grown rapidly over the past few years.

Because of its multi-disciplinary focus and the relevance of the course in the developing African environment, it is expected that the

interest in the master's programme will remain high. DiMTEC is possibly the graduate course at the University of the Free State (UFS) with the largest footprint in Africa, with students from Sudan, Nigeria, Kenya, Democratic Republic of the Congo, Zambia, Mozambique, Swaziland, Lesotho, Namibia, and Zimbabwe. Two students from Israel and Palestine also enrolled for the course during 2008. These students represent their countries, the United Nations and several non-governmental organisations (NGO) such as OXFAM, Save the Children, International Red Cross and Red Crescent Movements, CARE International, Food and Agricultural Organisation (FAO), etc.

Mr Andries Jordaan, Director of DiMTEC, visited the United Nations University (UNU) and Novi Sad University in Serbia during November 2008. The UNU, with its Rector in Tokyo, Japan and its Faculty of Environmental and Human Security in Bonn, Germany, is an international university with campuses all around the world. The Vice-Rector and Dean of the Faculty of Environmental and Human Security, Prof. Janos Bogardi and Mr Jordaan agreed on cooperation on several issues and a memorandum of understanding (MOU) is currently prepared for finalisation during 2009. This MOU will facilitate the exchange of lecturers and students and ensure the international profile of DiMTEC.

The Novi Sad University has more than 40 000 students with more than 10 000 students in the Faculty of Engineering alone. DiMTEC has entered into an MOU with this university in order to exchange lecturers and students. Mr Jordaan, together with the Novi Sad University's Department of Environmental Engineering, also identified certain areas of cooperation. An MOU is being prepared to be approved by the relevant authorities at both universities. During his visit to Serbia Mr Jordaan presented a guest lecture on the relation between conflicts and disasters at the University of Belgrade.

The centre presented the first Annual Conference in Disaster Risk Reduction, with the focus on Risk Reduction in Africa. The

aim of the conference was to give scientists and graduates the opportunity to share experiences, academic research, best practices and lessons learned with fellow disaster risk reduction practitioners. The conference also served as an opportunity to link with key individuals and organisations with an interest in Disaster Risk Reduction in Africa. The guest speaker was Prof. Dusan Sakulski of the United Nations University.

As part of the conference a unique demonstration was simulated on the steps to take during a disaster response. This took place on the Main Campus of the University of the Free State (UFS) in Bloemfontein, and a full-scale operation was executed with the cooperation of the South African Defence Force, South African Police Service, local hospitals and other response organisations.

DiMTEC received new funding of nearly R6 million from the Department of Science and Technology (DST) and the Department of Water Affairs and Forestry (DWAF) for a bursary programme that enables students to gain experience in disaster management in different government departments, while completing their master's degree studies in Disaster Management. Students were placed at various disaster management centres with great success. Ms Merle Naidoo has been appointed as the project manager from 2009. The induction training for the full-time



Speakers at the first Annual Conference in Disaster Risk Reduction are, from the left: Mr MacDonald Kadzatsa, DiMTEC student from OXFAM, Namibia, Mr Mzimane Khoza, DiMTEC student from the National Disaster Management Centre, Prof. Dusan Sakulski, UNU representative, Ms Sibisiswe Ndlovu, DiMTEC student from the Department of Civil Protection, Zimbabwe, Mr Andries Jordaan, Director: DiMTEC, and Mr Dan Pillay, project manager at the CSIR.

students will also be hosted on campus during 2009.

In 2008 the Council for Scientific and Industrial Research (CSIR), DST, DWAF and Department of Provincial and Local Government together with other stakeholders have invested in a bursary learner-ship programme. The programme caters for postgraduate students in Disaster Management and Early Warning Systems. It comprises full time students who will be placed in different organisations to gain practical experience and provide voluntary service. Part-time students will be assisted financially. Four students have been placed

at National Disaster Management Centres. These students will be rotated to other organisations after a period of three months from the time of placement. Five students are full-time and two students are part-time. The five full-time students are first-years and the two part-time students are second-years.

DiMTEC identified the need for students to know more about Africa, especially regarding what the NGOs like USAid, Red Cross, Oxfam, UNICEF and the World Food Programme do for communities during and after a disaster. A tour to Mozambique took place during April 2009 and 13 students and staff were amongst the group. The group met with NGOs and stayed in an Internally Displaced Persons camp about 20 km south of the Malawi border.

Another educational tour was undertaken to Cape Town during October 2008. This included the attendance of the Annual Disaster Management Conference hosted by the Disaster Management Institute of Southern Africa (DMISA). Some of the activities on the tour included seeing the flood lines in Laingsburg in the Western Cape and the extent of damage that can be caused should a flash flood occur, gathering insight on the work and organisational struc-



A demonstration of putting out a veld fire was held as part of the first Annual Conference in Disaster Risk Reduction.



Attendees discussing the content of the handbook of the Sphere Project and Minimum Standards in Disaster Response course.

Staff

Director: Mr Andries Jordaan

External Lecturers: Profs Dusan Sakulski, André Duvenhage, Messrs Schalk Carstens, Anthony Keston

Office Administrator: Ms Annelene Schröder-Groenewald

Financial Administrator: Ms Gerdamarie van Copenhagen

Coordinator: Masters Degree Course: Ms Olivia Kunguma

Coordinator: Short Courses: Ms Alice Ncube

Project Manager: DST Bursary Students: Ms Merle Naidoo

Project Coordinators and Researchers: Messrs Derrick Sissons, Regardt Ferreira

Contact details

Mr Andries Jordaan

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ture of the Provincial Disaster Management Centre (PDMS) and witnessing the operations in the xenophobia camps as well as the daily problems faced in the Western Cape.

Practical work for first-years and practical exams for final-year students were implemented during 2008. Through these practical sessions students were exposed to realities and were given the opportunity to apply their theoretical knowledge. The first-year students were sent to a rural area in Bloemfontein where they had to do Community Resilience Profiling, while the second-year students did a practical examination on xenophobic attacks in South Africa. They had to do risk assessments and compile contingency plans in response to such attacks.

DiMTEC moved into new offices towards the end of 2008. These premises consist of private offices, a storeroom and a computer laboratory. The computer laboratory will be used as an Early Warning Data Capturing Centre, where data on disasters in South Africa will be captured, analysed and evaluated. This information will be sent to the government and private sector to use as a warning of disasters.

Staff of DiMTEC presented short courses on various aspects of Disaster Management to government departments, non-governmental and private organisations in the Southern African Development Community (SADC) region. During 2008 the Sphere Project and Minimum Standards in Disaster Response course was presented at the UFS, East London and Queenstown and the Introduction to Disaster Management course was presented in Aliwal North, Welkom and at the UFS.

Staff also attended various conferences such as the first Annual Conference in Disaster Risk Reduction (presented by DiMTEC in Bloemfontein), the 42nd Annual

Conference of the South African Society for Agricultural Extension Officers in Port Elizabeth and the DMISA's Annual Conference in Goudini, Western Cape.

Projects completed included:

- A contingency plan for the UFS.
- Agricultural Impact Assessment for building a power station in the Deneysville, Sasolburg region.
- Business Plan on Pecan Nuts for Farmers in the Muden District, KwaZulu-Natal.
- International evaluation of re-settlement plan for the Merowe Dam Project, Sudan.
- Richtersveld Land Claim and Agricultural Development Plan.
- ESKOM/Ninham Shand Environmental Impact Studies.

Current projects include:

- A data validation study for the Elundini stock improvement programme.

Staff of DiMTEC are well represented in provincial and national bodies such as the South African Qualifications Authority's (SAQA) Scoping Committee for Disaster Management Training in South Africa, the National Disaster Management Technical Advisory committee for Disaster Risk Assessments, the Free State Disaster Management Advisory Forum and the Regional Consultative Forum for Africa of the International Council for Science (ICSU). ■

Research outputs

Conference contributions

Jordaan, A.J. 2008. *Agricultural development and training in the Richtersveld: A community perspective*. Paper delivered at the 42nd Annual Conference of the South Africa Society for Agricultural Extension, Tsitsikamma Conference Centre, Port Elizabeth, South Africa. 5-8 May.

Centre for Environmental Management

“Graduates are in demand by large companies, government and nature conservation bodies” - Prof. Maitland Seaman.

Overview

The Centre for Environmental Management in the Faculty of Natural and Agricultural Sciences, incorporating the BloemWater Chair in Water Environmental Management, 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 now an established centre of expertise in aquatic ecology, which carries out a number of applied projects and provides appropriate services to communities in the central part of South Africa. BloemWater, the regional water services agency, plays a central role in the development of this part of the centre's work. The BloemWater Chair in Water Environmental Management came into being on 1 July 2003 and Prof. Maitland Seaman, Director of the centre, is also the incumbent of the BloemWater Chair in Water Environmental Management.

The master's programme developed gradually but strongly around Project Management, Environmental Assessment, Environmental Management Systems, Integrated Environmental Management and Sustainable Development, into which a number of special skills and disciplines are woven.

From approximately 100 applicants, the master's programme took in about 50 students in 2008.



Prof. Maitland Seaman.

The intake increases in diversity every year. In 2008 around 30% of the students were from Southern African Development Community (SADC) countries and a few were from the rest of Africa, making this a truly continental programme. The programme is based on 37 full days of contact time at the Main Campus of the University of the Free State (UFS) in Bloemfontein, split into one session per semester.

The programme is an integrated one. As the environment presents a very wide field, there is a perceived need to produce graduates with a healthy overview of the South African environment. Grad-



uates are in demand by large companies, government and nature conservation bodies.

The centre turned 14 years old in 2008. This achievement was celebrated with a workshop and a formal function, to which all role players and lecturers were invited. Much has happened since the first students entered the programme in July 1994. The centre has streamlined the programme and updated the courses continuously, sometimes drastically. The programme was originally very science-oriented and had limited management focus. Efforts have been made to correct biases and accommodate the changing



Attending the celebration of the 14th year of the centre's existence are, from the left: Dr Daan Toerien, Research Associate at the centre, Dr Nico Avenant, Research Associate at the centre and Head: Mammalogy Department, National Museum, Prof. Maitland Seaman, Director of the Centre for Environmental Management, Dr Alex Weaver, Former Research Associate: Council for Scientific and Industrial Research (CSIR) and Dr Pieter Zietsman, Research Associate at the centre and Head: Botany Department, National Museum.

needs of the developing discipline of environmental management as practised in southern Africa.

Circumstances have changed. There is the growing importance of water, conservation is no longer only the domain of environmentalists, and environmental assessment has become more sophisticated. Environmental management systems are required in all but the smallest businesses, sustainability science has become established as its own discipline, and Africa needs to move beyond irrational exploitation toward cultural maturity.

Dr Alex Weaver was the guest speaker at the centre's 14th Year Celebration. He is a former Research Fellow in the Natural Resources and the Environment Division of the Council for Scientific and Industrial Research (CSIR) and he leads a sustainability science research group. Dr Weaver, as guest speaker, took part in the discussions to make sure that the master's programme covers all the necessary aspects. Among the many offices he has held, he

is a past president of the International Association for Impact Assessment, and he has been very influential in the development of environmental management at the CSIR and in southern Africa, having advised various universities on their environmental programmes. The discussions were very fruitful and the centre was given a good idea of what needs to be explored in the future to remain competitive.

Approximately 50 lecturers are involved in the programme, half of whom are contracted in from government and the private sector, for their specific competence.

In 2008 six students were registered for their Ph.D. degrees. During the April 2008 graduation ceremony, Ms Karissa Scott received the BloemWater Prize for the Best Master's Student in Environmental Management. Dr Limpho Letsela received her doctorate during the September 2008 graduation ceremony.

The centre has a cooperation agreement with the Katholieke Universiteit Leuven, Belgium, to

conduct research on temporary water ecology. In terms of this agreement, a Ph.D. and two M.Sc. students from Leuven spent time working at the centre in 2008, on studies initiated by the centre.

Through the motivation of the centre, the National Research Foundation (NRF) awarded a Research Niche Area in Integrated Water Resources Management to the UFS. This niche area forms part of the UFS's Strategic Cluster Initiative and the research focuses on Water Management in Water Scarce Areas. Prof. Seaman is the interim coordinator of the Cluster. Bursaries for postgraduate students form part of this grant from the NRF.

Under the umbrella of the Water Cluster, the first annual Orange River Basin Symposium was held by the UFS from 12-13 November 2008. The theme for the first symposium was *The Orange River Basin – The Resource*.

Staff of the centre attended a range of conferences in 2008. Prof. Seaman presented a paper *The Orange River Basin as field of water-related training and study at the University of the Free State, South Africa* at a session of the Universities Partnership in Transboundary Water at a World Water Congress in Montpellier, France. He also attended the World Water Week in Stockholm, Sweden. Ms Marthie Kemp attended the 51st Annual Symposium of the International Association for Vegetation Science in Stellenbosch from 7-12 September 2008. A total number of 251 participants from 37 countries attended the symposium. The main focus of the symposium was the link between vegetation science and evolutionary research. The programme included three parallel sessions, two poster sessions and a mid-week excursion.

Ms Linda Rossouw, a Ph.D. student of the centre, presented a paper at the 28th International Symposium of the North American Lake Management Society in Alberta, Canada from 11-14 November 2008. The title of the paper was *Environmental water requirements: Determining water*

Ms Louise Zietsman from the centre, identifying macro-invertebrates for the South African Scoring System at Sepane Spruit, Free State Province.

quality required in non-perennial river systems, South Africa.

Ms Nolene Morris, Chief Executive of BloemWater, officially opened the symposium and Dr Anthony Turton (former Natural Resource and Environment Unit Fellow: CSIR) was the keynote speaker. Various staff members of the centre delivered papers at the symposium.

Several projects and much fieldwork were carried out by the centre. Biomonitoring reports are provided by the centre to BloemWater for the Modder River and associated rivers. Two sites are monitored on the Caledon, thirteen sites on the Modder River and its important tributaries and two sites on the Riet River.

The centre is involved in a project with the Water Research Commission (WRC) to establish the environmental water requirements for non-perennial rivers. The South African National Water Act requires that the environmental reserve be determined for each significant water body before licenses may be issued. Methods currently available for the determination of environmental water requirements in South Africa are based on perennial rivers. Initially, the suitability of existing methods was determined through a series of desktop case studies. These case studies enable the researchers to identify gaps in knowledge, and hence the research needs to be identified.

Once this has been done, the next step is to modify or develop methods to meet these needs. At all stages this research has been interdisciplinary, with experts from the field making a major input



into each stage of the process. Important contributions in this regard have come from team members at Rhodes University, University of Cape Town, the CSIR and the UFS.

Communication of all phases of the work throughout the region is seen as crucial to its success. To this end, a communication strategy has been developed that will ensure that all interested parties know what is being done and are able to make appropriate input into the process as it proceeds.

The centre has been contracted to assist in developing an intervention plan for the National Grassland Biodiversity Programme, under the auspices of the South African National Biodiversity Institute (SANBI). This intervention plan, known as the *Free State River Ecosystem Project - the Koranna and Sepane Spruit in the Modder River Catchment Area*, was developed as a demonstration project to address biodiversity and river ecosystems services.

The centre also served the environmental community and the general public with numerous workshops through the year. ■

Staff

Director and BloemWater Chair: Prof. Maitland Seaman

Senior Lecturer: Dr Jan Roos

Lecturer: Ms Marinda Avenant

Associated Researchers: Drs Ziets Zietsman, James Brink, Nico Avenant, Daan Toerien

Course Co-ordinator: Ms Marthie Kemp

Senior Professional Officer: Ms Marie Watson (Macro-invertebrates)

Professional Officers: Mss Marilie Carstens (GIS), Eloise Lambrecht (Macro-invertebrates), Tascha Vos (Water Quality and Algae), Ansophi van der Merwe (Ecology), Dr Limpho Letsela (Sociology), Ms Louise Zietsman (Macro-invertebrates) Bettie Phillips (Finance), Sanet Neethling (Marketing) and Messrs Jurie du Plessis (Fish), Juan Potgieter (Fish)

Messenger: Ms Evodia Khalata

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Research outputs

Research articles

Avenant, N.L. & Du Plessis, J.J. 2008. Sustainable small stock farming and ecosystem conservation in southern Africa: A role for small mammals? *Mammalia* 72: 258-263.

Avenant, N.L., Watson, J.P. & Schulze, E. 2008. Correlating small mammal community characteristics and habitat integrity in the Caledon Nature Reserve, South Africa. *Mammalia* 72: 186-191.

Vanschoenwinkel, B., Gielen, S., Seaman, M. & Brendonck, L. 2008. Any way the wind blows: Frequent wind dispersal drives species sorting in ephemeral aquatic communities. *Oikos* 117: 125-134.

Vanschoenwinkel, B., Gielen, S., Vandewaerde, H., Seaman, M.T. & Brendonck, L. 2008. Relative importance of different dispersal vectors for small aquatic invertebrates in a rock pool metacommunity. *Ecography* 31: 567-577.

Reports

Carstens, M. & Lamprecht, E. 2008. *Survey of stream ecology and general landscape along the R712 between the koppie at Weltevrede and Sterkfontein Dam Nature Reserve.* Report to Terraworks, Bloemfontein, South Africa.

Seaman, M.T., Roos, J.C., Watson, M. & Vos, A.T. 2008. *State of the Modder River, Second term 2008 – A biomonitoring report.* Report to Bloem Water, Bloemfontein, South Africa.

Seaman, M.T., Roos, J.C., Watson, M. & Vos, A.T. 2008. *State of the Modder River, First term 2008 – A biomonitoring report.* Report to Bloem Water, Bloemfontein, South Africa.

Seaman, M.T., Roos, J.C., Watson, M., Avenant, M.F., Vos, A.T. & Du Plessis, J.J. 2008. *State of the Modder River, Third term 2008 – A biomonitoring report.* Report to Bloem Water, Bloemfontein, South Africa.

Seaman, M.T., Watson, M., Avenant, M.F., Vos, A.T. & Du Plessis, J.J. 2008. *State of the Modder River 2006 to 2008 – A biomonitoring report.* Report to Bloem Water, Bloemfontein, South Africa.

Conference contributions

Avenant, M.F. 2008. *Environmental water assessments in non-perennial rivers.* Paper presented at the 1st

Annual Orange River Basin Symposium, University of the Free State, Centre for Environmental Management, Bloemfontein, South Africa. 12-13 November.

Avenant, N.L. & Du Plessis, J.J. 2008. *Effective small mammal sampling and its implications for wildlife management.* Poster presented at the Southern African Wildlife Management Association (SAWMA) Conference: Biodiversity Conservation, the Science Management Interface, Mpekweni Beach Resort, Port Alfred, South Africa. 16-19 September.

Carstens, M. 2008. *Using remote sensing to observe the extent of water in the Seekoei River, A tributary of the Orange River.* Paper presented at the 1st Annual Orange River Basin Symposium, University of the Free State, Centre for Environmental Management, Bloemfontein, South Africa. 12-13 November.

Du Plessis, J.J. & Avenant, N.L. 2008. *A review of information on the ecology of black-backed jackal Canis mesomelas and caracal Caracal caracal to facilitate in the management of these two damage-causing animals in the livestock and wildlife ranching industries in South Africa.* Paper presented at the Southern African Wildlife Management Association (SAWMA) Conference: Biodiversity Conservation, the Science Management Interface, Mpekweni Beach Resort, Port Alfred, South Africa. 16-19 September.

Lamprecht, E. 2008. *Data extrapolation from macroinvertebrate communities in the Upper Orange River Catchment Area, South Africa. Is it viable?* Paper presented at the 1st Annual Orange River Basin Symposium, University of the Free State, Centre for Environmental Management, Bloemfontein, South Africa. 12-13 November.

Letsela, L. 2008. *Sustainability challenges of rural water supply in Lesotho.* Paper presented at the 1st Annual Orange River Basin Symposium, University of the Free State, Centre for Environmental Management, Bloemfontein, South Africa. 12-13 November.

Potgieter, J. 2008. *A Study of the fish community structure of a "closed system" reservoir.* Paper presented at the 1st Annual Orange River Basin Symposium, University of the Free State, Centre for Environmental Management, Bloemfontein, South Africa. 12-13 November.

Roos, J.C. 2008. *Water quality and eutrophication assessment of the Vaal River System.* Paper presented at the 1st Annual Orange River Basin Symposium, University of the Free State, Centre for Environmental Management, Bloemfontein, South Africa. 12-13 November.

Rossouw, L. & Vos, A.T. 2008. *Environmental water requirements: Determining water quality required in non-perennial river systems, South Africa.* Paper presented at the 28th International Symposium of the North American Lake Management Society, Château Lake Louise, Alberta, Canada. 11-14 November.

Seaman, M.T. 2008. *The Orange River Basin – Why it is important to us at the UFS.* Paper presented at the 1st Annual Orange River Basin Symposium, University of the Free State, Centre for Environmental Management, Bloemfontein, South Africa. 12-13 November.

Seaman, M.T. 2008. *The Orange River Basin as field of water-related training and study at the University of the Free State, South Africa.* Paper presented at the 13th World Water Congress: Session on Universities Partnership in Transboundary Waters, Montpellier, France. 1-4 September.

Vos, A.T. 2008. *Influence of flow and nutrients on algae (periphyton and phytoplankton) in the Modder River.* Paper presented at the 1st Annual Orange River Basin Symposium, University of the Free State, Centre for Environmental Management, Bloemfontein, South Africa. 12-13 November.

Vos, A.T. 2008. *The use of algae as index of water quality in non-perennial systems.* Paper presented at the 1st Annual Orange River Basin Symposium, University of the Free State, Centre for Environmental Management, Bloemfontein, South Africa. 12-13 November.

Watson, M. 2008. *Methodologies and invertebrates in the Orange River System.* Paper presented at the 1st Annual Orange River Basin Symposium, University of the Free State, Centre for Environmental Management, Bloemfontein, South Africa. 12-13 November.

Lengau Agricultural Development Centre

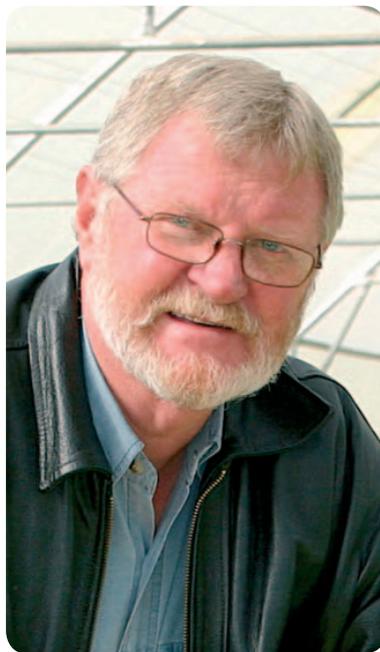
“Livestock auctions are held every Friday at the centre to support emergent farmers/entrepreneurs” - Dr Léan van der Westhuizen.

Overview

The Lengau Agricultural Development Centre has become a pinnacle in the development of newly-settled and prospective emerging and commercial black farmers. During 2008 the centre’s Agricultural Skills Development, Training and Mentorship Programme was evidence of the Faculty of Natural and Agricultural Sciences’ aim of being an engaged faculty of the University of the Free State (UFS) by means of utilising its academic capacity and facilities to face the challenges of a sustainable agriculture in the region, country and continent.

The need for human resource development is being realised in all sectors of the economy, but a particular need exists within the agricultural sector since, for many decades, black farmers were excluded from participating in mainstream agriculture. Prospective black farmers engaged in subsistence farming on communal land and had limited access to the commercial sector. 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 the training of emerging farmers, farm workers and entrepreneurs in agricultural business. The buildings, facilities and a portion of the land of the Sydenham Experimen-



Dr Léan van der Westhuizen.



tal 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 the National African Farmers Union embraced the programme as partners in agricultural transformation. The facilities at the centre are utilised in an extensive manner to address the needs of newly settled and prospective emerging and commercial black farmers. Services range from livestock auctioneering, 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.

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 part of an apprenticeship programme for prospective farmers, with a mentorship and support system in place to facilitate “learning by doing” before moving on to



Mr Andrew Mapolesa, one of the trainee broiler producers, amongst the three-week-old birds.

a commercial farm. Prospective trainee farmers will select a programme in beef cattle farming, dairy farming, small stock farming, pig farming, poultry farming or 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 the presentation of 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;

- supporting 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 organisations. 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; and
- establishing an HIV/Aids prevention, care and support initiative amongst farmers, farm workers and associated communities.

An agreement was entered into with BKB Louwid Auctioneers during 2008 to conduct weekly livestock auctions for the Bloemfontein area at the Lengau Agricultural Development Centre. This brings together commercial and small-

scale farmers and makes the latter aware of the commercial value of their livestock. Two of the trainee farmers canvass livestock from the commonage farmers on a regular basis. Another trainee has become a real entrepreneur, making a good profit out of buying and selling animals from and at the auctions. The auctioneering activities resulted in an average turnover of approximately R1 754 000 per month. The trainee, commonage and small-holder, and emergent farmers also take note of the price-determining factors and are in the process of changing their type of stock and management accordingly.

In conjunction with the National Emergent Red Meat Producers' Organisation (NERPO), Mangaung Local Municipality and Free State Provincial Department of Agriculture, 12 farmers' days were held in the Motheo district 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 2 500 head of cattle were handled and 76 farmers attended the sessions. A presenter from the Institute of Dairy Technology in Pretoria trained 15 stock farmers on primary herd care.

Another two hydroponic units were erected in 2008 at the centre with financial support from the Free State Provincial Department of Agriculture. Six hydroponic units and approximately half a hectare of open garden space are used to train 14 trainees in vegetable production skills at the centre. Another six units were erected by the 12 Blackthorn beneficiaries at Falaona in the eastern Free State and two units are in production in Wepener. Tomatoes, green peppers, spinach and lettuce are the main crops produced in the hydroponic units.

Twenty-two people were trained in broiler production skills at the centre and at Reddersburg. Three trainees made a success of the first trials in broiler production of 200 birds per cycle, achieving a mortality rate of 3.5% and slaughter mass of 2.017 kg per bird at



Produce of the Mamello sewing project at the Lengau Agricultural Development Centre.

average. The production cost per dressed broiler was an average of R10.78 per kg.

Three trainee stock farmers were successfully allocated land on the road to Thaba Nchu, Jagersfontein and Boshoff. It is foreseen that another three trainees will be allocated land within the next few months. These farmers are mentored on a regular basis and buy and sell livestock at the Lengau auctions.

The Thusano Animal Feeds entrepreneurship of eight shareholders was established at the Lengau Agri Centre to market lucern, teff, maize and straight run. One of the storage facilities at the centre is used to handle the fodder bought in bulk and sold mainly to developing farmers. Furthermore, four entrepreneurs are utilising the eucalyptus (bluegum) trees at the Lengau Agricultural Development Centre as a source of fire-wood for the local community.

A skills audit, strategic planning and gaps analysis of 50 LRAD projects was done in five districts in the Limpopo Province. The centre tendered for the follow-up agricultural skills development of the beneficiaries of these projects.

Ms Doretha Jacobs of the Department of Microbiology, Biochemistry and Food Biotechnology, in conjunction with the Department of Labour, trained 18 beneficiaries in sewing skills. The Mangaung Local Municipality funded the equipment. A variety of products were produced and marketed at the Langenhoven Park market. Two beneficiaries left the project during 2008 and started their own businesses. Consumer Science students apply their knowledge and skills in this project for community service learning purposes.

The Lengau HIV and Aids Prevention, Care and Support programme was officially launched in 2007. Five information sessions were held at the centre to introduce employees, emerging farmers and local sex workers to certain aspects regarding HIV/Aids. The programme also participated in the Free State Rural Development

Partnership Project (FSRDPP) with particular focus on farming communities in the Trompsburg, Springfontein and Philippolis rural areas. The objective of these sessions and workshops was to equip attendants with basic information on HIV/Aids and to impress upon them the importance of knowing one's status. Feedback received from the participants during and after the sessions was very positive.

An HIV and Aids Farm Project was implemented in the Philippolis district on the farms Slangfontein, Pypersfontein and Dwarsrivier. After the farms were identified, contact was made with the farmers and, once permission had been granted, the facilitators were introduced to the farm workers and the project commenced. The farmers' attitudes towards the programme varied and it was interesting to note that more progress was made on the farm where the farmer showed his support and even made a special effort to get his workers to attend the sessions. Groups of approximately twelve husbands, wives and children were informed of HIV/Aids – the basics, Attitudes and Stigma, Transmission, Prevention, Testing and Positive Living. When asked how their lives had changed since the start of the programme they explained that they now made use of preventative measures. They felt that they had a relationship of trust and respect with the facilitators and that they had gained valuable knowledge. Many of the workers stated that they had been tested for HIV and would continue to do this to ensure that they would be around to see their children grow up. The simplicity of the farm workers' lives, and their willingness and appreciation for the programmes, serves as encouragement to continue to reach a community which is so often forgotten.

Staff of the Lengau Agricultural Development Centre was involved in training of malaria vector control officers in Mozambique. The programme will be extended to other countries in Central Africa during 2009 and afterwards. ■



Members of the Blackthorn hydroponics project in the process of erecting one of the six tunnels.

Staff

Permanent:

Senior Lecturer: Dr Léan van der Westhuizen

Community Development Officer: Ms Lolly Mogoere

Temporary:

HIV/Aids Prevention, Care and Support Coordinator: Ms Estelle Heideman

Manager Administration: Mr Mogale Mphahlele

Farm Assistants: Messrs Raymond Melusi, Solomon Bebeza

Farm Guards: Mr Peter Makiti, Mr Esau Selepe

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Centre for

Microscopy

“Internal researchers and students at the faculty remain the key users of the centre at present.” - Prof. Pieter van Wyk.



Prof. Pieter van Wyk.

Overview

Research and training outputs at the Centre for Microscopy, as a service to departments in the Faculty of Natural and Agricultural Sciences and outside institutions, are determined by the hours of usage of the apparatus and laboratories.

In 2008 the total usage of the scanning electron microscope (SEM) amounted to 792 hours, for the transmission electron microscope (TEM) 75 hours and for the confocal laser scanning microscope (CLSM) 53 hours. The total microscope usage for 2008 was 920 hours compared to the 844 hours of 2007. The average usage of the respective microscopes over the past four years amounted to

566 hours per year for the SEM, 88 hours per year for the TEM, and 72 hours for the CLSM. Variations in the average usage remain representative as students and researchers complete projects and start new ones.

The above usage represents only the actual number of hours that people handled the microscopes. Any time spent planning the experiments and preparing the objects beforehand is not taken into account in the above-mentioned usage. The preparation of materials forms a very important component of microscopic research and takes up most of the time when it comes to the use of the centre's facilities. The total

utilisation of the centre, which includes the preparation of all materials and the use of all other apparatus, amounted to 204 days of the 240 days per year for 2008, compared to 178 in 2007.

A particular highlight of 2008 was a Zeiss workshop on the handling and care of optical microscopes, held at the centre on 16-17 April. The workshop also included demonstrations of the facilities at the centre. Fifty people, including some from the UFS, the Central University of Technology, Van Rensburg Pathologists and the National Museum, attended the proceedings.

Sixteen people from Liberty Life visited the centre on Biodiversity Day (21 May) as part of their team-building activities. Full demonstrations were given of all the microscopes, with the emphasis on biodiversity, along with lectures on the application of microscopy.

Another highlight of 2008 was the training of a foreign student, Janine Kotke-Levin van Stendal, Eastern Germany, who was completing a research project with Prof. Marian Tredoux of the Department of Geology in South Africa. For this purpose, the Shimadzu scanning electron microscope with the EDX was used. The Shimadzu scanning electron microscope was also used to conduct a food quality control for Mr H Schmidt of Pest Control. Mr Andrew Kessler, from the University of Cape Town, also used the confocal laser microscope to complete his final experiments as part of the yeast project

launched in 2006 towards his Ph.D.

Some highlights in terms of research included the attendance of the annual congress of the Microscopy Society of Southern Africa (MSSA2008) in Botswana by Prof. Pieter van Wyk and Ms Beanéiri Janecke. The following lectures were presented: "Electron and confocal microscopic examination of oxylipin accumulation in fermentative and non-fermentative yeasts" (Swart CW; Van Wyk PWJ & Kock JLF) and "Comparison between microbial biofilms of local beer and curdled milk in a clay pot" (Janecke BB *et al.*).

The Leica prize for the best research with a confocal microscope was awarded to Ms Chantel Swart and was collected on her behalf by Prof. Van Wyk. Ms Janecke furthermore represented the centre at the Southern African Wildlife Management Association's annual conference with a seminar, "Assessment of faecal nitrogen as an indicator of nutritional status of browser and mixed feeder game species in the central Free State" (Janecke BB & Smit GN).

The centre was also involved in two school projects in cooperation with Prof. Rudi L Verhoeven of the Department Plant Sciences. The projects, presented by learners during the 2008 Expo for schools, focused on ultra-structural differences between plants treated with an electrical current to determine electrical conduction. The Jeol microscope was used for this purpose.

An order was placed for a Nikon AZ-100, which is a new type of microscope with a camera for stereo optical microscopy. This microscope meets a variety of research needs, particularly in terms of the accurate measurement and morphology of larger types of live organisms that cannot be examined by means of the electron microscopes. Delivery and installation is planned for early 2009.

The electricity supply dilemma that struck South Africa in 2008 affected the centre and its users significantly. Power failures caused



Students undergoing training on the transmission electron microscope.

unnecessary expenses and a loss of working hours. In an effort to resolve this problem, the centre was equipped with an emergency power supply and (UPS). Any future power failures will therefore not inflict so much damage on the microscopes. The dean, and in particular university management, were thanked for the expenditure that has made it possible for future research at the centre to proceed with as little disruption as possible.

The usual courses in the preparation of materials and the handling of apparatus were presented to honours students of the Departments of Zoology and Entomology (DRK/ENT614), Microbial, Biochemical and Food Biotechnology (MKB/BOC614) and Plant Sciences (PWS614). These courses, lasting three days each, were presented to each group separately. A one-day course was offered to honours students of Genetics (GEN 686) and Medical Microbiology and Virology (MKM601). The second-year students of the Departments of Zoology and Entomology and Plant Sciences attended an introductory course in microscopy on 18 March and 25 April respectively.

Follow-up courses in the practical handling of the electron micro-

scopes were held for postgraduate students and researchers from 16-16 May and from 6-9 October. Individual training was offered on an ongoing basis throughout the year to researchers and postgraduates, according to the needs of the respective departments, to teach them the skills to independently prepare objects and handle the microscopes.

Utilisation of the centre

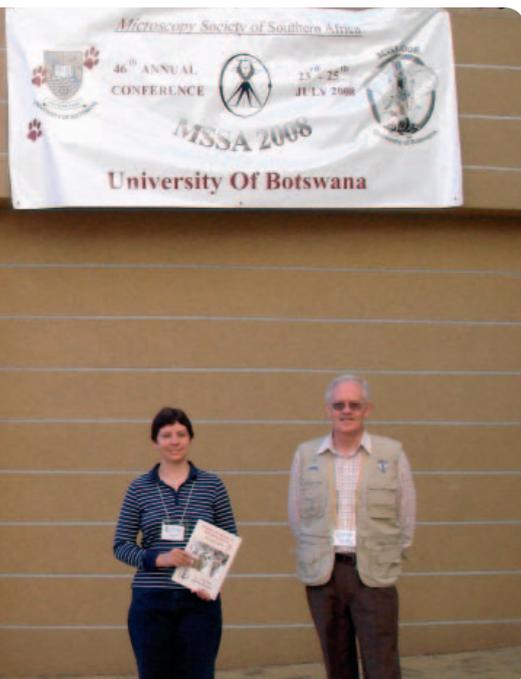
Internal researchers and students at the faculty remain the key users of the centre at present. The following departments, personnel and students made use of the centre's facilities in 2008 (approximate usage only):

Department of Chemistry:

Luyt R (by Van Wyk PWJ: SEM: 16 hours; TEM 11 hours), Mokoena M (SEM: 10 hours; by Janecke BB: CEM Hons. 6 hours).

Department of Zoology and Entomology:

Adendorff J (SEM: 2 hours), Basson L (SEM: 5 hours), Brink S (SEM: 3 hours), Haddad C (SEM: 3 hours), Janse van Rensburg C (SEM: 2 hours), Landman H (SEM: 6 hours), Terry S (SEM: 14 hours),



Ms Beanétri Janecke and Prof. Pieter van Wyk at the annual congress of the Microscopy Society of Southern Africa in Botswana.

Staff

Affiliated Professor: Prof. Pieter van Wyk

Research Officer: Ms Beanétri Janecke

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Van As J (SEM: 3 hours), Van As L (SEM: 1 hour), West D (SEM: 43 hours).

Department of Physics:

Biggs M (by Janecke BB: SEM: 3 hours), Coetsee L (SEM: 102 hours), Cronje S (SEM: 1 hour), Dhlamini S (SEM: 5 hours), Harris R (SEM: 1 hour), Kroon T (SEM: 7 hours; TEM: 2 hours), Nsimama P (by Janecke BB: SEM: 10 hours), Ntwaeaborwa M (SEM: 1 hour; TEM: 1 hour).

The following students of the Qwaqwa Campus in this department did not personally work with the microscopes, and their research on the Shimadzu SSX-550 was done by Liza Coetzee: Jappie Jafta Dolo (Ph.D.), Thami Koao (M.Sc.), Kewele Foka (Hons.), Abdub Ali (M.Sc.), Daniel Bem (Ph.D.), Patrick Nsimama (Ph.D.).

Department of Geology:

Joubert A (SEM: 2 hours), Gauert C (SEM: 5 hours), Kottke-Levin J (SEM: 28 hours), Ndaluliwa K (SEM: 8 hours).

Department of Microbial, Biochemical and Food Biotechnology:

Ells R (CLSM: 9 hours), Kakoma K (by Van Wyk PWJ; TEM: 9 hours), Leeuw N (TEM: 2 hours), Mabizela L (TEM: 15 hours), Moolman I (CLSM: 2 hours), Moore I (by Janecke BB: SEM: 3 hours), Ncango D (CLSM: 4 hours; SEM: 7 hours; TEM: 3 hours), Nthokoa K (SEM 4 hours), Randall C (SEM: 3 hours), Swart C (CLSM: 7 hours;

SEM: 4 hours; TEM: 4 hours), Van Marwijk J (TEM: 5 hours).

Department of Plant Sciences:

Amenorpe G (SEM: 34 hours), Joubert L (SEM: 62 hours), Mweta D (SEM: 17 hours; CLSM: 5 hours), Verhoeven RL (SEM: 31 hours).

Department of Animal, Wildlife and Grassland Sciences

Malan P (SEM: 17 hours).

Centre: user support and the service and repair of microscopes:

Bester Dreyer (CUT student; Cardiothoracic Surgery/CUT collaboration) (SEM: 182 hours).

The hours of support rendered by the centre's staff to all of the above-mentioned departments' users in respect of the use of microscopes and image processing amounted to 18 hours for the CLSM, 20 hours for the SEMs and 6 hours for the TEM. Beginner and refresher courses (SEM: 15 hours, TEM: 10 hours, workshop: 20 hours).

Maintenance to the Jeol: 6 hours; Shimadzu: 86 hours and TEM: 11 hours. This maintenance period of 103 hours includes approximately 35 hours of repairs carried out by personnel themselves. In light of the average service fee charged by external companies, this means a saving of approximately R60 000. The component repaired by the Electronics Division constituted an additional saving of R35 000, meaning a total saving of R95 000 for the faculty. ■

Research outputs

Research articles

Coetsee, E., Terblans, J.J. & Swart, H.C. 2008. $Y_2SiO_5:Ce$ thin films grown by PLD. *Physica Status Solidi C* 5(2): 634-637.

Dhlamini, M.S., Terblans, J.J., Kroon, R.E., Ntwaeaborwa, O.M., Ngaruiya, J.M., Botha, J.R. & Swart, H.C. 2008. Photoluminescence properties of SiO_2 surface passivated PbS nanoparticles. *South African Journal of Science* 104(9-10): 398-400.

Dhlamini, M.S., Terblans, J.J., Ntwaeaborwa, O.M., Joubert, H.D. & Swart, H.C. 2008. Preparations and luminescent properties of PbS nanoparticle phosphors incorporated in a SiO_2 matrix. *Physica Status Solidi C* 5(2): 598-601.

Dhlamini, M.S., Terblans, J.J., Ntwaeaborwa, O.M., Ngaruiya, J.M., Hillie, K.T., Botha, J.R. & Swart, H.C. 2008. Photoluminescence properties

- of powder and pulsed laser deposited PbS nanoparticles in SiO₂. *Journal of Luminescence* 128(12): 1997-2003.
- Dolo, J.J., Swart, H.C., Terblans, J.J., Coetsee, E., Dhlamini, M.S., Ntwaeaborwa, O.M. & Dejene, B.F.** 2008. Degradation of commercial Gd₂O₃:Tb phosphor. *Physica Status Solidi C* 5(2): 594-597.
- Dramicanin, M.D., Viana, A., Andric, Z., Djokovic, V. & Luyt, A.S.** 2008. Synthesis of Y₂SiO₅:Eu³⁺ nanoparticles from a hydrothermally prepared silica sol. *Journal of Alloys and Compounds* 464: 357-360.
- Mishra, S.B. & Luyt, A.S.** 2008. Effect of organic peroxides on the morphological, thermal and tensile properties of EVA-organoclay nanocomposites. *eXPRESS Polymer Letters* 4: 256-264.
- Ncango, D.M., Swart, C.W., Goldblatt, M.E., Pohl, C.H., Van Wyk, P.W.J., Botes, P.J. & Kock, J.L.F.** 2008. Oxy-lipin and mitochondrion probes to track yeast sexual cells. *Canadian Journal of Microbiology* 54(6): 450-455.
- Ntwaeaborwa, O.M., Dhlamini, M.S., Botha, J.R. & Swart, H.C.** 2008. Characterization of sol-gel SiO₂:Ce,Tb powder and pulsed laser deposited thin film phosphor. *Physica Status Solidi C* 5(2): 602-605.
- Radhakrishnan, T., Georges, M., Nair, P. & Luyt, A.S.** 2008. Composites comprising CdS nanoparticles and poly(ethylene oxide): Optical properties and influence of the nanofiller content on the thermal behaviour of the host matrix. *Colloid and Polymer Science* 286: 683-689.
- Reed, C., Basson, L., Van As, L. & Dyková, I.** 2007. Four new myxozoans (Myxosporea: Bivalvulida) from intertidal fishes along the south coast of Africa. *Folia Parasitologica* 54: 283-292.
- Sebolai, O.M., Pohl, C.H., Botes, P.J., Van Wyk, P.W.J. & Kock, J.L.F.** 2008. The influence of acetylsalicylic acid on oxylipin migration in *Cryptococcus neoformans* var. *neoformans* UOFS Y-1378. *Canadian Journal of Microbiology* 54(2): 91-96.
- Sebolai, O.M., Pohl, C.H., Botes, P.J., Van Wyk, P.W.J., Mzizi, R., Swart, C.W. & Kock, J.L.F.** 2008. Distribution of 3-hydroxy oxylipins and acetylsalicylic acid sensitivity in *Cryptococcus* species. *Canadian Journal of Microbiology* 54(2): 111-118.
- Swart, C.W., Van Wyk, P.W.J., Pohl, C.H. & Kock, J.L.F.** 2008. Variation in yeast mitochondrial activity associated with asci. *Canadian Journal of Microbiology* 54(7): 532-536.
- Van As, L.L. & Van As, J.G.** 2007. *Lamproglena hepseti* n.sp. (Copepoda: Lernaedidae), a gill parasite of the African pike, *Hepsetus odoe* (Bloch) from the Okavango River and Delta, Botswana. *Systematic Parasitology* 67: 19-24.

Chapters in books

- Ntwaeaborwa, O.M., Swart, H.C., Kroon, R.E., Botha, J.R., Ngaruiya, J.M. & Holloway, P.H.** 2008. Enhanced photoluminescence of rare-earth activators in sol-gel derived SiO₂ by energy transfer from ZnO nanoparticles and co-activators. In *Photoluminescence Research Progress*, edited by H.K. Wright and G.V. Edwards. Hauppauge: Nova Science Publishers. pp. 287-306

Conference contributions

- Basson, L.** 2008. *One fish species, a plethora of ciliophorans*. Paper presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), University of Botswana, Gaborone, Botswana. 21-25 July.
- Dhlamini, M.S., Ntwaeaborwa, O.M., Ngaruiya, J.M., Terblans, J.J. & Swart, H.C.** 2008. *Sol-gel synthesis and luminescent properties of nanoparticulate ZrO₂:PbS powder phosphor*. Poster presented at the 14th International Conference on Solid Films and Surfaces (ICSFS), Trinity College, Dublin, Ireland. 29 June-4 July.
- Dikobe, D.G. & Luyt, A.S.** 2008. *Morphology and thermal properties of PP/LLDPE/WP and MAPP/LLDPE/WP polymer blend composites*. Poster presented at the 10th Annual UNESCO/IUPAC (International Union of Pure and Applied Chemistry) Conference on Macromolecules and Materials, Bergen-Dal Ruskamp, Kruger National Park, South Africa. 7-11 September.
- Dikobe, D.G. & Luyt, A.S.** 2008. *Thermal and mechanical properties of polymer blend/wood flour composites*. Oral presentation delivered at the 13th European Conference on Composite Materials (ECCM), Stockholm, Sweden. 2-5 June.
- Ells, R., Kock, J.L.F., Van Wyk, P.W.J., Botes, P.J. & Pohl, C.H.** 2008. *Effect of arachidonic acid on biofilm formation and antifungal susceptibility of two closely related Candida species*. Lecture presented at the 12th International Congress on Yeasts, Kiev, Ukraine. 23-27 August.
- Jansen van Rensburg, C. & Van As, J.G.** 2008. *Protoeces sp. (Trematoda: Digenea) in the brown mussel, Perna perna*. Paper presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), University of Botswana, Gaborone, Botswana. 21-25 July.
- Landman, H. & Jansen van Rensburg, C.** 2008. *Plant-parasitic nematodes associated with a sunflower cultivar in the Free State Province*. Poster presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), University of Botswana, Gaborone, Botswana. 21-25 July.
- Leeuw, N.J., Swart, C.W., Ncango, D.M., Pohl, C.H., Sebolai, O.M., Strauss, C.J., Botes, P.J., Van Wyk, P.W.J. & Kock, J.L.F.** 2008. *Acetylsalicylic acid as antifungal in Eremothecium and other yeasts*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Lyle, R. & Haddad, C.R.** 2008. *A taxonomic revision of the Afrotropical tracheline sac spider genus Trachelas L. Koch, 1872 (Araneae: Corinnidae), with emphasis on southern Africa*. Poster presented at the 23rd International Congress of Entomology (ICE2008): Celebrating Entomology – Contributing to Modern Science, International Convention Centre, Durban, South Africa. 6-12 July.
- Mabizela, N.B. & Litthauer, D.** 2008. *Phage metagenomics: PCR detection and diversity of phage particles from deep mine water*. Poster presented at the BIO-08 Combined Conference of the South African Society for Microbiology (SASM), Biotech SA and the South African Society for Biochemistry and Molecular Biology (SASBMB), Grahamstown, South Africa. 21-25 January.
- Mokoena, M.A. & Luyt, A.S.** 2008. *Investigation of fibre reinforced HDPE composites crosslinked/grafted through siloxane linkage*. Poster presented at the 10th Annual UNESCO/IUPAC (International Union of Pure and Applied Chemistry) Conference on Macromolecules and Materials, Bergen-Dal Ruskamp, Kruger National Park, South Africa. 7-11 September.
- Molefi, J.A., Luyt, A.S. & Krupa, I.** 2008. *Thermal and mechanical properties of phase change conductive polymer composite materials*. Poster presented at the 10th Annual UNESCO/IUPAC (International Union of Pure and Applied Chemistry) Conference on Macromolecules and Materials, Bergen-Dal Ruskamp, Kruger National Park, South Africa. 7-11 September.
- Ncango, D.M., Kock, J.L.F., Swart, C.W., Pohl, C.H., Strauss, C.J., Van**

- Wyk, P.W.J. & Botes, P.J.** 2008. *Oxy-lipin and mitochondrion probes to track asci of Ascoidea*. Poster presented at the 12th International Congress on Yeasts, Kiev, Ukraine. 23-27 August.
- Ncango, D.M., Kock, J.L.F., Swart, C.W., Pohl, C.H., Strauss, C.J., Van Wyk, P.W.J. & Botes, P.J.** 2008. *Oxy-lipin and mitochondrion probes to track asci of Ascoidea*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Ntwaeaborwa, O.M., Dhlamini, M.S., Terblans, J.J. & Swart, H.C.** 2008. *The effects of phonon-mediated energy transfer from ZnO nanoparticles to SiO₂:PbS*. Poster presented at the 14th International Workshop on Inorganic and Organic Electroluminescence & 2008 International Conference on the Science and Technology of Emissive Displays and Lighting, Grand Hotel Duca D'Este, Rome, Italy. 9-12 September.
- Ntwaeaborwa, O.M., Swart, H.C., Dhlamini, M.S., Terblans, J.J., Kroon, R.E. & Holloway, P.H.** 2008. *Synthesis, Characterization and Luminescent Properties of ZnO-SiO₂:PbS*. Poster presented at the 55th International Symposium and Exhibition of the American Vacuum Society (AVS), Hynes Convention Center, Boston, Massachusetts, USA. 19-25 October.
- Pohl, C.H., Ncango, M.D., Swart, C.W., Van Wyk, P.W.J., Lodolo, E. & Kock, J.L.F.** 2008. *Oxy-lipin studies expose aspirin as antifungal*. Lecture presented at the 12th International Congress on Yeasts, Kiev, Ukraine. 23-27 August.
- Sebolai, O.M., Pohl, C.H., Botes, P.J., Strauss, C.J., Van Wyk, P.W.J. & Kock, J.L.F.** 2008. *Oxy-lipin release in Cryptococcus neoformans*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Swart, C.W., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F.** 2008. *Oxy-lipin accumulation in fermentative and non-fermentative yeasts*. Poster presented at the 12th International Congress on Yeasts, Kiev, Ukraine. 23-27 August.
- Swart, C.W., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F.** 2008. *Oxy-lipin accumulation in fermentative and non-fermentative yeasts*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- Swart, C.W., Van Wyk, P.W.J. & Kock, J.L.F.** 2008. *Electron and confocal microscopic examination of oxy-lipin accumulation in fermentative and non-fermentative yeasts*. Lecture presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), Gabarone, Botswana. 23-25 July.
- Swart, H.C., Coetsee, E., Terblans, J.J., Fitz-Gerald, J.M. & Botha, J.R.** 2008. *Luminescence of Y₂SiO₅:Ce nanocrystalline thin films*. Poster presented at the 14th International Conference on Solid Films and Surfaces (ICSFS), Trinity College, Dublin, Ireland. 29 June - 4 July.
- Swart, H.C., Mothudi, B.M., Nieuwoudt, S., Terblans, J.J., Coetsee, E. & Ntwaeaborwa, O.M.** 2008. *Luminescent properties and de-gradation of SrAlxOy:Eu²⁺·Dy³⁺ phosphors*. Proceedings of the 14th International Workshop on Inorganic and Organic Electroluminescence & 2008 International Conference on the Science and Technology of Emissive Displays and Lighting, Grand Hotel Duca D'Este, Rome, Italy. 9-12 September. pp. 367-370.
- Van As, L. & Van As, J.G.** 2008. *Tadpole ciliophorans of Lake Ngami, Botswana*. Paper presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), University of Botswana, Gabarone, Botswana. 21-25 July.
- Van Marwijk, J. & Van Heerden, E.** 2008. *Characterization of nanoparticles produced by Thermus scotoductus SA-01*. Lecture presented at the BIO-08 Combined Conference of the South African Society for Microbiology (SASM), Biotech SA and the South African Society for Biochemistry and Molecular Biology (SASBMB), Grahamstown, South Africa. 21-25 January.
- Van Wyk, P.W.J., Pohl, C.H. & Kock, J.L.F.** 2008. *Ascospore release and oxy-lipin production in the yeast Dipodascopsis*. Poster presented at the 15th Biennial Congress of the South African Society for Microbiology, Grahamstown, South Africa. 21-22 January.
- West, D. & Van As, J.G.** 2008. *Succession of zooplankton re-establishment in Lake Ngami, Botswana*. Paper presented at the 46th Annual Conference of the Microscopy Society of Southern Africa (MSSA 2008), University of Botswana, Gabarone, Botswana. 21-25 July.

Centre for

Sustainable Agriculture and Rural Development

"The international component of the total student count is approximately 35%." - Prof. Izak Groenewald

Overview

The Centre for Sustainable Agriculture and Rural Development affords postgraduate students the opportunity to acquire multi-disciplinary skills and knowledge in sustainable agricultural practices through distance education.

Research which focuses on rural development, value-adding chain, agribusiness management, and crop and livestock production is aimed at the development and maintenance of sustainable agricultural production systems.

New entrants to this programme originate from all spheres of life and have a common goal: to study the science of sustainability and agricultural development. The majority of students are in the full time employ of the Department of Agriculture and the Agricultural Research Council (ARC), whilst others are part-time, commercial or small farmers, working for agricultural input suppliers, banks and consultancies. The international component of the total student count is approximately 35%.

The course content is scrutinised annually by local and international partners to ensure local applicability and relevancy and also to remain internationally sound. In 2008, 50 students were allowed access to the programme from more than 100 enquiries.

During the year 2008, an all-time record of 30 master's degrees in Sustainable Agriculture



Prof. Izak Groenewald.

(MSA) were awarded. This was the culmination of many months of hard work for these graduates, who study on a part time basis whilst working full time. This also brings the total number of MSA degrees awarded since 1994 (when the centre started) to 183.

The centre has a proud track-record of its graduates. They leave the programme well equipped to address the challenges of modern agriculture as depicted by ever-changing environmental constraints and challenges. Technological, managerial and thinking skills are developed and embedded in the programme. Some top achievers are:



- Mr Z Pityi: Senior Manager, Department of Agriculture, Eastern Cape
- Mr D Bese: Senior Manager, Department of Agriculture, Eastern Cape
- Ms E van Aswegen: Finalist, Agricultural Women Entrepreneur of 2008
- Mr P Verkuil: Vice Chairperson, Board of Suid-Wes Landbou
- Mr JB van den Berg: Provincial and National winner, Young Farmer of 2008

Mr JB van den Berg from Bothaville was honoured as the Free State's Young Farmer of the Year and was also named the National Young Farmer of the Year 2008.



Mr JB van den Berg, Ph.D. student at the centre who was named National Young Farmer of the Year 2008 and his wife, Cornél.

In 2004 Mr Van den Berg received his master's degree on the application of strategic planning and marketing in sustainable wheat production. In 2008 he registered for Ph.D. studies at the centre. He is the sole shareholder in the farming company JBT Boerdery. His turnover doubled from 2005 to 2007 and his farm's profits also increased.

Ms Stella Heyns' exceptional achievement was the obtaining of a first place in all four of the evaluation categories of the international GLO-BUS business strategy simulations. GLO-BUS, used by the centre, is the world's first real international simulation focusing

on competitive business strategy. The GLO-BUS exercise is done online and students do not only compete in class, but also on an international level against other registered students.

International linkages:

The centre was involved in several international linkage activities and two student exchange programmes were managed. Long-term discussions with Dronten Professional Agricultural University, The Netherlands resulted in the signing of a memorandum of understanding (MOU) which will facilitate the mutual exchange of undergraduate students and staff members. Through this MOU the University of the Free State (UFS) has acquired entry to several other academic institutions in Europe.

The long-standing student exchange programme with Virginia Polytechnic Institute and State University (Virginia Tech) in the United States of America (USA) was extended for a third term of five years during of a UFS delegation to Blacksburg, Virginia. This MOU was also expanded to encompass the whole of the UFS and not only the programme of the Faculty of Natural and Agricultural Sciences or the faculty's agriculture programme.

During the second semester of 2008 five students from the UFS

were exchanged with students of Virginia Tech. The beauty of this exchange is that credits obtained at Virginia Tech are transferred to the UFS, thus not prolonging their period of study for a specific degree. In total, 131 students have taken part in this programme over the past ten years.

Prof. Herman van Schalkwyk, Dean of the Faculty of Natural and Agricultural Sciences, Prof. Izak Groenewald, Director of the Centre for Sustainable Agriculture and Rural Development, and members of staff also paid a successful visit to the University of Minnesota in the USA in June 2008. They visited among others the Minnesota Council on Economic Education (MCEE) and had talks with a representative of Cargill Inc., the world's largest privately owned corporation. There is a good possibility that substantive financial support will result from this interaction between the UFS and the University of Minnesota.

Prof. Groenewald was re-appointed to the editorial board of the *Journal for Sustainable Agriculture*, an internationally recognised scientific journal.

Regional linkages

Several regional workshops were undertaken to visit research sites of current MSA students, to expand cooperation agreements and recruit new students. Currently, the centre has 20 master's and two Ph.D. students in Namibia.

Local linkages

Prof. Groenewald, because of his expertise in phosphate supplementation for free-grazing ruminants, has been re-appointed on a national panel of experts to investigate the occurrence of arthrosis, an occurrence which resembles P-deficiency but with specific other properties that result in lower animal performance and eventual mortality.

Prof. Groenewald is invited regularly as guest speaker to farmers' meetings and congresses. He also gives technical and professional support to major feeding companies as a registered animal scientist. ■



The centre honoured students receiving their master's degrees in Sustainable Agriculture during the autumn graduation ceremony. In 2008 the centre boasted the most graduandi of all the faculty's centres. Here are, from the left: Prof. Hennie Snyman, professor in the Department of Animal, Wildlife and Grassland Sciences at the UFS, Ms Poppy Makabanyane, Agricultural Research Council's (ARC) Onderstepoort Veterinary Institute, Mr Phillip Maake, Department of Agriculture, Limpopo, Ms Makhosi Buthelezi, ARC in Rustenburg, and Prof. Izak Groenewald, Director: Centre for Sustainable Agriculture and Rural Development at the UFS.



Students from the UFS on their way to Virginia Polytechnic Institute and State University (Virginia Tech) in the United States of America (USA) as part of the exchange programme between the UFS and Virginia Tech. Here are, from the left, front: Roean Wessels, Magriet van der Linde and Roto Ongezwa; back: Marcel Heine and Prof. Izak Groenewald, Director of the Centre for Sustainable Agriculture and Rural Development. Charles Tharaga joined the group at the Oliver Tambo International Airport. The students spent the second semester of 2008 in the USA.



During the visit to the Minnesota University in the USA are, from the left, back: Prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS, Prof. Izak Groenewald, Director: Centre for Sustainable Agriculture and Rural Development at the UFS, and Mr Tim Bodin, member of the MCEE council of directors and economist from Cargill Inc.; front: Dr Nona Mason, chairperson of the Minnesota Council on Economic Education (MCEE) and director of the master's programme in Business Communication at the St. Thomas University, and Prof. Claudia Parliament, executive director of the MCEE and professor in the Department of Applied Economics at the University of Minnesota. Prof. Parliament completed her sabbatical leave at the UFS in 2008.

Research outputs

Research articles

Esterhuizen, J., Groenewald, I.B., Strydom, P.E. & Hugo, A. 2008. The performance and meat quality of Bonsmara steers raised in a feedlot, on conventional pastures or on organic pastures. *South African Journal of Animal Science* 38(4): 303-314.

Stroebel, A., Swanepoel, F.J.C., Nthakheni, N.D., Nesamvuni, A.E. & Taylor, G.J. 2008. Benefits obtained from cattle by smallholder farmers: A case study of Limpopo Province, South Africa. *Australian Journal of Experimental Agriculture* 48: 825-828.

Swanepoel, F.J.C., Taylor, G.J., Webb, E.C. & Stroebel, A. 2008. Effect of nu-

trition on testicular traits of tropically adapted yearling beef bulls. *Australian Journal of Experimental Agriculture* 48: 950-953.

Taylor, G.J., Swanepoel, F.J.C., Webb, E.C. & Stroebel, A. 2008. Effect of heifer frame size on their subsequent reproductive performance and preweaning performance of their calves. *Australian Journal of Experimental Agriculture* 48: 945-949.

Reports

Swanepoel, F.J.C., Stroebel, A., Van Rooyen, J.C. & Sebolai, O.

Collaboration

Collaboration with the following institutions has been established and maintained in various ways:

- University of Namibia
- University of Virginia
- University of Cornell
- Royal Agricultural College, United Kingdom
- Dronten Professional Agricultural University – The Netherlands
- University of Wageningen – the Netherlands
- Departments of Agriculture: Western Cape, Eastern Cape, Free State and Limpopo.

Staff

Professor: Prof. Izak Groenewald

Professors Extraordinary: Profs Frans Swanepoel, Edward Nesamuvuni, Alice Pell

Senior Researchers: Dr Aldo Stroebel

Research Associate: Mr Johan van Niekerk (Ph.D. student and lecturer)

Programme Coordinator: Ms Mia Kirsten

Contact details

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Website: www.ufs.ac.za/censard

2008. *Programme framework and programme guide for Agricultural Centres of Excellence (CoE)*. Report to Department of Agriculture and Land Affairs, Pretoria, South Africa.

Swanepoel, F.J.C., Van Rooyen, J.C., Stroebel, A. & Sebolai, O. 2008. *Programme framework and programme guide for the Agricultural Technology and Human Resources Programme (ATRHP)*. Report to the Department of Agriculture and Land Affairs, Pretoria, South Africa.

Conference contributions

Greeff, P.F., Laubscher, J.M. & Groenewald, I.B. 2008. *Pathway to sustainable apple production systems*. Paper presented at the Annual South African Society of Crop Production Conference, Strand, South Africa. 23 January.

Langa, T., Nkosi, B.D., Meeske, R., Groenewald, I.B. & Palic, D. 2008. *The effect of Bonsilage maix Flussig and Lalsil Fresh LB on the fermentation and aerobic stability of whole crop maize silage*. Poster presented at the 10th World Conference on Animal Production (WCAP), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.

Madzivhandila, P., Groenewald, I.B., Griffith, G. & Fleming, E. 2008. *Continuous improvement and innovation as an approach to effective research and development: A trident evaluation of the Beef Profit Partnership project*. Paper presented at the 52nd Annual Conference of the Australian Agriculture Resource Economics Society (AARES): Biophysical Modelling and Performance Measurement, Rydges Lakeside, Canberra, Australian Capital Territory, Australia. 5-8 February.

Mudau, J.N., Nesamvuni, A.E., Nephawe, K.A., Norris, D. & Groenewald, I.B. 2008. *Prediction of body weight of indigenous chickens in Limpopo Province of South Africa*. Poster presented at the 10th World Conference on Animal Production (WCAP), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.

Mudau, K.S., Nesamvuni, A.E., & Belemu, N.D. 2008. *Achievements in*

Vhembe District through Commodity Partnership Model. Paper presented at the 42nd Annual Conference of the South Africa Society for Agricultural Extension, Tsitsikamma Conference Centre, Port Elizabeth, South Africa. 5-6 May.

Nesamvuni, A.E. & Liphadzi, K.B. 2008. *Demand & supply of pasture scientists: A case of Limpopo Department of Agriculture*. Paper presented at the 43rd Annual Congress of the Grassland Society of Southern Africa, Badplaas, Mpumalanga, South Africa. 21-25 July.

Nkosi, B.D., Langa, T., Meeske, R., Groenewald, I.B. & Palic, D. 2008. *The effect of Bonsilage maix Flussig and Lalsil Fresh LB on the fermentation and aerobic stability of whole crop maoze silage*. Poster presented at the 10th World Conference on Animal Production (WCAP), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.

Nkosi, B.D., Leeuw, K.J., Ratsaka, M.M., Palic, D., Langa, T. & Groenewald, I.B. 2008. *The effect of dietary inclusion of beetroot wastes on the growth performance of lambs*. Poster presented at the 59th Annual Meeting of the European Association for Animal Production, Vilnius, Lithuania. 24-27 August.

Nkosi, B.D., Meeske, R., Groenewald, I.B., Palic, D. & Langa, T. 2008. *The effect of Lalsil Fresh LB on the fermentation and aerobic stability of ensiled TMR potato hash*. Poster presented at the 10th World Conference on Animal Production (WCAP), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.

Pell, A.N., Stroebel, A. & Kristjanson, P. 2008. *What works, what doesn't and why: Development projects that make a difference*. Paper presented at the Satellite Symposium on the Role of Livestock in Developing Communities: Enhancing Multifunctionality, during 10th World Conference on Animal Production (WCAP), Cape Town International Convention Centre, Cape Town, South Africa. 23-28 November.

Stroebel, A. & Swanepoel, F.J.C. 2008. *Cultivating knowledge and skills to grow African agriculture – An analyses and synthesis*. Paper

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Stroebel, A. & Swanepoel, F.J.C. 2008. *Summary of lessons from previous AgriBEE showcasings*. Paper presented at the 3rd Annual AgriBEE Networking and Showcasing Event, Cape Town International Convention Centre, Cape Town, South Africa. 21 February.

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Swanepoel, F.J.C., Gaofhiwe, D. & Sebolai, O. 2008. *A focussed approach to research development: Case study of the University of the Free State*. Paper presented at the Annual International Meeting of the USA Society for Research Administrators (SRA), Washington DC, USA. 9-13 October.

Swanepoel, F.J.C., Kriel, L. & Gaofhiwe, D. 2008. *Strategic academic clusters*. Paper presented at the 7th Southern African Research and Innovation Management Association (SARIMA) Conference, Stellenbosch, South Africa. 3-6 June.

Swanepoel, F.J.C., Taylor, G.J., Webb, E.C. & Stroebel, A. 2008. *Effect of nutrition on testicular traits of tropically adapted yearling beef bulls*. Paper presented at the 27th Biennial Conference of the Australian Society for Animal Production, University of Queensland, Brisbane, Australia. 23-27 June.

Taylor, G.J., Swanepoel, F.J.C., Webb, E.C. & Stroebel, A. 2008. *Effect of heifer frame size on their subsequent reproductive performance and pre-weaning performance of their calves*. Paper presented at the 27th Biennial Conference of the Australian Society for Animal Production, University of Queensland, Brisbane, Australia. 23-27 June.



Experimental Farm



Experimental Farm

Paradys Experimental Farm



Mr Jannie Myburgh.

Overview

During 2008 the Paradys Experimental Farm experienced a challenging year. The first rains of the season fell late in November, and staff and students had to work quickly to prepare the lands for production. A switch from year-to-year production to a more sustainable intermediary crop rotation system was initiated by Mr Jannie Myburgh, acting farm manager. The initiation of this system has given rise to new challenges, and certain measures have been put in place to implement minimum cultivation practices. Through the implementation of new systems, the experimental farm aims to contribute towards efforts to reduce greenhouse

gases, since such procedures can take place at farm level.

A year marked by exceptionally good rain made it possible for the experimental farm to boast an excellent production season, which included the following: silage, maize, teff, oats, and the establishment of smutsvinger grass. New implements and methods also enabled the farm to make hay using its own resources.

The dairy situated on the experimental farm offers livestock experts and development farmers an exceptional opportunity to participate at a practical level in animal production, health, reproduction, nutrition and management prac-

tices, and to become adept at data processing. The dairy is a member of the Milk Producers' Organisation (MPO), and milk of the highest quality is delivered to Dairy Belle. In cooperation with the MPO, the experimental farm offered various short courses in herd management and calf-raising practices. For the third year in a row Meadows Feeds, one of the partners of the experimental farm, once again conducted a successful study on calf nutrition. The study particularly focused on milk surrogates, and a second phase gave rise to successful new products that are clearly a sign of things to come. Enormous strides were made in respect of research into lactating animals, which promises to make an enormous contribution in these difficult economic times in the dairy industry.

Paradys Experimental Farm underwent further development with the inclusion of two breeds in the dairy programme, which will enable further investigations. A group of outstanding Holstein cows, descended from, amongst others, the Juliet bloodline from the Netherlands, was purchased. A group of high-quality Dairy Swiss cows also forms part of this excellent herd.

A successful lamb and weaner percentage was achieved with the excellent Dorper flock on the experimental farm. The sheep being used for the AI courses are performing exceedingly well. Students assist with the shearing of the sheep, and the lambs placed in

the feedlot for finishing performed extremely well and fetched record prices at a BKB auction at the Lengau Agricultural Development Centre.

The goat division was also phased in and now forms part of study projects, especially the flushing of embryos.

For the first time ever, the Afrikaner Cattle Breeders' Society held their prestigious Annual General Meeting and Farmers' Day events at the experimental farm. With breeders who came from near and far to attend, the Afrikaner breed, which is the property of the University of the Free State (UFS), could be inspected by the breeders, who had nothing but compliments for this high-quality animal. The obvious improvement in the outstanding characteristics of the breeding group was mentioned, as was the herd's above-average performance within the breed.

Furthermore, as from 2009, well-thought-out grazing practices will be developed, to be implemented in the form of a three-camp system. The successful effects of the system are already evident,

and the carrying capacity of the farm should be optimally utilised within two years.

A new New Holland "skid steer" was purchased to enable the mixing of stock feed on a larger scale and also to assist with the cleaning of kraals and other tasks on the farm that were previously highly labour intensive. These tasks can now be undertaken on a larger scale and be carried out at a faster pace. The offices on the farm also have an improved appearance after undergoing total renovation.

During 2008 the experimental farm presented the Department of Education's Agricultural Management Practice programme for agricultural schools. Excellent progress was made during contact sessions, and the agricultural programme of Reddersburg High School is now fully underway thanks to the inputs of the UFS.

During the year, the practical lessons of students involved their carrying out certain tasks on the farm every Friday, whether on the lands or through the collection of data for monitoring programmes on the farm. ■

Staff

Acting Farm Manager: Mr Jannie Myburgh

Administrative Manager: Ms Amanda Smith

Students: Messrs EJ King, Werner Brand, Retief Scholtz

Farm Workers: Mmes Anna Seboniyane, Elisa Seboniyane, Messrs Thabo Khubeka, Vinie Khubeka, Piet Lekaje, Jeremia Lelaka, Isaac Nkotshane, Christiaan Olivier, Daniel Somi, Paulus Somi, Samuel Motswari, Samuel Kheswa, Ismael Tukula, Isaac Goodman, Petrus Ramatekoane, Petrus Moriribela, Stephen Bavuma

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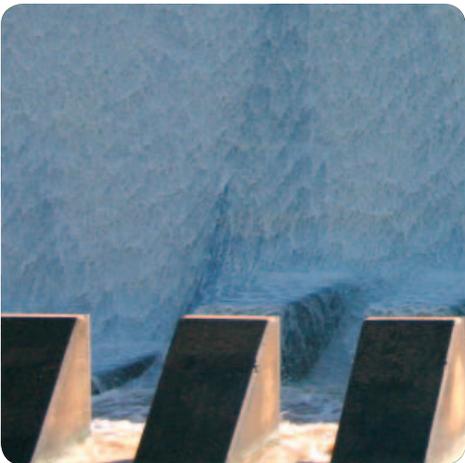


Activities on the experimental farm





Institute



Institute for

Groundwater Studies

“The institute received numerous requests from the mining industry to present a short course focusing on groundwater-related problems associated with the mining environment” - Dr Ingrid Dennis.



Dr Ingrid Dennis.

Overview

The Institute for Groundwater Studies (IGS) was founded in 1974 by Prof. Frank Hodgson, who became its first director. When Prof. Hodgson retired after more than 30 years at the helm, Dr Ingrid Dennis was appointed as director on 1 August 2007.

To date, more than 300 postgraduate students in Geohydrology have been qualified from this institution.

During 2008, 17 honours, 22 M.Sc. and 11 Ph.D. students were registered at the institute. The total number of registered students amounted to 50, of which nine were international students. These students were from Came-

roon, Zimbabwe, Botswana, Eritria, Congo, Zambia, Namibia and Switzerland. The course material included practical fieldwork such as drilling and aquifer testing. In 2008, a group of students also attended a week-long field school, which included a visit to an industrial complex and a rural water supply scheme.

Dr Danie Vermeulen presented a Geophysics course which was attended by approximately 35 postgraduate students from six universities, with funding from the Framework Programme for Research Education and Training in Water (FETWater) training programme. The course was an extension

of a FETWater gathering attended by Drs Ingrid Dennis, Rainier Dennis and Danie Vermeulen in Dullstroom, Mpumalanga.

Drs Ingrid Dennis and Rainier Dennis held two-day training workshops on the Groundwater Resource Directed Measures (GRDM) software for employees from the Department of Water Affairs and Forestry and Local Government, as well as for consultants in the groundwater industry. The workshops were held in Bloemfontein, Durban, Stellenbosch, Port Elizabeth and Pretoria.

Dr Vermeulen was one of approximately 500 delegates who attended an International Mine Water Association (IMWA) congress in June 2008, at Karlovy Vary in the Czech Republic. The topic of Dr Vermeulen's presentation was "Operation and Monitoring guidelines for irrigation with coal mine water in South Africa". The association has members from the water sector in the mining industry from all over the world. After the congress, Dr Vermeulen engaged in a tour to visit all the mines in Bohemia in order to investigate groundwater-related issues.

Drs Ingrid Dennis and Jennifer Pretorius were invited to present a paper on the impacts of mining waste on groundwater systems at the 4th International Mining and Industrial Waste Management Conference from 11-12 March 2008 in Rustenburg, North West Province. The conference was attended by local and international engineers and scientists.

Business Zone organised a Mine Water Management workshop at the conference centre of the Reserve Bank in Pretoria. The two-day forum was attended by 150 delegates, of which only ten were invited speakers. Drs Ingrid Dennis and Danie Vermeulen were among the invited speakers.

The IGS received numerous requests from the mining industry to present a short course focusing on groundwater-related problems associated with the mining environment. During November 2008, a week-long short course was held on the subject at Bain's Game Lodge in Bloemfontein. Seventy-eight delegates from the mining industry and regulators attended the course. The course was opened by guest speakers Mr Nikisi Lesufi of the Chamber of Mines and retired Prof. Frank Hodgson. All lecturing staff at the IGS presented course material in their specialisation fields. Two other presenters (Messrs Melt Marais and Piet van Deventer) from Fraser Alexander Tailings also presented course material on mining waste deposits.

On 18 and 19 November 2008, Dr Rainier Dennis visited Gaborone, Botswana to attend a "Groundwater in SADC IWRM (International Water Resource Management) Initiative" workshop. The objectives of the workshop were to assess, develop and initiate actions to create a sustainable integration of groundwater resources management.

The four-year Water Research Commission (WRC) project on field investigations to study the fate and transport of light non-aqueous phase liquids (LNAPLs) in groundwater was awarded to the IGS in early 2007. For this project, the IGS collaborated with the Universities of KwaZulu-Natal and Pretoria, and Golder Associates Consultants. This project aims to consolidate knowledge about the fate and transport of LNAPL pollutants in groundwater in a systematic manner. As part of the project, representatives from the industry (oil companies, consultants, researchers and regulators) were invited to workshops in February 2008. The intention of



At the FETWater Meeting in Dullstroom were, from the left: Dr Ingrid Dennis, Director: Institute for Groundwater Studies at the UFS, Mr Ronny Verhoeven, Ghent University, Belgium, Mr Rudy Herman, Flemish Government, Mr Steve Mitchell, Water Research Council, Mr Alex Makarigakis, United Nations Educational, Scientific and Cultural Organisation (UNESCO), Dr Rainier Dennis, Institute for Groundwater Studies at the UFS, Dr Danie Vermeulen, Institute for Groundwater Studies at the UFS, Dr Jan Roos (UFS), and Mr Andries Jordaan, Director: Disaster Management Training and Education Centre for Africa (DiMTEC) at the UFS.

the workshops was to combine the dissemination of the products of the WRC project K5/1501 on DNAPLs and to obtain collective input from the industries and oil companies, regulators and local authorities on the objectives, approach and methodologies planned for the LNAPL research. The workshops were presented by Drs Jennifer Pretorius and Brent Usher, held in Pretoria, Durban and Cape Town, and attended by approximately 60 delegates.

Regular speeches concerning irrigation with groundwater were presented by Dr Vermeulen at the Agricultural Unions in the Free State and Northern Cape. For many farmers, this is an important subject and invoked lively discussions.

Prof. Gerrit van Tonder and Dr Jennifer Pretorius gave several presentations to local pensioners' societies on subjects ranging from water quality to groundwater use.

In 2008, the South African Development Community (SADC) short-listed the IGS to host the Groundwater Managing Institute of Southern Africa. The IGS has been visited by representatives from the SADC and negotiations are currently ongoing.

A two-year contract with Goldfields Mining Group was

awarded to the IGS laboratory. The purpose of the contract is to assess the acid-generating potential of all the mining group's waste deposits. The IGS laboratory renewed its contract with BloemWater to perform weekly bacterial and two-weekly chemical analyses of all the water supply points in the region. The Department of Water Affairs and Forestry also awarded a contract for all the analyses of water samples taken by the regulator in the Free State region.

For 2009, the IGS was granted R100 000 by SASOL for the third consecutive year, for the purpose of groundwater-related research. ■



Students during a drilling practical.

Research outputs

Research articles

Dennis, I., Pretorius, J.A., Van Deventer, P. & Steyl, G. 2008. *Methods to assess the impacts of tailings dams on the groundwater system in South Africa.* *Journal of Mining and Metallurgy* 44A(1): 59-66.

Gebrekrastos, R.A., Shapiro, A.M. & Usher, B.H. 2008. In situ estimation of the effective chemical diffusion coefficient of a rock matrix in a fractured aquifer. *Hydrogeology Journal* 16(4): 629-639.

Usher, B.H. 2008. Upscaling laboratory results on water quality for underground collieries in South Africa's Highveld Coalfields. *Minerals Engineering Journal* 22(1): 43-56.

Vermeulen, P.D. & Usher, B.H. 2008. The effect of graben structures on the migration of groundwater contaminants on an industrial site. *Environmental Geology* 10. [Online].

Chapters in books

Dennis, I. & Veltman, S. 2008. The South African groundwater decision tool. In *Groundwater flow understanding: From local to regional scale*, edited by J.J. Carrillo Rivera and M.A. Ortega Guerrero. Leiden, The Netherlands: Taylor and Francis. pp. 135-149.

Usher, B.H. & Veltman, S. 2008. The development of a methodology for groundwater management in dolomitic terrains of South Africa. In *Groundwater flow understanding: From local to regional scale*, edited by J.J. Carrillo Rivera and M.A. Ortega Guerrero. Leiden, The Netherlands: Taylor and Francis. pp. 165-182.

Reports

Adams, S., Beekman, H.E., Campbell, R.B., Conrad, J., Fey, M.B., Jovanovic, N., Saayman, I.C., Thomas, A. & Usher, B.H. 2008. *Assessment of aquifer vulnerability.* Report no: 1432/1/07 to the Water Research Commission (WRC), Pretoria, South Africa.

Dennis, I. 2008. *Groundwater Reserve Determination for the Thukela Catchment: Inception Report.* Report about project no: WP 9437/3 to the Department of Water Affairs and Forestry (DWAF), Pretoria, South Africa.

Dennis, I. 2008. *Review of Berg WAAS conceptual and numerical models.* Report about project no: P14/14/2/3/8/2/2 to the Department of Water Affairs and Forestry (DWAF), Pretoria, South Africa.

Dennis, I. 2008. *Review of commercial software packages to calculate surface-groundwater interaction.* Report about project no: P14/14/2/3/8/2/2 to the Department of Water Affairs and Forestry (DWAF), Pretoria, South Africa.

Dennis, R. 2008. *Training and testing of neural networks to simulate surface-groundwater interaction.* Report about project no: P14/14/2/3/8/2/2 to the Department of Water Affairs and Forestry (DWAF), Pretoria, South Africa.

Dennis, R. & Dennis, I. 2008. *Review of groundwater component of WSAM.* Report about project no: P14/14/2/3/8/2/2 to the Department of Water Affairs and Forestry (DWAF), Pretoria, South Africa.

Gebrekrastos, R.A., Groenewald, J., Jagals, P., Lenong, S., Pienaar, M.,

Pretorius, J.A., Robertson, N., Traoré, H.N., Tshitenge, C., Usher, B.H. & Zadoroshnaya, V. 2008. *Field and laboratory investigations to study the fate and transport of dense non-aqueous phase liquids (DNAPLs) in groundwater.* Report no: 1501/5/08 to the Water Research Commission (WRC), Pretoria, South Africa.

Gebrekrastos, R.A., Pretorius, J.A. & Usher, B.H. 2008. *Groundwater monitoring guidelines for DNAPLs in South African Aquifers.* Report no: 1501/4/08 to the Water Research Commission (WRC), Pretoria, South Africa.

Gebrekrastos, R.A., Pretorius, J.A. & Usher, B.H. 2008. *Guidelines for the acceptance of monitored natural attenuation processes in South Africa.* Report no: 1501/3/08 to the Water Research Commission (WRC), Pretoria, South Africa.

Gebrekrastos, R.A., Pretorius, J.A. & Usher, B.H. 2008. *Manual for site assessment at DNAPL contaminated sites in South Africa.* Report no: 1501/2/08 to the Water Research Commission (WRC), Pretoria, South Africa.

Usher, B.H., Van Tonder, G.J. & Vermeulen, P.D. 2008. *Determination of the impact of coal mine water irrigation on groundwater resources.* Report no: 1507/1/08 to the Water Research Commission (WRC), Pretoria, South Africa.

Conference contributions

Dennis, I., Pretorius, J.A. & Van Deventer, P. 2008. *Impacts of tailings dams on the groundwater systems in South Africa.* Paper delivered at the 4th International Mining and Industrial Waste Management Conference: The tailings life cycle: Managing waste for life, Orion Safari Lodge, Rustenburg, South Africa. 11-12 March.

Vermeulen, P.D. & Usher, B.H. 2008. *Operation and monitoring guidelines for irrigating with coal mine water in South Africa.* Paper delivered at the 10th International Mine Water Association (IMWA) Congress: Mine Water and the Environment, Karlovy Vary, Czech Republic. 2-5 June.

Staff

Director: Dr Ingrid Dennis

Professors: Prof. Gerrit van Tonder

Senior Lecturer: Dr Brent Usher

Researchers: Drs Rainier Dennis, Jennifer Pretorius, Danie Vermeulen, Mr Sakhile Mndaweni

Affiliated Researchers: Profs Jopie Botha, Frank Hodgson, Messrs Mehari Menghistu, Richard Akoachere, Michael Bester, Modreck Gomo, Georges Moukodi, Charl van der Merwe

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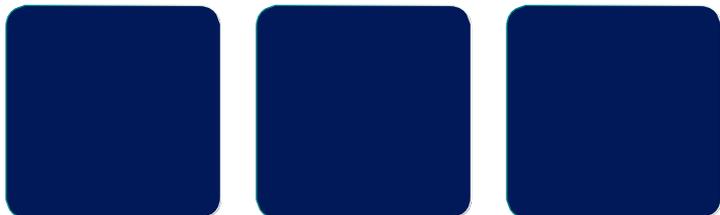
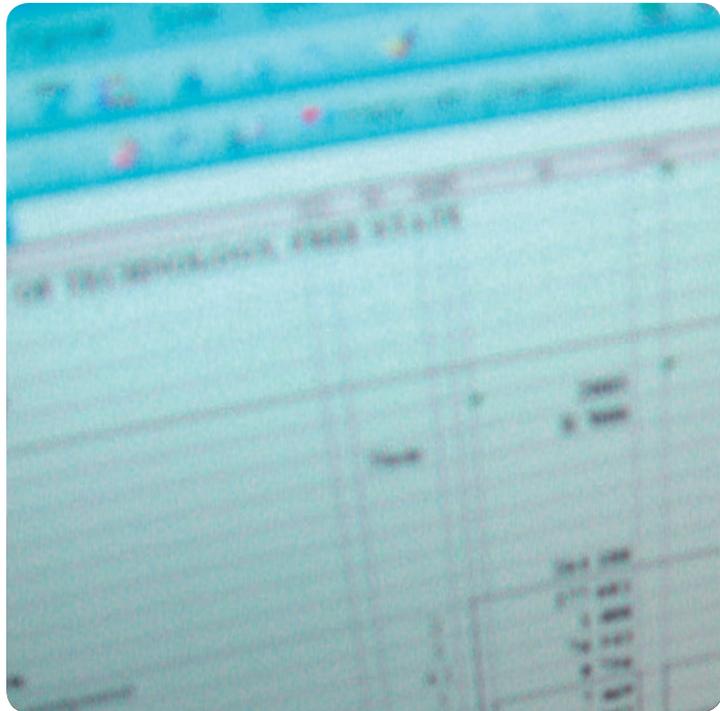
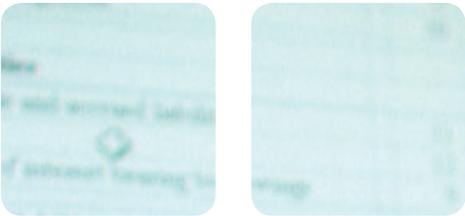
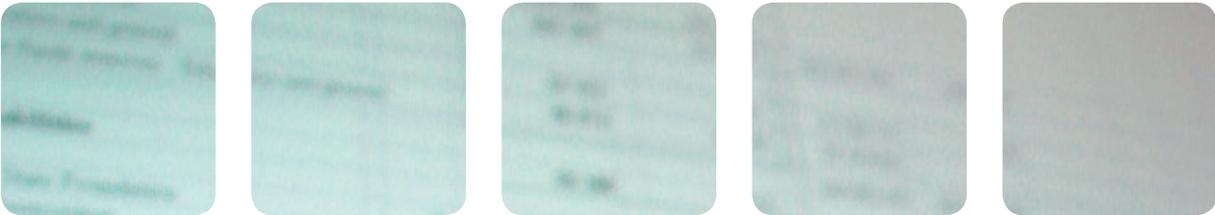
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Statistical data

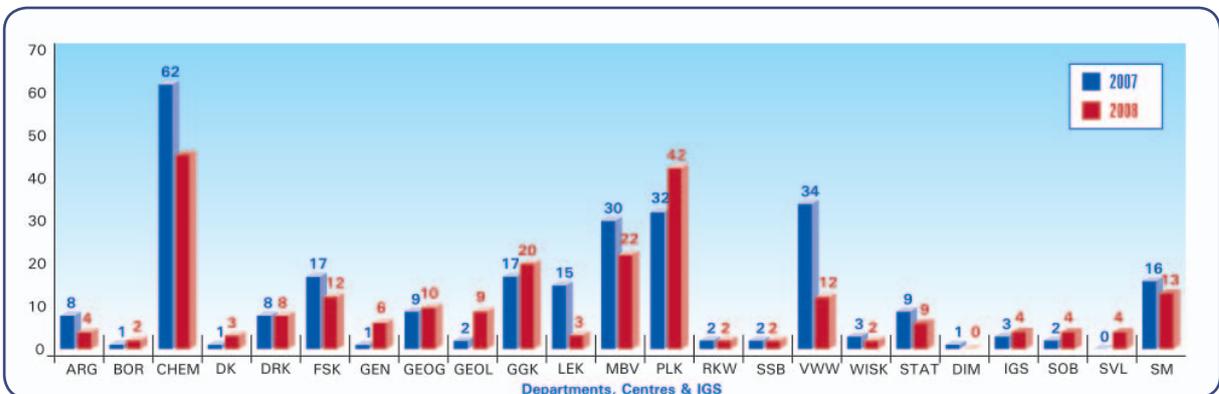


Research outputs: 2007-2008

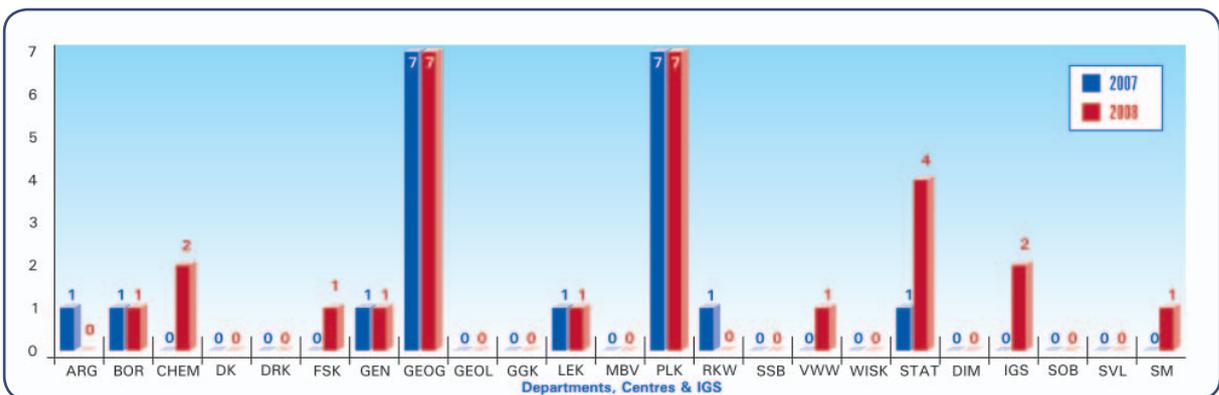
List of abbreviations

Abbreviation	Name	Abbreviation	Name
ARG	Department of Architecture	GGK	Department of Soil, Crop and Climate Sciences
BOR	Department of Quantity Surveying and Construction Management	IGS	Institute for Groundwater Studies
SOB	Centre for Environmental Management	LEK	Department of Agricultural Economics
CEM	Department of Chemistry	MBV	Department of Microbial, Biochemical and Food Biotechnology
SM	Centre for Microscopy	PLK	Department of Plant Sciences
SVL	Centre for Sustainable Agriculture and Rural Development	RKW	Department of Computer Science and Informatics
DK	Dean's Office	SSB	Department of Urban and Regional Planning
DRK	Department of Zoology and Entomology	SRB	Disaster Management Training and Education Centre for Africa (DIMTEC)
FSK	Department of Physics	VWW	Department of Animal, Wildlife and Grassland Sciences
GEN	Department of Genetics	STAT	Department of Mathematical Statistics and Actuarial Science
GEOG	Department of Geography	WISK	Department of Mathematics and Applied Mathematics
GEOL	Department of Geology		

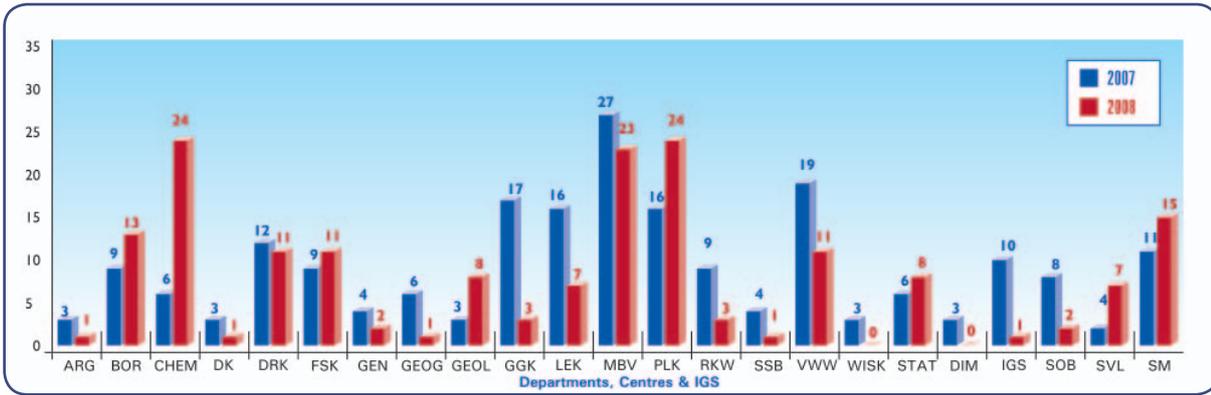
Accredited articles



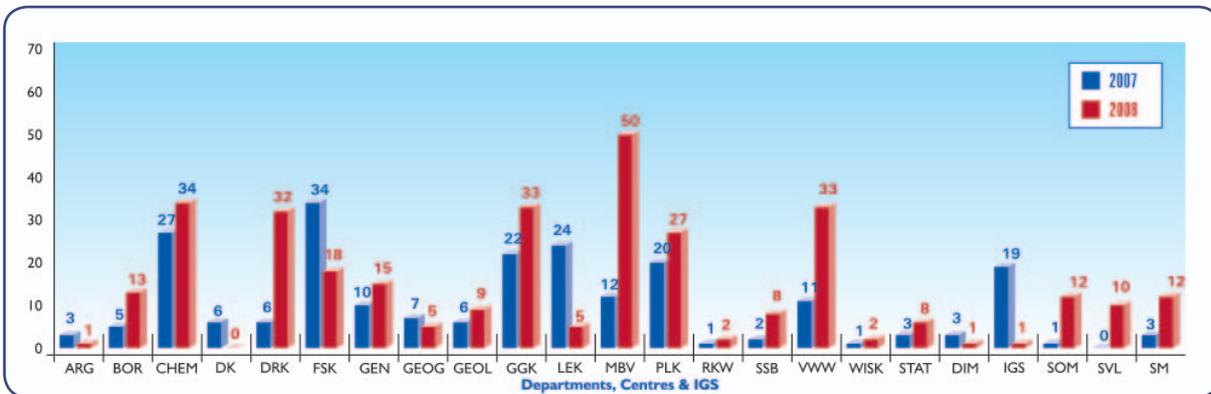
Books



International conferences



Local conferences



Student figures: 2007-2008

Student figures

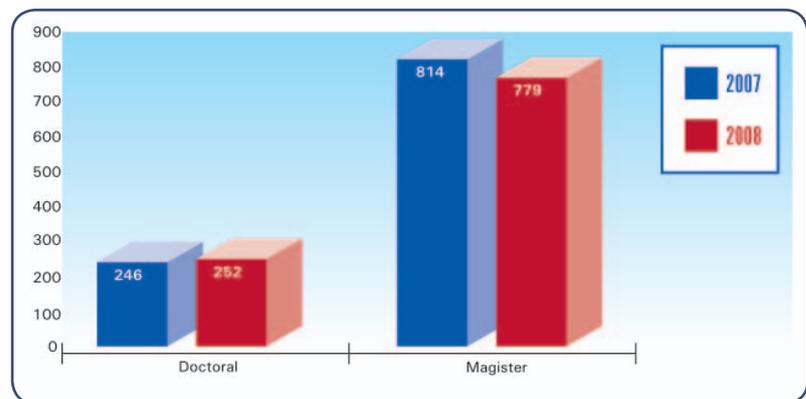
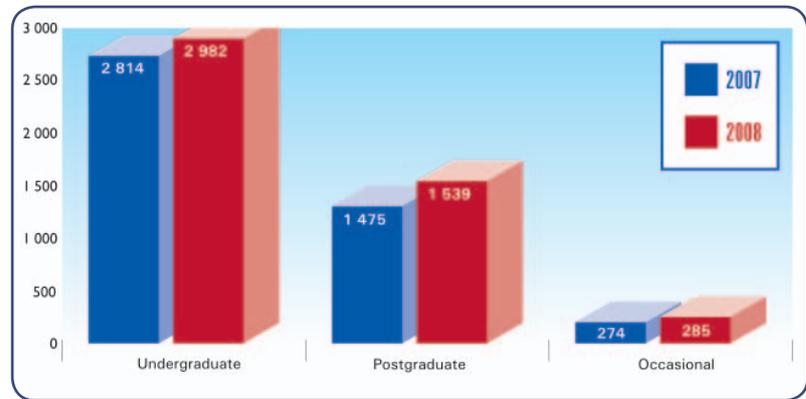
Year	Description	Black	Coloured	Asian	White	Total
2007	Undergraduate	1492	66	38	1218	2814
	Postgraduate	710	41	40	684	1475
	Occasional	230	6	2	36	274
*TOTAL		2432	113	80	1938	4563
2008	Undergraduate	1667	51	37	1227	2982
	Postgraduate	755	40	43	701	1539
	Occasional	260	5	1	19	285
* TOTAL		2682	96	81	1947	4806

International students

Nationality	Year	Year
	2007	*2008
Angola	2	0
Asian countries	20	24
Botswana	17	23
Democratic Republic of the Congo	0	1
European countries	9	10
Lesotho	118	144
Malawi	3	5
Mauritius	2	3
Mozambique	4	7
Namibia	54	65
North America	15	5
Other African countries	47	69
South America	1	0
Swaziland	5	6
Zambia	7	7
Zimbabwe	48	60
Total	352	429

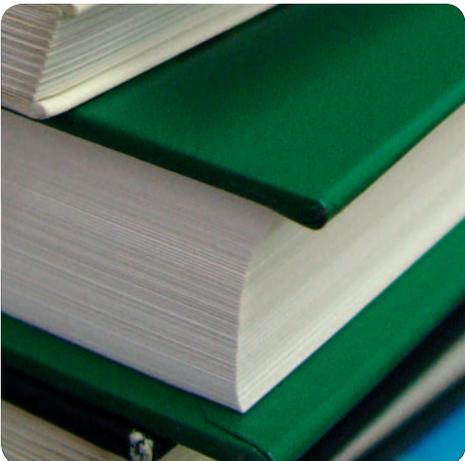
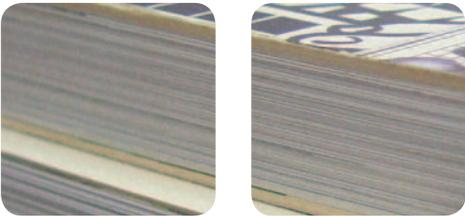
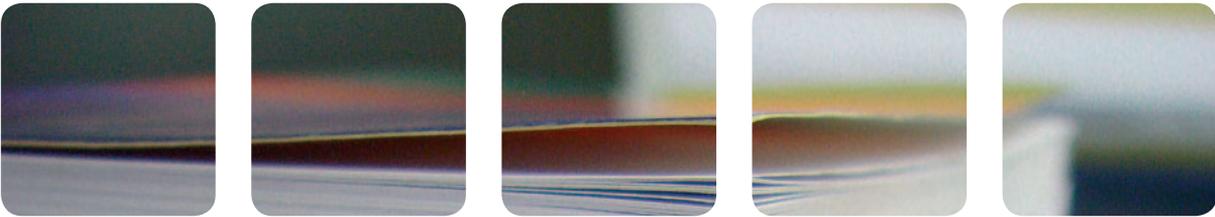
*2008 Final HEMIS figures not available

Comparison for the Faculty of Natural and Agricultural Sciences





Glossary



Glossary

A

AACC -	American Association for Cereal Chemists
AACE -	Association for the Advancement of Cost Engineering
ADF -	Amsterdam Density Functional Programme
ADG -	Average Daily Grain
AEASA -	Agricultural Economics Association of South Africa
AEON -	the African Earth Observation Network
AGU -	American Geophysical Union
AI -	Artificial Insemination
ARC -	Agricultural Research Council
ARV -	Antiretroviral
ASC -	Architecture Student Conference
ASAQS -	Association of South African Quantity Surveyors
ASOCSA -	Association of Schools of Construction of Southern Africa

B

BBSRC -	Biotechnology and Biological Sciences Research Council
BMBF -	Federal Ministry of Education and Research, Germany

C

CAA -	Commonwealth Association of Architects
CANSA -	Cancer Association of South Africa
CAB -	Centro de Astrobiología
CED -	Centre for Education Development
CePHMa -	Centre for Plant Health Management
CHESD -	Centre for Higher Education Studies and Development
CHPC -	Centre for High Performance Computing
CIDB -	Construction Industry Development Board
CIOB-SA -	Chartered Institute of Building, South Africa
CSIR -	Council for Scientific and Industrial Research Organisation
CSTA -	Cereal Science and Technology Association
CUT -	Central University of Technology

D

DiMTEC -	Disaster Management Training and Education Centre for Africa
DMISA -	Disaster Management Institute of Southern Africa
DRRW -	Durable Rust Resistance in Wheat
DST -	Department of Science and Technology
DWAF -	Department of Water Affairs and Forestry

E

ECA -	European Crystallographic Association
EGIC -	Economic Growth and International Competitiveness
EMSA -	Environmental Management Systems Association
EMS -	Environmental Management Systems
EPWP -	Expanded Public Works Programme

F

FAO -	Food and Agricultural Organisation
FETWater -	Framework Programme for Research Education and Training in Water
FMP -	Facilities Management Programme
FSRDPP -	Free State Rural Development Partnership Project
FTIR -	Fourier Transform Infra Red Spectrometer

G

FGAP -	Facility for Genomics and Proteomics
GIS -	Geographical Information Systems
GMO -	Genetically Modified Organisms
GRDM -	Groundwater Resource Directed Measures
GSSA -	Grassland Science Society of South Africa
GSSA -	Geological Society of South Africa

H

HCI -	Human-computer Interaction
HRTEM -	High Resolution Transmission Electron Microscopy

I

IAMA -	International Food and Agribusiness Management Association
IAU -	International Astronomical Union
ICACS -	International Conference on Atomic Collisions in Solids
ICCC -	International Conference on Coordination Chemistry
ICEC -	International Cost Engineering Council
ICRISAT -	International Crops Research Institute for the Semi-Arid Tropics
ICSU -	International Council for Science
IDC -	Industrial Development Corporation
IGC -	International Geological Congress
IGS -	Institute for Groundwater Studies
IMWA -	International Mine Water Association
INCRoP -	Insects on New Crops Programme
IPMP -	Intensive Project Management Programme
ISI -	International Statistical Institute
ISME -	International Society for Microbial Ecology
IT -	Information Technology
IUMS -	International Union of Microbiological Societies

L

LPI -	Lunar and Planetary Institute
LRAD -	Land Redistribution for Agricultural Development

M

MCEE -	Minnesota Council on Economic Education
MDC -	Maputo Development Corridor
MEC -	Member of the Executive Council
MNS -	Material and Nanosciences Cluster
MOU -	Memorandum of Understanding
MRC -	Medical Research Council
MSA -	Masters in Sustainable Agriculture
MSSA -	Microscopy Society of Southern Africa
MUCPP -	Mangaung University Community Partnership Programme

N

NAMC -	National Agricultural Marketing Council
NASA -	National Aeronautics and Space Administration
NASSP -	National Astrophysics and Space Science Programme
NBN -	National Bioinformatics Network
NCEE -	National Council for Economic Education
NDF -	Neutral Detergent Fibre
NECSA -	Nuclear Energy Corporation of South Africa
NERPO -	National Emergent Red Meat Producers Organisation
NGO -	Non-Governmental Organisation
NRF -	National Research Foundation
NSTF -	National Science and Technology Forum
NWGA -	National Wool Growers' Association

O

OECD -	Organisation for Economic Cooperation and Development
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P

PAQS -	Pacific Association of Quantity Surveyors
PDMS -	Provincial Disaster Management Centre
PRT -	Protein Research Trust

R

RDP -	Redress and Development Programme
RIBA -	Royal Institute of British Architects
RICS -	Royal Institute of Chartered Surveyors
RIEP -	Research Institute of Education Planning
RMMA -	Red Meat Abattoirs Association
RPO -	Red Meat Producers Organisation
RTPI -	Royal Town Planning Institute

S

SA -	South Africa
SAAPMB -	South African Association of Physicists in Medicine and Biology
SAB -	South African Breweries Limited

SABC -	South African Broadcasting Corporation
SACAP -	South African Council for the Architectural Professions
SACPCMP -	South African Council for the Property Valuers Profession
SACPLAN -	South African Council of Planners
SACQSP -	South African Council for the Quantity Surveying Profession
SADC -	Southern African Development Community
SAFA -	South African Feedlot Association
SAFEFE -	South African Foundation for Economic and Financial Education
SAFOI -	South African Fryer Oil Initiative
SAIA -	South African Institute of Architects
SAIM -	Society for Industrial and Applied Mathematics
SAISC -	Southern African Institute of Steel Construction
SANBI -	South African National Biodiversity Institute
SANCID -	South African Commission on Irrigation and Drainage
SANPAD -	South African Netherlands Research Programme on Alternatives in Development
SANSA -	South African National Survey of Arachnida
SAPOA -	South African Property Owners Association
SAPPS -	Symposium of the South African Pecan Producers Association
SAQA -	South African Qualifications Authority
SASA -	South African Statistical Association
SASHS -	Southern African Society for Horticultural Sciences
SASM -	South African Society for Microbiology
SAWMA -	South African Wildlife Management Association
SAWSS -	Southern African Weed Science Society
SCM -	Scientific Computing and Modeling
SEG -	Society of Economic Geologists
SEM -	Scanning Electron Microscope

SLE -	Senior Lecturer Equivalent
SSSSA -	Soil Science Society of South Africa
SWMA -	Southern African Wildlife Management Association

T

TEM -	Transmission Electron Microscope
THRIP -	Technology and Human Resource for Industry Programme

U

UCT -	University of Cape Town
UEC -	Unit for Earth Construction
UFS -	University of the Free State
UJ -	University of Johannesburg
UK -	United Kingdom
UN -	United Nations
UNESCO -	United Nations Educational, Scientific and Cultural Organisation
UNU -	United Nations University
UP -	University of Pretoria
USA -	United States of America
USAID -	United States Agency for International Development
UWC -	University of the Western Cape

W

WCAP -	World Conference on Animal Production
WITS -	University of the Witwatersrand
WRC -	Water Research Commission

