



Report
2007

Faculty of Natural and Agricultural Sciences



The cover features a solid blue header at the top. Below it is a white band, followed by a light blue band containing the title and subtitle. The bottom half of the cover is white. The bands are separated by wavy, undulating lines.

Faculty of Natural and Agricultural Sciences

Report 2007

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Preface

From the Dean's Office



Prof. Herman van Schalkwyk

The faculty positioned itself in 2007 through world-class research and community service as a faculty where there is no substitute for excellence. This included areas as diverse as parasitology, environmental and water management, physics, chemistry, microbiology and food technology, building sciences and construction management, sustainable agriculture and the development of new crops.

Research outputs were strengthened by the extension of a purposeful strategy to acquire high quality scientists and researchers, purchasing expensive laboratory equipment and investing in infrastructure. A number of agreements were reached with suppliers of equipment, making it more affordable for the faculty.

The faculty's research outputs are still on the increase. In 2006, 252 articles appeared in accredited journals. This figure increased to 275 in 2007 – an average increase of 1%. This is mainly thanks to the dedication of the faculty's researchers.

Six of the faculty's researchers increased their evaluation status with the National Research Foundation (NRF). Three researchers applied to the NRF for first-time evaluation and were successful.

Research in the faculty received a further boost with a grant of R13.7 million from BioPAD to the Department of Microbiology, Biochemical and Food Biotechnology's Biochemical division to conduct research on pre-historic organisms. BioPAD is a South African biotechnology company that forms partnerships between researchers, entrepreneurs, businesses, government and other role-players in order to advance innovation and develop sustainable biotechnological companies. The contract entails the establishment of a Platform for Metagenomics – a technique which enables researchers to extract DNA from microbes for further investigation in a laboratory.

A project of more than R40 million to upgrade the facilities of the Department of Chemistry continued, despite a fire which destroyed four of the research laboratories and caused several millions of rand worth of structural damage as well as damage to the apparatus. When this upgrading is completed the department will be reckoned under the best chemistry departments in the world.

The faculty's student numbers showed a steady growth from 4 179 under-, postgraduate and occasional students in 2006, to 4 727 in 2007. There is also a strong representation of foreign students with more than 400 students from mainly Africa, but also Europe and Asia studying at the faculty.

A Marketing Manager for the faculty, Mr Nelis Maeder, was appointed in 2007 to especially assist with writing business plans and proposals and to handle the marketing thereof to external investors.

Two successful contracts were signed with the Southern African Development Community (SADC) and the Mangaung Local Municipality.

In its pursuit of quality and excellence and to improve its through flow rates, the faculty appointed Mr Johan Kruger as

Learning and Teaching Manager at the beginning of 2007. His initial focus is on courses in the first year of the extended and general programmes. The faculty is looking at new learning and assessment methods for both the general and extended undergraduate programmes in order to improve throughput rates and quality teaching.

The faculty increased its involvement at school level with the development of a project that will assist with the development of learning material in mathematics and sciences and to assist teachers with the use of their learning material.

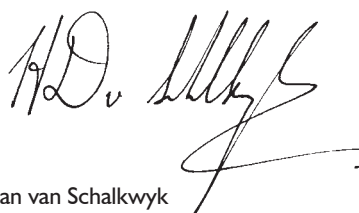
Several staff members from the faculty were named on national committees and councils. Prof. Kobus Laubscher from the Department of Agricultural Economics was appointed as chairperson by the National Productivity Institute's Social Plan and Productivity Advisory Council, and Ms Sheila Vrahimis from the Department of Geography was appointed on the Free State Naming Committee.

Where community service learning is concerned, the faculty is still making its mark. The Lengau Agricultural Development Centre continued with its activities in 2007 and many outreach activities, among others farmers' days and training, followed.

The latest addition to the programme is the HIV/Aids initiative among farm workers to inform them about the disease, how to deal with it and how to prevent it.

To be dynamic and excellent requires innovative thinking and commitment. It requires the delivering of excellent teaching and learning opportunities to students. It also requires a willingness to build partnerships, and a multi-disciplinary and practical approach to the South African tertiary education environment.

This report covers the activities of the faculty in 1007. It is a reflection of a years' commitment on the part of a team of skilled and motivated academics and support staff.



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

Faculty and Free State Department of Agriculture take hands

Mr Casca Mokitlane, Member of the Executive Council (MEC) for Agriculture in the Free State, visited the Faculty of Natural and Agricultural Sciences and had investigative discussions with Prof. Herman van Schalkwyk, Dean of the faculty, on how a more focused strategic leadership for the development of agriculture in the Free State province can be established. Important agricultural issues between the faculty and the department were identified in order to build a more vibrant and sustainable agricultural industry in the province. Mr Mokitlane was also informed about the research done at the faculty, training programmes offered and the roles currently played by the different divisions in terms of community service. Both parties were in agreement that the one cannot function without the other and that, in the interests of agriculture, they must move closer to each other to face the challenges ahead.



Here are, from the left: Mr Mokitlane, Prof. Van Schalkwyk, and Mr Tshepiso Ramarakane, Head of the Department of Agriculture in the Free State.

Faculty hosts exchange students from Virginia Tech



A group of 13 exchange students from Virginia Tech in the United States of America (USA) visited the faculty as part of an Ecology course. Attending the welcoming function are, from the left, front: Rockey Warren, Katie Lottinville, Ashley Wright, Prof. Leon van Rensburg, Professor in the Department of Soil, Crop and Climate Sciences at the UFS; back: Prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS.

Links with Dronten University strengthened

The Faculty of Natural and Agricultural Sciences and the CAH Dronten Professional Agricultural University in the Netherlands, expanded and strengthened the relationship between the two institutions with the signing of a letter of undertaking between Dr Will Beckering from Dronten and Prof. Herman van Schalkwyk, Dean of the faculty. The letter paved the way for the establishment of a memorandum of understanding and implementation agreements between the two institutions. Both institutions share an interest in the training of emerging farmers, the carrying out of an agricultural skills development project, short-term visits of staff for consultations and lecturing, and formulating and implementing projects on capacity development to broaden access to professional education. They also share an interest in the exchange of students for study programmes, placement projects, curricular development, more especially the possibilities of developing a joint master's degree programme, and the identification of possibilities of the use of e-learning in joint educational programmes.



Signing the letter of undertaking are, from the left, front: Dr Bechering, and Prof. Van Schalkwyk, back: Dr Aldo Stroebe, Head: Internationalisation at the UFS, and Prof. Izak Groenewald, Director: Centre for Sustainable Agriculture and Rural Development at the UFS.

Faculty facilitates historic meeting between NAFU and Free State Agriculture



Here are, from the left: Mr Louw Steytler, President of Free State Agriculture, Prof. Van Schalkwyk, and Rev Otto Mbongula, President of NAFU in the Free State.

A significant breakthrough in the agricultural sector took place when Prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences facilitated a meeting between Free State Agriculture and the National African Farmers Union (NAFU). During the meeting the two parties decided to work together in future in various areas to achieve collective objectives for the agricultural sector. The parties agreed to talk to each other regularly and to identify differences and similarities to the advantage of the province's economy. The parties also agreed to involve other role players in the discussions in due course, and communication with the Provincial Government was highlighted as an important point of departure.

Courses of SADC's regional training programme presented by the faculty



The first module in a series of three service contracts of the Southern African Development Community's (SADC) Promotion of Regional Integration (PRINT) programme, entitled Delivery of a Regional Training Program in Livestock Marketing and Trade was presented by the Department of Agricultural Economics on the Main Campus in Bloemfontein. The module is part of a short course in Livestock Marketing and Trade sponsored by SADC PRINT and the European Union (EU). The course was attended by 14 participants from 11 member countries. From the left are: Mr Gerard Oosterwijk, Training Advisor, SADC PRINT, Dr Welbourne Madzima, PRINT Livestock Co-ordinator, Prof. Herman van Schalkwyk, Dean, Faculty of Natural and Agricultural Sciences at the UFS, and Ms Temana Johny, Administrative Assistant, SADC PRINT.

Faculty publishes report



In June 2007 the faculty published a report in which the various departments and centres highlighted their activities for 2005/06. Pictured here are some of the departmental chairpersons during the launch of the report.

Dean's office excels



Prof. Neil Heideman

Prof. Neil Heideman, Vice-Dean of the Faculty of Natural and Agricultural Sciences at the UFS, was awarded a Fulbright Senior Researcher Fellowship. He returned from the United States (USA) at the end of April 2007 after a six-month visit to the laboratory of Prof Jack Sites, a fellow herpetologist at Brigham Young University, Utah. Prof Heideman used the opportunity to apply microsatellites (short repetitive sequences in DNA molecules) to population genetics questions in threatened legless skinks from the Cape West Coast. In recent years microsatellites have become the marker of choice for measuring genetic variability in populations. Prof. Sites has extensive experience in the application of the technique and was therefore an ideal candidate to spend time with. Although not new to South Africa, the country's capacity in the use of microsatellites is still very limited, being essentially non-existent among herpetologists.

Prof. Herman van Schalkwyk, Dean of the faculty, was appointed by the national Minister of Agriculture as non-executive director on the Council of the Land Bank and as member of the National Agricultural Marketing Council (NAMC).





Departments in *the Agricultural Sciences*



Prof. Johan Willemse

Department of Agricultural Economics

Overview

The approach of the Department of Agricultural Economics is to equip students to be outstanding agricultural economists and to contribute to community service through research and the practical application of their knowledge. In 2007 the department continued to improve curricula, add new incentives and apply knowledge in various research projects linked to the industry and the fields of expertise of staff.

Altogether, 21 M.Sc. and 21 Ph.D. students enrolled for studies in the department. This includes students from Eritrea, Mozambique, Nigeria, Namibia, Botswana, Lesotho, Ethiopia, Swaziland, Ghana and South Africa, amongst others.

Prof. Kloppe Oosthuizen was appointed by the International Commission on Irrigation and Drainage to lead a symposium in Lahore, Pakistan on socio-economic aspects of agricultural production in developing countries. Dr Wimpie Nell was elected as a member of the council of the International Farm Management Association (IFMA) to represent Southern Africa.

Prof. Johan Willemse, Departmental Chairperson, was appointed as an independent non-executive director of the Absa Group and vice-chairperson of the Agricultural Economics Association of South Africa (AEASA).

The 20th FR Tomlinson commemorative lecture of the AEASA was hosted by the department and Prof. Oosthuizen received an honorary medal.

Staff of the department attended the 16th International Farm Management Conference in Cork, Ireland.

During 2007, the Centre for Agricultural Management was appointed by the national Department of Agriculture as a Centre of Excellence for the roll-out of small, medium and micro enterprises (SMME). The UFS was one of three educational institutions identified to host such a Centre of Excellence. The first course for extension officers commenced in November 2007.

Most of the work and research at the department is done on a group basis, although individual research is also done extensively. The research team of Prof. Giel Viljoen consists of Drs Godfrey Kundhlande and Jack Armour, Mr Mompoti Baiphethi and Ms Heidi Mabanda. The team's research focuses on the generation of information to improve efficiency and sustainability in the use

and management of natural resources, water and land. Research focus areas include assessing the impacts and management of natural disasters like floods and droughts, saline irrigation water and rain water harvesting techniques.

Two students graduated from the group in 2007, namely Mr Armour who received a Ph.D. degree with a dissertation entitled: *Multi-dimensional models for the sustainable management of water quantity and quality in the Orange-Vaal-Riet convergence system* and Ms Mabanda, who received a master's degree with a mini-dissertation entitled: *An assessment of the role and influence of commodity and financial markets on the sustainable adoption of the in-field rainwater harvesting (IRWH) technique by resource poor small scale farmers in Thaba Nchu*.

The initiative of the department to support educators and to enable them to prepare their learners to meet the National Curriculum Standards in Economics and Management Sciences (EMS) at the General Education and Training (GET) level and Economics at the Further Education and Training (FET) level was established in 2007. This initiative is carried out in co-operation with the provincial Department of Education, the National Council of Economic Education (NCEE) in the United States of America (USA) and the South African Foundation for Economic and Financial Education (SAFEFE). In this case, SAFEFE will play a role similar to that of the South African Mathematics Foundation.

At international level various activities were funded by the NCEE. 31 South Africans from six provinces (19 staff members of the provincial departments of education and 12 UFS staff members) completed the Train the Trainers programme; 53 South Africans from six provinces were selected to participate in the first all-South African Train the Trainers programme; eight graduates of the Train the Trainer programme were selected to participate in the NCEE year-long Train the Writer programme (including a one-week workshop in Bucharest, Romania); the NCEE hosted a delegation of four education leaders from the Free State and KwaZulu-Natal in the USA and two graduates of the Train the Trainers programme from the Free State were invited to the USA for a study tour. Other activities included: graduates of the Train the Trainers programme were supported through three alumni projects; an introductory teachers' workshop was conducted in KwaZulu-Natal for 45 participants; and five educational leaders from the Free State and

KwaZulu-Natal were hosted at the 2007 NCEE annual conference in Denver, Colorado in the USA.

At local level various activities were carried out by SAFEFE. This included an Economic Literacy Olympiad which was introduced for the first time to all 1 300 GET schools in the Free State. The Olympiad was conducted over four rounds. More than 400 teachers and 2 500 learners were involved. The plan is to expand the project to include 200 schools in the Northern Cape and to have an inter-provincial competition. In another project 123 Learning Area Managers and Subject Advisors in the Northern Cape and 77 FET teachers in the Free State were trained. Ten lessons were developed for the foundation phase at GET level and presented to 78 Learning Facilitators in the Free State and KwaZulu-Natal. An NCEE alumni project in the Eastern Cape was approved to develop an Olympiad for Economics at FET level in 2008. In November 2007, 120 GET teachers were trained. Pre- and post-testing was conducted which will be followed up with pre- and post-testing of their learners for research purposes.

It is important that the UFS develops extensive engagement with learners from pre-school up until Grade 12 regarding research, teaching and outreach that touches all parts of the university and includes programmes that represent the best in partnerships – enduring, collaborative, complementary and focused on issues of importance to the UFS and the Free State.

The department continues to excel in community service. Many of the research projects have a strong community service component. These specifically include contact sessions on the Main Campus with the SADC PRINT project, in which the countries of the Southern African Development Community (SADC) participate.

A unit for Livestock and Wildlife Economics was established in the department during 2007, focusing on research. The team consists of Prof. Kobus Laubscher, Messrs Pieter Taljaard, David Spies and Flippie Cloete.

Prof. Willemse and his research assistant Ms Lize Terblanche conduct quarterly Market Outlook Workshops for farmers and agri businesses. These workshops were well attended (averaging 300 attendees) by farmers from throughout South Africa. Guest speakers included Mr Neil



*The department presented a workshop on agricultural strategy on the Main Campus in Bloemfontein. The workshop was facilitated by Ms Chantelle Ilbury, co-author with Clem Sunter of the book *Games Foxes Play - Planning for Extraordinary Times*. At the workshop are, from the left: Mr Willie Anderson, agricultural economist from PFS in Ladybrand, Ms Ilbury, Profs Kobus Laubscher, Associate Professor in the department, and Johan Willemse, Departmental Chairperson and co-facilitator of the workshop.*

Jacobson, a director from Future World, and Ms Chantel Ilbury, co-author of *Games Foxes Play - Planning for Extraordinary Times* by Mr Clem Sunter. They also presented agricultural economic market and scenario presentations to farmer groups and assisted various agricultural organisations in this regard.

The Centre for Agricultural Management presented two financial management courses to a total of 22 farmers and one strategic management course to 11 farmers. The centre also coordinated one three-day dairy processing course attended by six people, and one course in the processing of meat, attended by 27 people. A farm management course was presented to ten farmers at the Lengau Agricultural Development Centre.

The centre is also involved in assisting the Lower Majaekgoro Trust with business plans and training. Three courses were presented to the ten farmers of the Trust, namely Farm Management, Horticultural Management and the Management of the Finances of a farming business.

A Food Garden Management course was presented by the Centre for Agricultural Management during December 2007. Also attending the training course were three dietician students from the UFS. Because of their engagement at the Botshabelo District Hospital, the students requested the centre to help them start a food garden at the hospital.

A short course on vermiculture and vermicomposting at the Mangaung University Community Partnership Programme (MUCPP) was attended by 17 people. The vermicomposting project at MUCPP is growing well and will be expanded to the Tshwaraganang Garden Project and the MUCPP Health Centre. As a result of this course a manual has been written. The centre has since been contacted by various community projects and individuals for assistance in starting vermicomposting.

Dr Ntsikane Maine was guest speaker at the first women's seminar held by the student chapter of the Black Management Forum (BMF) at the UFS. The BMF's student chapter was launched at the UFS in 2006.

Students in the department excelled at the 45th Annual Conference of the AEASA held in Johannesburg. The organising committee received 53 paper submissions, of which 35 were selected for presentation at the conference. Of the 35 papers, 15 were from students of the department, including one upgraded paper.

Students and lecturers who participated in the conference received various awards: Prof. Johan Willemse, Messrs Pieter Taljaard and Dirkie Strydom received the first prize for the best poster, Mr Henry Jordaan received the first prize for the best master's thesis, Messrs Jordaan and Bennie Grové received the third prize for the best paper, and Ms Leandré du Preez was awarded the prize

Staff

Professors: Profs Klopper Oosthuizen, Giel Viljoen

Professors Extraordinary: Profs Jan Groenewald, Dr Kit le Clus

Associate Professors: Profs Johan Willemse, Kobus Laubscher

Affiliated Associate Professors: Profs André Jooste, Daan Louw

Senior Lecturers: Drs Wimpie Nell, Ntsikane Maine, Mr Kobus van Staden

Lecturers: Drs Godfrey Kundhlande, Jack Armour, Messrs Pieter Taljaard, Olu Oyewumi, Henry Jordaan, Bennie Grové

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Senior Officer: Ms Marie Engelbrecht

Officer: Ms Ina Combrinck

Typist/Clerical Assistant: Mss Wilna du Plessis, Francia Neuhoof, Chrizna van der Merwe

Secretary: Ms Louise Hoffman

Professional Officer: Ms Annely Minnaar

Research Assistants: Ms Lize Terblanche, Nicky Matthews, Leandré du Preez, Messrs Ferdie Botha, Flippie Cloete, Attie du Plessis, Philip Fourie, Wim Grobbelaar, Marvin, Khaile, Abraham Landman, Frikkie Maré, Salomo Mbai, Lesedi Modo, Petso Mokhatla, Abiodun Ogundej, Louis Smith, David Spies, Dirkie Strydom, Walter van Niekerk, Derrick Sissons

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for the best Agricultural Economics student at the UFS.

The department hosted two visiting professors from the USA, namely Prof.

Dixie Reeves from Virginia Tech and Prof. Rodney Smith from the University of Minnesota. Three students from Dronten Professional Agricultural University in the Netherlands also visited the department.



Third-year students of the department had to take part in a competition as part of a course in Marketing. The students had to manage the price of white mealies for delivery in July 2007 by buying and selling on Safex. The competition ran from 25 April 2007 to 25 May 2007. During this period, the market grew from R1 650 to R1 712 per ton. The winning group achieved a price of R1 777 per ton, hereby beating the market by R65 per ton or almost 4%. From the left are: Messrs Llewellyn Eastman, member of the winning group, Frikkie Maré, member of the winning group, Willem Zwiegers, leader of the winning group, Dr Kit le Clus, Professor Extraordinary at the department, and Mr Pieter Taljaard, Lecturer at the department.

Research outputs

Research articles

Armour, R.J. & Viljoen, M.F. 2007. An economic case for drainage for sustainable irrigation: Case studies in the lower Vaal and Riet catchments. *South African Journal of Economic and Management Sciences (Special Environmental Issue)* December 2007: 470-481.

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Chapters in books

Yokwe, S., Nell, W.T. & Marinova, D. 2007. Technology transfer and adoption by small-scale women farmers: A case study in Qwaqwa district in South Africa. In *The International Handbook On Environmental Technology Management: Part V - Case Studies In New Technologies For The Environment*, edited by D. Marinova, D. Annandale & J. Phillimore. Northampton Massachusetts, UK: Edward Elgar Publishing. pp. 492-504.

Reports

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Kundhlande, G., Baiphethi, M.N., Mabandla, H.N., Matebesi, S.Z., Mdibe,



Four educators from South Africa recently visited the National Council on Economic Education (NCEE) in the United States of America (USA) on an exchange programme to study economic education delivery systems. The NCEE is a non-profit educational organisation in the USA with a nationwide network of university-based centres for economic education. The South African delegation met with the department of education in Minnesota, staff from the national department of education in Washington DC and representatives of the South African Embassy, amongst others. From the left are: Dr Patty Elder, Vice-President: International Economics of the NCEE, Ms Faith Ndaba, Chief Director: Curriculum Management, Department of Education in the Free State, Dr Thula Mbatha, Chief Director: Curriculum, Department of Education, KwaZulu-Natal, Representative Betty McCollum, Education and Related Matters in Washington DC, Prof. Klopper Oosthuizen, from the department, Dr Nhlanhla Ngcobo, Director: Teacher Development, Department of Education in KwaZulu-Natal, and Prof. Claudia Parliament, Executive Director: Minnesota Council on Economic Education.



Prof. Klopper Oosthuizen delivered a paper during the FR Tomlinson Commemorative Lecture on the Main Campus in Bloemfontein entitled: Economics education: aspirations and responsibilities of the profession. The commemorative lecture is presented by the Agricultural Economics Association of South Africa (AEASA) to give recognition to contributions made to the Agricultural Economics discipline in South Africa. Attending the lecture are, from the left: Mr Niel Pretorius, Provincial Manager: Agriculture, Standard Bank, Dr Moraka Makhura, President of AEASA, and Prof. Oosthuizen with an award he received from the AEASA.

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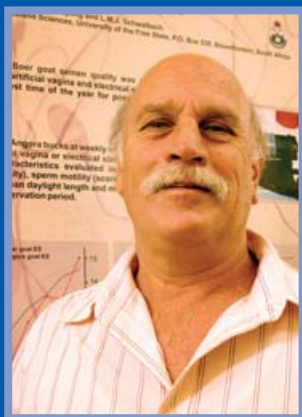
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Prof. Johan Greyling

Department of Animal, Wildlife and Grassland Sciences

Overview

As the largest animal production department and the most specialised group at a South African tertiary institution, the Department of Animal, Wildlife and Grassland Sciences made a significant impact on the livestock industry during the year.

Various aspects ranging from alternative feeds supplementation, the manipulation of reproductive techniques (in vivo and in vitro) in a variety of production systems, breeding value predictions, the formulating of breeding objectives and the conservation of the natural ecosystems to the restoration of degraded vegetation and sustainable wildlife management were addressed. This made a significant impact on the livestock industry, small-scale and commercial enterprises.

Altogether 47 postgraduate students were registered at the department, of which 13 were honours students, 16 were students in M.Sc. Agric., 3 were M.Sc. students, and 15 Ph.D. students.

Members of the department were actively involved in activities representing the department and the UFS. Profs Johan Greyling, Departmental Chairperson, and Frikkie Naser were judges in the National Breed Plan and Voermol Cattle and Sheep Farmer of the year, Prof. Hentie van der Merwe was involved in the national SA Dairy Farmer of the year competition, and Prof. H.O. de Waal in the SA Young Farmer of the year competition. Staff also served on various formal agricultural committees such as the Red Meat Producers' Organisation (RPO), the Free State Game Association, the National Lucerne Organisation, the South African Society for Animal Science (SASAS), the Grassland Science Society of Southern Africa (GSSA), the World Poultry Science Association, the National Wool Growers' Association (NWGA), and so forth.

Indicative of its productivity for 2007, the department published 33 scientific manuscripts in accredited journals, delivered 30 national and international presentations at congresses and contributed 14 popular scientific articles in local journals.

Several members of the department also served on the editorial boards of national and international scientific journals such as the *Small Ruminant Research*, *Livestock Production Science*, *South African Journal of Animal Science*, *African Journal of Range & Forage Science* and the *Journal of Arid Environments*.

The department was well represented at international congresses. Profs De Waal and Hennie Snyman and Mr Ockert Einkamerer made presentations at the VI International Congress on Cactus Pear and Cochineal in Brazil. Profs Greyling, Naser and Japie van Wyk, Dr Luis Schwalbach and Mr Foch de Witt attended and made presentations at the European Association of Animal Production in Dublin, Ireland. Ms Khoboso Lehloeny delivered a paper at a Reproduction Congress in Slovenia and attended an in vitro embryo production course in Italy.

Prof. Snyman and some of his colleagues received the South African Society of Crop Production (SASCP) Board award for the best paper published in the *South African Journal of Plant and Soil* for 2006 – an indication of the standard of outputs delivered. Locally contributions were made at various congresses.

Profs Nico Smit and Snyman and Mr Gideon Janse van Rensburg attended the congress of the South African Wildlife Management Association in Didima. Mr Foch de Witt attended the SASAS Special Mini Congress in Bela Bela, Profs Smit and Snyman and Mr Paul Malan attended the Joint 42nd Annual Congress of the Grassland Society and the 4th Annual Meeting of the Thicket Forum in Grahamstown. Mr Malan attended the Arid Zone Ecology Forum in Sutherland, while Prof. Snyman participated in the Barkley East Farmers Forum in Rhodes and another farmers' forum at Kaalspruit, Bloemfontein.

The African Large Predator Research Unit (ALPRU), situated in the department and under the supervision of Prof. De Waal, undertook certain research projects and was approached and funded by the NWGA, RPO and Cape Mohair and Wool (CMW) to look into controlling the lynx and jackal, especially in the small stock industry as great financial losses are incurred annually because of predators. Together with this, contract research was also executed for Meadow Feeds and the National Lucerne Organisation by Prof. Van der Merwe. Mr De Witt conducted a broiler trial on behalf of Supreme Chickens and a second trial is pending.

Prof. De Waal is also the project manager of the Northern Cape IDC Nguni Development Project. 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. There are about 153 Nguni's involved in the project. The cattle were purchased from the Kalahari Nguni Club with money granted to the project by the IDC.

First-time farmers are selected to take part in the project and they receive ten cows in calf and two stud bulls. The farmers receive training and guidance in aspects such as veld management, animal health and meat management. The cattle are the property of a trust for five years. When the farmers completed their training after five years, the animals become theirs. They have to return ten registered cows and two bulls to the IDC as these animals are then passed on to the next first-time farmers.

To maintain the active research programme, external funding from different national and international institutions is of the utmost importance. Here the National Research Foundation (NRF), Cape Mohair & Wool, the NWGA, Alexander Forbes, Meadow Feeds, Voermol, the Central Research Fund of the UFS, the National Lucerne Organisation and the May and Stanley Smith Charitable Trust, amongst others, played a pivotal role.

Research highlights include a study to determine the small-scale habitat and feeding preference of springbok, blesbok and black wildebeest as the fencing of small areas and stocking them with game species is becoming a common tendency in South Africa. Seasonal variation in the natural pasture utilisation was demonstrated with a larger number of certain plant species being used during the rainy season. A seasonal trend in root distribution and root:shoot ratio was also recorded, demonstrating that maintaining grassland in good condition ensures greater utilisation of plant-available water.

A study on the restoration of degraded natural pastures on game-managed areas of the Free State and possible rehabilitation techniques to be implemented was undertaken. In the field of Grassland Science, the production, adaptability and distribution of two tasty and dominant Karoo bushes is being investigated. This involves above- and underground development and production – an aspect that could have great application in the sustainable utilisation of the Karoo vegetation ecosystem.

In the discipline of Animal Nutrition, acceptable egg shell quality in layers was obtained, irrespective of the limestone



The UFS, in conjunction with the University of Stellenbosch (US) and the Institute for Animal Production, hosted Dr Arthur Gilmour, well-known biometrician from New South Wales, Australia. Dr Gilmour presented a two-day workshop at the UFS on the application of Arthur's Restricted Maximum Likelihood (ASREML) to common animal breeding problems. ASREML is a software programme suitable for the estimation of genetic and environmental variances and co-variances in animal breeding, amongst other things, and is the preferred software package for animal breeding experimentation. The workshop was attended by postgraduate students and researchers in animal breeding from different universities. At the workshop are, from the left: Dr Gilmour, Ms Puleng Matebesi, M.Sc. student at the UFS, Profs Japie van Wyk, Divisional Head of Animal Breeding at the department and one of the organisers of the workshop, Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS, and Frikkie Naser, Lecturer at the department's Animal Breeding Division.



Prof. H.O. de Waal (left) and Dr Luis Schwalbach (second from the right) with some of the farmers involved in the Northern Cape IDC Nguni Development Project.



Prof. Johan Greyling, Departmental Chairperson, (second from the right) was the main judge in the Voermol Cattle and Sheep Farmer of the year competition.

(CA⁺⁺) source, particle size and/or distribution ratios. Adequate Ca is the most determining factor affecting shell quality. Large limestone particles are however important to ensure increased tibia bone breaking strength in high-producing hens. The cactus pear (*Opuntia*) was evaluated as feed supplementation during period of feed shortages. In a study on sheep it was found that the ADG and changes in live body weight decreased slightly over time (63 days) as the inclusion increased – possibly restricting its potential use.

The effect of different inclusion levels of mono-, poli-unsaturated and saturated fatty acids in the feed on the production (growth) and carcass quality of broilers was investigated. Preliminary results show the diet composition to have an effect on the carcass quality and consumer acceptability.

Other pioneer research is being done in the field of in vitro embryo production in cattle, multi-ovulation and embryo transfer in goats and interspecies cloning in game. These are all techniques aimed at accelerating genetic progress and the possible preservation of endangered species.

Regarding animal breeding, one of the projects addressed was the genetic and phenotypic characterisation of indigenous chickens in Ethiopia, with the growth and

egg production performance of native and exotic chickens also being investigated. In livestock and specifically the dairy industry, the genotype by environmental interaction for milk production in the South African Jersey population was also determined. Animal breeding is on the brink of a new era where information from traditional breeding value estimation will be combined with molecular genetic information of an animal in order to provide the animal with a more accurate breeding value.

Community service and involvement form a particular pillar of strength in the department. Projects in the Thaba Nchu and Kaalspruit areas were again maintained. The team of Prof. Greyling, Dr Schwalbach, Ms Lehloenyia and Mr De Witt facilitated small-scale egg production in the rural areas, together with broiler production at black schools for the handicapped. These actions would not have been possible without the financial support of Alexander Forbes (Johannesburg).

Other agricultural community service activities included the training of upcoming small-scale livestock farmers in basic husbandry skills in Bothaville by Prof. De Waal and Dr Schwalbach, and cattle and sheep AI courses were conducted in conjunction with the Glen Agricultural Development Institute by Prof. Greyling, Dr Schwalbach and Ms Lehloenyia.

Staff

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

Professors Extraordinary: Profs Amie Aucamp, Schalk Cloete, James Hayes, Nadia Loskutoff, Machiel Scholtz

Associate Professors: Prof. H.O. de Waal

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

Lecturers: Messrs Foch de Witt, Mike Fair, Paul Malan, Ms Khoboso Lehloenyia

Junior Lecturer: Mr Ockert Einkamerer

Professional Officer: Mr Gideon Janse van Rensburg

Technician: Mr Willie Combrinck

Senior Officer: Ms Hester Linde

Senior Typist: Ms Linda Nel

Typist: Ms Revenna Barnard

Assistant Officer: Ms Cristina Schwalbach

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Research outputs

Research articles

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Conference contributions

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- Avenant, P.L., Fouche, H.J. & Snyman, H.A.** 2007. *Influence of late-seasonal frost on Opuntia spp. in a semi-arid climate of South Africa*. Paper presented at the VI International Conference on Cactus Pear and Cochineal and the VI General Meeting of the FAO-CACTUSNET, João-Pessoa, Brazil. 22-26 October.
- Bahlmann, M., Smit, G.N. & Oosthuizen, I.B.** 2007. *Diet preferences of Black rhinoceros (Diceros bicornis) in the Marakele Park, Limpopo Province - Provisional results*. Poster presented at the South African Wildlife Management Association Symposium (SAWMA), Didima, Drakensberg, South Africa. 18-21 September.
- Cloete, S.W.P., Van Wyk, J.B. & Olivier, J.J.** 2007. *Divergent selection for reproduction - genetic parameters and genetic change*. Poster presented at the 58th Annual Meeting of the European Association for Animal Production (EAAP), Dublin, Ireland. 26-29 September.
- De Witt, F.H., Van der Merwe, H.J., Fair, M.D. & Greyling, J.P.C.** 2007. *Influence of limestone particle size on egg production and eggshell characteristics during early lay*. Poster presented at the 58th Annual Meeting of the European Association for Animal Production (EAAP), Dublin, Ireland. 26-29 September.
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- Einkamerer, O.B., De Waal, H.O. & Combrinck, W.J.** 2007. *Water intake and water excreted in faeces and urine by sheep on Opuntia diets*. Poster presented at the VI International Conference on Cactus Pear and Cochineal and the VI General Meeting of the FAO-CACTUSNET, João-Pessoa, Brazil. 22-26 October.
- Einkamerer, O.B., De Waal, H.O., Combrinck, W.J. & Fair, M.D.** 2007. *Apparent digestibility, daily gain and changes in live body weight of sheep on Opuntia diets*. Poster presented at the VI International Conference on Cactus Pear and Cochineal and the VI General Meeting of the FAO-CACTUSNET, João-Pessoa, Brazil. 22-26 October.
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- Greyling, J.P.C., Bester, N., Schwalbach, L.M.J., Van der Merwe, H.J. & Fair, M.D.** 2007. *The effect of different dietary energy levels on fat accumulation and distribution in young replacement Dorper rams*. Poster presented at the 58th Annual Meeting of the European Association for Animal Production (EAAP), Dublin, Ireland. 26-29 September.
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- Janecke, B.B. & Smit, G.N.** 2007. *The effect of seasonal changes in woody vegetation on the foraging behaviour of herbivore game species, central Free State*. Paper presented at the South African Wildlife Management Association Symposium (SAWMA), Didima, Drakensberg, South Africa. 18-21 September.
- Janecke, B.B., Smit, G.N. & Van Wyk, P.W.J.** 2007. *The application of scanning electron microscope technology in the identification of mammal species from hair remains in leopard scats*. Paper presented at the South African Wildlife Management Association Symposium (SAWMA), Didima, Drakensberg, South Africa. 18-21 September.
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- Malan, P.J.** 2007. *Vegetative propagation of some Karoo shrubs*. Poster presented at the Arid Zone Ecology Forum, Sutherland, South Africa. 10-13 September.
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- Oliver, S.Z. & Smit, G.N.** 2007. *The influence of different cutting heights of tall, under utilized grassland on the habitat selection of herbivore game species in the central Free State*. Poster presented at the South African Wildlife Management Association Symposium (SAWMA), Didima, Drakensberg, South Africa. 18-21 September.
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- Schwalbach, L.M.J., Greyling, J.P.C. & Lehloeny, K.C.** 2007. *The efficacy of Neem (Azadirachta indica) seed extracts for flea control in goats*. Paper presented at the 58th Annual Meeting of the European Association for Animal Production (EAAP), Dublin, Ireland. 26-29 September.
- Smit, G.N.** 2007. *Rare and endemic Acacia species from South Africa*. Paper presented at the Joint 42nd Annual Grassland Society of Southern Africa (GSSA) Congress and 4th Annual Thicket Forum Meeting 21st Century Challenges: Range, Forage and Thicket, Rhodes University, Grahamstown, South Africa. 16-20 July.
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- Snyman, H.A.** 2007. *In situ rooting profiles of Opuntia spp.* Poster presented at the VI International Conference on Cactus Pear and Cochineal and the VI General Meeting of the

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Snyman, H.A. 2007. *Water stress and root growth of Opuntia spp.* Poster presented at the VI International Conference on Cactus Pear and Cochineal and the VI General Meeting of the FAO-CACTUSNET, João-Pessoa, Brazil. 22-26 October.

Snyman, H.A. 2007. *Water-use efficiency of Opuntia spp.* Poster presented at the VI International Conference on Cactus Pear and Cochineal and the VI General Meeting of the FAO-CACTUSNET, João-Pessoa, Brazil. 22-26 October.

Van Niekerk, D.J., Neser, F.W.C. & Van der Westhuizen, J. 2007. *Investigation into the possibility of a GXE in the South African Jersey Population.* Poster presented at the 58th Annual Meeting of the European Association for Animal Production (EAAP), Dublin, Ireland. 26-29 September.

Zeeman, D.C., De Waal, H.O. & Combrinck, W.J. 2007. *Wet faeces produced by sheep on diets with sun-dried and coarsely ground Opuntia ficus-indica cladodes.* Poster presented at the VI International Conference on Cactus Pear and Cochineal and the VI General Meeting of the FAO-CACTUSNET, João-Pessoa, Brazil. 22-26 October.



During a meeting of the Northern Cape IDC Nguni Development Project's board of trustees in Kimberley are, from the left: Mr Tommy Mohajane, from the IDC and Chairperson of the trust, Ms Jacqui Maisela, Department of Agriculture and Land Reform in the Northern Cape and Vice-Chairperson of the trust, Ms Phiwe Marumo, from the IDC and a trustee, and Prof. H.O. de Waal, Associate Professor at the Department of Animal, Wildlife and Grassland Sciences at the UFS and project manager of the Northern Cape IDC Nguni Development Project.



Prof. Sakkie Pretorius

Department of Plant Sciences

Overview

The Department of Plant Sciences consists of the disciplines Botany, Plant Breeding and Plant Pathology. Genetics, a former division of Plant Sciences, gained independence as a full academic department in 2007.

Staff members in Plant Sciences participated and excelled in a range of scientific activities, including plant taxonomy, ecology, palynology, physiology, algal biotechnology, conventional and molecular plant breeding, mycology and applied plant pathology. Profs Rudi Verhoeven, Maryke Labuschagne and Wijnand Swart served as subject heads for the respective disciplines. Mr Robert Lentsoane was the Botany head at the Qwaqwa campus.

In **Botany** Ms Lize Joubert received the award for best presentation by an M.Sc. student at the annual postgraduate symposium of the University of Johannesburg and Ms Caroli de Waal received one of two nationally awarded scholarships of the South African Association of Botanists (SAAB).

Prof. Johan Grobbelaar, a senior professor in the department, was invited as a panel member of a bio fuel mini-symposium at the congress of the International Society for Marine Biotechnology in Eilat, Israel. At the 30th Congress of the International Association of Theoretical and Applied Limnology, Montreal, Canada, Prof. Grobbelaar received the SIL flag and confirmation that he is the organiser of the 31st congress in Cape Town in 2010.

Prof. Grobbelaar also visited Marion Island with a group of 45 researchers from South Africa, Germany, Sweden, Malaysia, Australia, New Zealand and Switzerland. The aim of the visit, coordinated by Prof. Valdon Smith of the University of Stellenbosch, was to investigate the fresh waters of the island. Only a small group of countries, including South Africa, work in the Antarctic region. The importance of Marion Island in this region is emphasised by the fact that a new research station of R230 million is being built on the island. Marion is the larger of two islands collectively known as the King Edward Islands. It is about 17 km wide and 23 km long and situated 1 770 km south-east of Port Elizabeth on the Antarctic convergence. From 1971 to 2007 the average temperature on the island increased by 1.5°C.

Prof. Bruno Moerschbacher, Mss Jenni Moldenhauer, Uschi Beike and Sabine Fehser from the Institute of Plant Biochemistry and Biotechnology at Münster University in Germany, visited the

department in January to discuss joint research projects. Prof. Moerschbacher and Ms Moldenhauer presented papers at congresses of SAAB and the Southern African Society for Plant Pathology (SASPP).

Dr Brian Chase, from the University of Oxford in the United Kingdom (UK), visited Prof. Louis Scott regarding a project on fossil pollen of the Namib region. Other visitors to Prof. Scott's laboratory included Dr Carlos Cordova from the University of Oklahoma in the United States of America (USA) (plant phytolith distribution in South Africa) and Mr Martin Finné, Stockholm University, Sweden (fossil and modern grass phytoliths of the Braamhoek wetland).

Dr Frank Neumann continued his work as a postdoctoral fellow on the palynological examination of a borehole core from Verlorenvlei, Western Cape. The core, spanning approximately 2 000 years, has already been dated by the radiocarbon and lead dating methods by Prof. Curt Stager of Paul Smith's College in New York, USA. Prof. Stager also provided geochemical data and an analysis of diatoms in the core. This research will reveal climate change, palaeo ecological developments and human impact in and around the lake. Prof. Scott visited the Okavango and Ngami Lake in Botswana where cores were collected for pollen analyses.

Dr Johann du Preez was appointed as focus group leader for the "Management of aquatic ecosystems in water-scarce areas" in the "Water management in water-scarce areas" cluster of the UFS. In addition, Dr Du Preez was a member of a task team assessing in-stream flow requirements of the Lesotho Highlands Water Project and participated in a project of the Department of Water Affairs and Forestry to compile a comprehensive ecological reserve for the Sabi River. He also served on the steering committee of the Department of Environmental Affairs and Tourism, tasked with compiling a biodiversity plan for the Free State.

The department's taxonomists, Prof. Johan Venter, Dr Andor Venter and Ms Lize Joubert, travelled to Europe and the UK where they visited herbariums in Zürich, Geneva, Paris, Brussels, Leiden and London. These herbariums possess important specimens collected in the 18th and 19th centuries in Africa and Asia. The highlight was a visit to the Linnaean Society in Burlington House near Piccadilly Circus in London, where the

Linnaeus collection was viewed. Linnaeus, the Father of Taxonomy, was a professor of Biology at Uppsala University in Sweden in the 18th century. He not only described more than 6 000 new plants, but also many animals. Linnaeus' main and lasting contribution to botany was the binomial system of naming plants which he introduced in his publication, *Species Plantarum*, in 1753. In his own words: "If you do not know the name of things, the knowledge of them is lost." This statement remains valid, especially as conservation of biodiversity, which is impossible without correct nomenclature, is very much a 21st-century issue. Linnaeus' books and collection of plant, animal and rock specimens are maintained by the Linnaean Society of London.

In 2007, 42 students were registered for postgraduate studies in **Plant Breeding**. Following this sustained increase in student numbers, the division now has five lecturers. Prof. Charl van Deventer, Drs Liezel Herselman, Barbara Mashope, and Elizma Koen attended and presented papers at international conferences in China, the USA, Brazil, Australia and the Netherlands.

Prof. Labuschagne visited Malawi regarding a research agreement on cassava starch as well as Zimbabwe and Sudan to follow up on postgraduate research projects. Three Ph.D. students, who are part of the Generation Challenge Programme of the Rockefeller Foundation, joined the division in 2007. Due to her active involvement in the training of plant breeders in Africa, the Foundation invited Prof. Labuschagne to their "Biotechnology, Breeding and Seed Systems for African Crops" research meeting in Mozambique.

Eighteen manuscripts were published or accepted for publication by the division during 2007 and a successful and well-attended Plant Breeding training course was presented. Prof. Labuschagne was elected as the South African representative for the American Association for Cereal Chemists (AACC) and as board member of the South African Cereal Science and Technology Association.

A technology award of the South African National Research Foundation Thrust for Industry-Related Projects (THRIP) was presented by the National Department of Trade and Industry to the university's Centre for Plant Health Management (CePHMa) at a prestige function held at the Nelson Mandela Metropolitan University in Port



Biologists participating in the excursion to Marion Island. At the back, second from the right is Prof. Valdson Smith, from the University of Stellenbosch, and to his right is Prof. Johan Grobbelaar from the department.



Students collecting fungi at Hogsback in the Eastern Cape.



Postgraduate students in Plant Breeding, who are part of the Generation Challenge Programme of the Rockefeller Foundation, pictured here with Prof. Maryke Labuschagne (middle).



The Centre for Plant Health Management (CePHMa) in the department hosted visitors from the Virginia Cooperative Extension Agents and Virginia Tech's College of Agriculture and Life Sciences in the United States of America (USA). Opportunities to establish cooperative research, training, outreach programmes and student exchange activities in southern Africa were discussed among other things. From the left, are: Prof. Sakkie Pretorius, Departmental Chairperson, Mr Matthew Lewis, Virginia Cooperative Extension, Ms Mary Ann Hansen, Virginia Tech, Prof. Wijnand Swart, Chairperson of CePHMa, Ms Robyn Whittington, Virginia Cooperative Extension, Prof. Schalk Louw, Department of Zoology and Entomology, UFS, Prof. Erik Stromberg, Virginia Tech, Dr James Allemann, Department of Soil, Crop and Climate Sciences, UFS, Mr David Moore, Virginia Cooperative Extension, and Prof. Neal McLaren, from the department.

Elizabeth. The award is in recognition of research work undertaken by Profs Wijnand Swart, Maryke Labuschagne and Schalk Louw on kenaf, a fibre crop with many industrial applications. Research was conducted in conjunction with Sustainable Fibre Solutions, a South African-based company.

In **Plant Pathology**, Prof. Swart is leader of a Research Niche Area (RNA) of the National Research Foundation (NRF), namely "The development of sustainable crop value chains for staple and underutilised crops in the semi-arid regions of southern Africa". Research within this RNA investigates ways to pro-actively apply ecological principles in order to develop value chains for staple crops and underutilised plants that are tolerant to sub-optimal environmental conditions. As part of a UFS initiative to align and fund research, Prof. Swart serves as coordinator for the cluster "Technologies for sustainable crop industries in semi-arid regions". In November he delivered an invited keynote address entitled: *Strategies for the management of cactus pear diseases: A global perspective*, at the VI International Conference on Cactus Pear and Cochineal and the VI General Meeting of the FAO-CACTUSNET, João-Pessoa, Brazil. He

was elected as liaison officer for *Opuntia*-related research in southern Africa as well as Associate Editor: Plant Pathology on the editorial board of the *Journal of the Professional Association for Cactus Pear Development*.

The Mexican Ambassador, Ambassador Luis Cabrera and deputy head of the Mexican Embassy in South Africa, Chancellor Miguel Malvañón, met with cactus pear researchers at the UFS. Developments concerning the memorandum of understanding between CePHMa and the University of Chapingo in Mexico were also discussed.

Prof. Neal McLaren presented and co-authored several presentations at the congress of the Southern African Society for Plant Pathology. In addition, he presented a paper to the Soilborne Diseases Interest Group organised by the Plant Protection Research Institute of the Agricultural Research Council (ARC) in Stellenbosch. As epidemiologist Prof. McLaren continued his research on rust and Sclerotinia stem rot of soybeans (with support from the Protein Research Fund [PRF]), and sorghum grain mould, mycotoxins and general disease management (supported by the Sorghum Trust).

He was invited to serve as regional editor for the *Asian Journal of Plant Pathology* and linkages between the UFS and Virginia Tech in the USA were strengthened when Prof. McLaren accompanied a group of Virginia Tech agricultural extension agents on a tour to Bethlehem, Cedara, Greytown and the University of KwaZulu-Natal. In a reciprocal exchange he visited Virginia Tech with the aim of improving research ties. He also received Dr Gary Peterson from Texas A&M Extension Services, for a visit to discuss collaborative research of the International Sorghum and Millet Research Support Programme (INTSORMIL) and Dr John Leslie from Kansas State University, about Fusarium research.

Fusarium research was improved by the addition of a new West Campus field facility for wheat head blight experimentation. Ms Wilmarie Kriel established a 0.25 hectare field plot, covered by shade netting and fitted with mist-irrigation, for initiating and promoting head blight epidemics. This facility allowed detailed comparisons among leading wheat cultivars for head blight response and yield loss in 2007. As part of the undergraduate teaching programme she accompanied mycology students on an informative and enjoyable excursion to Hogsback where

the forests yielded many interesting fungal species. She also attended the Soilborne Diseases workshop in Stellenbosch.

Prof. Sakkie Pretorius, Departmental Chairperson, participated in the assessment of South African and international wheat germplasm for resistance to stem rust, in particular race TTKS (Ug99), in Kenya. He continued his annual evaluation of South African wheat cultivars and lines of resistance to rust diseases. This included detailed comparisons using different

racess as well as field testing in KwaZulu-Natal. In collaboration with Dr Renée Prins of CenGen, their research on the genetics of rust resistance, funded by the Winter Cereal Trust, focused on the improvement of gene mapping in a doubled haploid wheat population. Prof. Pretorius addressed plant breeders from Pannar on durable disease resistance in crops and hosted Prof. Robert Park from the University of Sydney in Australia on a brief visit to South Africa.



The Mexican Ambassador, Ambassador Luis Cabrera and deputy head of the Mexican Embassy in South Africa, Chancellor Miguel Malvañon visited the faculty. Possibilities for collaboration between the faculty and similar faculties at universities in Mexico were some of the topics that were discussed. The Ambassador also met with cactus pear researchers at the UFS and developments concerning the memorandum of understanding which was signed last year between the Centre for Plant Health Management (CePHMa) at the UFS and the University of Chapingo in Mexico, were also discussed. Here are, from the left, front: Ambassador Cabrera and Prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS; back: Chancellor Malvañon and Prof. Wijnand Swart, Chairperson of CePHMa.

Research outputs

Research articles

Allemann, J. & Swart, W.J. 2007. Cropping systems for indigenous vegetables: An ecological perspective. *Acta Horticulturae* 752: 615-620.

Assefa, A. & Labuschagne, M.T. 2007. Variability among barley landraces in response to waterlogging stress. *South African Journal of Plant and Soil* 24(4): 192-196.

Assefa, A., Labuschagne, M.T. & Viljoen, C.D. 2007. AFLP analysis of genetic relationships between barley (*Hordeum vulgare* L.) landraces from north Shewa in Ethiopia. *Conservation Genetics* 8(2): 273-280.

Blodgett, J.T., Swart, W.J., Louw, S.VdM. & Weeks, W.J. 2007. Soil amendments and watering influence the incidence of endophytic fungi in *Amaranthus hybridus* in South Africa. *Applied Soil Ecology* 35(2): 311-318.

Carrión, J.S., Scott, L., Arribas, A., Fuentes, N., Gil Romera, G. & Montoya, E. 2007. Pleistocene landscapes in Central Iberia inferred from pollen analysis of hyena coprolites. *Journal of Quaternary Science* 22(2): 191-202.

Craven, M., Barnard, A. & Labuschagne, M.T. 2007. The effect of glyphosate applica-

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

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

Senior Lecturers: Drs Johan du Preez, 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, Messrs Hendri Pretorius, Koos van der Heever

Administrative and Support

Staff: Mss Sadie Geldenhuys, Suzine Uys, Erna van Deventer, Zelda van der Linde, Hilda Dlamini, Lilian Molos, Messrs Gerald Moshodi, Dirk Jansen, Petrus Foko, Simon Pheneti, Magdonald Moreki

Qwaqwa Campus:

Lecturers: Dr Erwin Sieben, Ms Joyce Moloi, Mr Robert Lentsoane
Junior Lecturer: Mr Raymond Pitso

Research Fellow: Prof. Rodney Moffett

Assistants: Messrs Ngaka Mzizi, Pheello Mojau

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A project of the Centre for Plant Health Management (CePHMa) in the department won a 2007 Technology Award presented by the National Department of Trade and Industry at the Nelson Mandela Metropolitan University in Port Elizabeth. The award is in recognition of the groundbreaking research work undertaken by the UFS on kenaf, a South African commercial fibre crop used in the automotive industry, amongst others. The research was initiated at the UFS six years ago in collaboration with the British company Sustainable Projects Development Group (SPDG) and is presently continued with the South African company Sustainable Fibre Solutions (SFS). At the awards ceremony are, from the left: Profs Wijnand Swart, Maryke Labuschagne and Schalk Louw.

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Botha, C. & McLaren, N.W. 2007. *Evaluation of the inoculation techniques for Sclerotinia sclerotiorum on soybeans*. Paper presented at the 45th Congress of the Southern African Society for Plant Pathology (SASPP), Benoni, South Africa. 21-24 January.

Botha, C.F., Du Preez, P.J. & Scholtz, N. 2007. *Plant communities on the uranium ore bodies of the Rystkuil-channel section of the Karoo Uranium Province, Beaufort West District*. Paper presented at the 33rd Annual Conference of the South African Association of Botanists (SAAB), Cape Town, South Africa. 14-18 January.

Chase, B.M., Gil Romera, G., Marais, E., Meadows, M.E., Scott, L., Sealy, J., Thomas, D.S.G. & Pazdur, A. 2007. *Developments in the use of rock hyrax middens as southern African palaeoenvironmental archives*. Poster presented at the XVII Congress of the International Union for Quaternary Research (INQUA): The Tropics - Heat Engine of the Quaternary, Cairns, Australia. 28 July - 3 August.

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Grobbelaar, J.U. 2007. *Algal Biotechnology: Bridging the gap between basic and applied research*. Paper presented at the 33rd Annual Conference of the South African Association of Botanists (SAAB), Cape Town, South Africa. 14-18 January.

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Grobbelaar, J.U. 2007. *Some chemical and biological properties of glacial lakes on the Subantarctic Island Marion, comparing data spanning 35 years*. Paper presented at the 30th Congress of the International Association of Theoretical and Applied Limnology, Montreal, Canada. 12-18 August.

Herselman, L., Phillipou, O.A., Pretorius, Z.A. & Prins, R. 2007. *The effectiveness of targeted bulk segregant analysis to identify AFLP markers closely linked to QTL for adult plant stripe rust resistance in wheat*. Poster presented at the 2nd International Conference on Plant Molecular Breeding (ICPMB), Sanya City, Hainan, China. 23-27 March.

- Janse van Rensburg, B., Flett, B.C., McLaren, N.W. & McDonald, A.H.** 2007. *Sources of variation in detection of fumonisins in maize samples*. Poster presented at the 45th Congress of the Southern African Society for Plant Pathology (SASPP), Benoni, South Africa. 21-24 January.
- Janse van Rensburg, B., Flett, B.C., McLaren, N.W. & McDonald, A.H.** 2007. *Variation in the identification of Fusarium spp. on maize samples due to enumerator*. Poster presented at the 45th Congress of the Southern African Society for Plant Pathology (SASPP), Benoni, South Africa. 21-24 January.
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- Koen, E., Lichakane, M. & Labuschagne, M.T.** 2007. *The evaluation and characterisation of South African wheat cultivars for temperature stress tolerance*. Poster presentation at the Australian Centre for Plant Functional Genomics (ACPGF) 2007 Genomics Symposium: The Genomics of Drought, Adelaide, Australia. 22-24 October.
- Komen, J.S. & Pretorius, Z.A.** 2007. *Fungicide efficacy for wheat stem rust control*. Paper presented at the 45th Congress of the Southern African Society for Plant Pathology (SASPP), Benoni, South Africa. 21-24 January.
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- Labuschagne, M.T.** 2007. *Gluten and starch in wheat: Current status in research at the UFS*. Invited presentation at the Cereal Science and Technology (CST-SA) Workshop: From breed to bread, ARC Small Grains Institute, Bethlehem, South Africa. 5 July.
- Levin, R.A., Shak, J.R., Miller, J.S., Bernadello, G. & Venter, A.M.** 2007. *Evolutionary relationships in tribe Lycieae (Solanaceae)*. In *Genomics meets biodiversity: Proceedings of the Sixth International Solanaceae Conference*, edited by D.M. Spooner, L. Bohs, J. Giovannoni, R.G. Olmstead & D. Shibata. Drukkerij Van Damme-Beke, Brugge, Belgium. pp. 225-239.
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- Lukonge, E.P., Herselman, L. & Labuschagne, M.T.** 2007. *Genetic diversity of Tanzanian cotton (Gossypium hirsutum L.) as revealed by AFLP analysis*. Poster presentation at the World Cotton Research Conference (WCRC-4), Lubbock, Texas, USA. 10-14 September.
- Mashope, B.K., Labuschagne, M.T. & Potgieter, J.P.** 2007. *Fruit quality of South African cactus pear varieties*. Poster presented at the VI International Conference on Cactus Pear and Cochineal and the VI General Meeting of the FAO-CACTUSNET, João-Pessoa, Brazil. 22-26 October.
- McLaren, N.W.** 2007. *Evaluation of soybean cultivars for resistance to sclerotinia stalk rot*. Paper presented at the 45th Congress of the Southern African Society for Plant Pathology (SASPP), Benoni, South Africa. 21-24 January.
- Moldenhauer, J., Van der Westhuizen, A.J., Pretorius, Z.A. & Moerschbacher, B.M.** 2007. *Microscopic studies on stripe rust-infected doubled haploid wheat lines derived from a cross Kariaga x Avocet S*. Paper presented at the 33rd Annual Conference of the South African Association of Botanists (SAAB), Cape Town, South Africa. 14-18 January.
- Moldenhauer, J., Van der Westhuizen, A.J., Pretorius, Z.A. & Moerschbacher, B.M.** 2007. *Microscopic studies on stripe rust-infected doubled haploid wheat lines derived from a cross Kariaga x Avocet S*. Paper presented at the 45th Congress of the Southern African Society for Plant Pathology (SASPP), Benoni, South Africa. 21-24 January.
- Moloi, M.J. & Van der Westhuizen, A.J.** 2007. *Involvement of nitric oxide during the Russian wheat aphid resistance*. Paper presented at the 33rd Annual Conference of the South African Association of Botanists (SAAB), Cape Town, South Africa. 14-18 January.
- Neumann, F., Stager, C. & Scott, L.** 2007. *Holocene vegetation history at lake Sibaya*. Paper presented at the Southern African Society for Quaternary Research (SASQUA) XVII Biennial Congress, Umgeni Valley Nature Reserve, Howick, South Africa. 11-13 April.
- Norström, E., Scott, L. & Partridge, T.C.** 2007. *Vegetation changes at Braamhoek wetland, South Africa, during the last ~15 000 years BP, with focus on the Pleistocene-Holocene transition*. Poster presented at the Southern African Society for Quaternary Research (SASQUA) XVII Biennial Congress, Umgeni Valley Nature Reserve, Howick, South Africa. 11-13 April.
- Parau, J.V., McLaren, N.W., Van Wyk, P.W.J., Louw, S.VdM. & Van den Berg, J.** 2007. *Predisposition of sorghum grains to grain mold pathogens by panicle feeding insects*. Poster presented at the 45th Congress of the Southern African Society for Plant Pathology (SASPP), Benoni, South Africa. 21-24 January.
- Potgieter, J.P. & Mashope, B.K.** 2007. *Cactus pear germplasm conservation in South Africa*. Keynote address presented at the VI International Conference on Cactus Pear and Cochineal and the VI General Meeting of the FAO-CACTUSNET, João-Pessoa, Brazil. 22-26 October.
- Pretorius, Z.A., Bender, C.M., Boshoff, W.H.P., Komen, J.S. & Snyman, L.** 2007. *Recent pathogenic adaptations in wheat rust fungi in South Africa*. Paper presented at the 45th Congress of the Southern African Society for Plant Pathology (SASPP), Benoni, South Africa. 21-24 January.
- Pretorius, Z.A., Bender, C.M., Prins, R. & McLaren, N.W.** 2007. *Phenotyping of a doubled-haploid wheat population for stripe rust infection*. Paper presented at the 45th Congress of the Southern African Society for Plant Pathology (SASPP), Benoni, South Africa. 21-24 January.
- Seaman, M.T., Avenant, M.F., Armour, J., Barker, C.H., Dollar, E., Du Preez, P.J., Hughes, D., King, J.M., Rossouw, L., Van Tonder, G. & Watson, M.** 2007. *Environmental water requirements (EWRs) in non-perennial systems - The Seekoei River example*. Poster presented at the 10th International River Symposium and International Conference on Environmental Flows, Brisbane, Australia. 3-6 September.
- Swart, W.J.** 2007. *Strategies for the management of cactus pear diseases: A global perspective*. Invited keynote address presented at the VI International Conference on Cactus Pear and Cochineal and the VI General Meeting of the FAO-CACTUSNET, João-Pessoa, Brazil. 22-26 October.
- Swart, W.J. & Allemann, J.** 2007. *Cropping systems for indigenous vegetables: An ecological perspective*. Proceedings of the First International Conference on Indigenous Vegetables and Legumes, International Society for Horticultural Science (ISHS), Ghent, Belgium. 22 May. *Acta Horticulturae* 752(623): 615-620.
- Tesfaendrias, M.T., McLaren, N.W. & Swart, W.J.** 2007. *The effect of grain mould fungi on sorghum malt quality and its management during malting*. Poster presented at the Southwestern Ontario Region of the Canadian Phytopathological Society (SORA-CPS) Meeting, Guelph Turfgrass Institute, Ontario, Canada. 11 May.
- Visser, D.D., Caldwell, P.M. & McLaren, N.W.** 2007. *Studies on the control of Sclerotinia sclerotiorum on soybeans*. Paper presented at the 45th Congress of the Southern African Society for Plant Pathology (SASPP), Benoni, South Africa. 21-24 January.



Prof. Chris du Preez

Department of Soil, Crop and Climate Sciences

Overview

Over the past few years the Department of Soil, Crop and Climate Sciences has shown growth not only in its number of undergraduate students, but also in the number of postgraduate students. In 2007, 24 masters and 16 doctoral students were enrolled. Approximately 40% of these students came from countries like Eritrea, Ethiopia, Kenya, Lesotho, Mauritius, Mozambique, Namibia, Swaziland and Zimbabwe. Seven master's and six doctoral students graduated during the year.

Students and staff presented their research at various national and international conferences. Dr Elmarie van der Watt received the Board Floating Trophy of the South African Society of Crop Production for the best paper presented by a member of the society at the Combined Congress of the South African Society of Crop Production, the Soil Science Society of South Africa and the Southern African Society for Horticultural Sciences, Aventura, Badplaas. Her paper dealt with a bio-stimulant that is now commercially available following extensive research and development work conducted under contract for Agraforum.

At the same congress Dr Sebo Molete received an award from the Soil Science Society of South Africa for the best article on soil science in the *South African Journal of Plant and Soil*. Her article entitled: *Retention of applied phosphorus by the benchmark soils of Lesotho and quantification of their phosphorus retention indices* evolved from her doctoral thesis and was co-authored by Prof. Chris du Preez, Departmental Chairperson, and Dr Vincent Marake. Mr Johan van Tol was awarded for the best presentation by a young member at the congress of the South African National Committee for the International Association of Hydrology Sciences. His paper dealt with pedofeatures as indicators of hillslope hydrology.

Mr Angelo Mockie resigned as assistant professional officer and Mr Wilhelm Hoffman was appointed in his place. Staff acted as external examiners for other universities, evaluated articles for scientific magazines, served on steering committees of research projects, etc.

Dr Cornie van Huyssteen was elected Vice-President of the Soil Science Society of South Africa. He also served as Vice-Chairman of the South African Soil Survey Society. Prof. Sue

Walker was a council member of the South African Society of Crop Production.

Dr Piet le Roux visited Italy for a workshop on invitation from the Joint Research Commission of the European Soil Bureau Network. Ideas were exchanged on the publication of a Soil Atlas for Africa.

Prof. Du Preez was a member of a panel evaluating researchers for an award by the International Fertilizer Association in Paris, France for the fifth consecutive time. 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. The Directorate Land Use and Soil Management of the national Department of Agriculture appointed him to a team dealing with a soil protection strategy and policy for South Africa.

The World Meteorological Organisation has a Commission of Agricultural Meteorology that works through various programmes. Prof. Walker is the chairperson of the programme focusing on *Agrometeorological services for agricultural production*. A meeting of the implementation co-ordination team was held in Hanoi, Vietnam. Various aspects relating to agrometeorological services were discussed. These included training and education, and requirements for developing farm-level strategies to make specific proposals for applications to agriculture, forestry and fisheries as well as opportunities to raise awareness about such services. Work on these and other projects will continue in a collaborative way until the next meeting of the commission to be held in 2010.

Prof. Leon van Rensburg attended a workshop at the University of Viçosa in Brazil. The aim of the workshop was to prepare a research protocol entitled: *Beyond conservation agriculture: A science program on the transition from promised to practice* and to establish working relations between researchers of universities from Brazil, the Netherlands and South Africa who will participate in this project.

Two short training courses were arranged by the Agrometeorology section during 2007. The first was on *Seasonal forecasting*, presented by Prof. Willem Landman of the South African Weather Service. The second course dealing with *On-farm decision making* was presented under contract to the national

Department of Agriculture's Directorate Agricultural Risk and Disaster Management and presented by staff from the department. Participants from various provincial departments of agriculture learned about a range of practical topics such as seasonal forecasting, fire indices and short and long term forecasts to make advisories for farmers.

Research in the department is aimed at various aspects of the soil-crop-atmosphere system. Approximately R2.2 million was spent on research in 2007, 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), the Water Research Commission (WRC), the Protein Research Trust (PRT), New York Botanical Gardens, Omnia Fertilizer Ltd. and AgraForUm.

Weed Science research by Drs James Allemann and Gert Ceronio concerning the effect of the herbicide alachlor on the commercially available sunflower cultivars is continuing. A new Weed Science laboratory has recently been completed, which will enable more in-depth studies into the effects of herbicides to be conducted. The morphology laboratory was also refurbished during the year. These changes will allow a greater depth of research to take place within agronomy and horticulture.

Prof. Seef Pretorius' team 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 fruits, vegetables and field crops, development of alternative crops and enhancement of systemically induced resistance of crop plants towards biotic and abiotic stress factors.

To date extracts from more than 3 000 wild plants have been screened for antifungal, anti-bacterial, bio-stimulatory and herbicidal activity. Extracts from two plants showed above average antifungal activity. All their active compounds have been isolated and identified and a patent registered. Although many extracts showed anti-bacterial activity, none of these are regarded as above average. On herbicidal activity, a cactus plant extract showed above average activity and is currently being tested.

The treatment of maize seed with a series of different inorganic and organic compounds separately and in combination, under laboratory and greenhouse



A doctoral student, Mr Walter Mupangwa, standing in on-farm tillage trials in southern Zimbabwe.

conditions, has resulted in the identification of a potential combined product that not only increased seed germination but also enhanced seedling vigour significantly. This is now also being tested on seeds of other crops.

The team is also involved in research on new natural bio-stimulatory products that have been patented under contract for a German company. A vast number of field trials during 2007 confirmed the yield and quality enhancing properties of these products in vegetables, fruit and field crops, especially under irrigation conditions. The products have now been commercialised.

The two donor plants mentioned earlier show above average potential as new crops. The agronomic requirements of one of the two plants, in relation to the antifungal activity it possesses, have already been scrutinised under greenhouse conditions. Indications are that the inherent antifungal activity of the plant can be improved with selected manipulation methods that confirm the new crop status of this plant. A field study will follow.

Two organic molecules were identified from wild plants with above average

potential to induce resistance against both biotic and abiotic stress factors. The mechanism of action of these compounds has been partially elucidated physiologically and on gene level. Both molecules are organic and therefore have the potential to be registered as suitable for organic crop production when developed as natural products. A provisional patent has been registered.

Staff members from the Agrometeorology section continue to work on three joint projects funded by the WRC. Partners are the universities of Cape Town, Pretoria and KwaZulu-Natal as well as the Agricultural Research Council's (ARC) Institute for Soil, Climate and Water, CSIR-Environmentek and the South African Weather Service. The research focuses on the applications of rainfall forecasts for agriculturally-related decision making in catchments. Good progress was made in all these projects and several workshops were held during the year to exchange relevant information with the partners.

Prof. Walker is also involved in supervising doctoral students working on two international projects. The first project is

funded by the WaterNet Challenge Programme and is entitled: *The challenge of integrated water resources management for improved rural livelihoods: managing risk, mitigating drought and improving water productivity in the water scarce Limpopo basin*. The second project, entitled: *Building adaptive capacity to cope with increasing vulnerability due to climatic change in Zambia and Zimbabwe* is funded by the Canadian International Development Research Centre.

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 from the University of Bonn in Germany. Prof. Du Preez is a member of this team, which is financed by the Research Foundation of Germany. 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 ARC's Small Grain Institute at Bethlehem.

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.

Until recently, hydrological models ignored the role of soil, or treated soil 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 hydripedology. 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.

Research on irrigation and salinity of soil continued through the WRC-funded project called *Managing salinity associated with irrigation in selected areas of South Africa*. The intention is to develop optimal management strategies for field to scheme level ensuring sustainable irriga-

tion farming. Hence sites with diverse properties were selected on the Riet River and Vaalharts schemes in association with relevant stakeholders for detail measurements that are running well. Staff members involved are Profs Du Preez, Van Rensburg, and Alan Bennie, Drs Le Roux and Van Huyssteen, Messrs Johan Barnard, Jason Sparrow, Gideon Voigt and Ms Kotzé.

Commercialisation of the in-field rainwater harvesting (IRWH) crop production system is now possible after two

implements were developed, namely a contour plough and a basin plough. It is envisaged that this technology will play a significant role in improving crop yields on clayey soils in semi-arid regions. The next phase in this research is to improve IRWH cropping further through precision agriculture. Data on soils and maize yields are currently collected by the team members, namely Prof Van Rensburg, Drs Le Roux and Hensley, and Messrs Ian Bothma and Coenraad Fraenkel.



Students from the department visiting semi-commercial maize planting on the Western Campus of the Main Campus in Bloemfontein.



A contour plough which is used to establish contours and basins for in-field water harvesting.

Research outputs

Staff

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

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

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

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

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Departments in *the Building Sciences*



Prof. Jan Smit

Department of Architecture

Overview

The Department of Architecture is a vibrant and energy-filled department where the atmosphere of creativity and energy amongst staff and students is tangible. This dynamic symbiosis has made the department one of the leading architecture departments in the country.

The department's quality of teaching is proven by the unconditional international accreditation awarded by the Royal Institute of British Architects, the Commonwealth Association of Architects and the South African Council for the Architectural Professions.

In 2007, the department received 392 enquiries for the B.A.S. degree: only 55 of these were selected for the course. In order to ensure quality and conform to the university's strategic aim of excellence, the department restricts student intake and numbers by choice. As a result of the boom experienced by the building professions, all of our postgraduate students completing their studies during the year were offered positions by July 2007.

One of the highlights of 2007 was the founding of the Centre for People and Buildings – South Africa (CfPB-SA) at the department. This initiative was started in 2006 by Dr Pieter C. le Roux and based partly on his prior co-operation with the Centre for People and Buildings in Delft, the Netherlands. It was also partly the result of the department's need to identify and undertake increased international co-operation. In the Netherlands the CfPB undertakes scientific research on interrelationships between people, work and workplace environments through the use and development of theory, empirical data, and tools with the objective of formulating optimal solutions in terms of products (workplaces) and processes (decision-making) on the basis of evidence-based reasoning.

The founding of the CfPB-SA was aimed at professionalising the South Africa Facility Management (FM) industry through research on similar management-orientated issues within the domain of people, work, and workplace environments. During the period 2005-2007 Ms Wilandi Esterhuysen became part of the daily activities of the CfPB-SA and for her research she conducted indicative-level post-occupancy evaluation (POE) studies in two Telkom workplaces.

Dr Le Roux left the department in September 2007 to take up a position as senior researcher and programme manager at the CfPB in Delft, the Netherlands. Ms Esterhuysen is continuing with the CfPB-SA, and is in the process of formulating a proposal for continued co-operation between the department and the CfPB in terms of future activities and guidance of the CfPB-SA.

Prof. Bannie Britz, former head of the department, received an honorary doctorate from the department for his contribution to South African architecture as a practising architect. Prof. Britz is still active on the university's Main Campus where he is busy creating a pedestrian-friendly environment for all users of the campus.

Staff members of the department serve on various national institutes and councils. Mr Kobus du Preez is registered with South African Council for the Architectural Professions (SACAP), is a member of the South African Institute of Architects (SAIA), a committee member of the SAIA Heritage Committee and chairman of the Permit Committee of the Free State Heritage Authority. Mr Gert Swart is registered with the SACAP and Prof. Jan Smit, Departmental Chairperson, Ms Petria Jooste-Smit, Messrs Henry Pretorius and Jan Ras are also registered with the SACAP and members of SAIA.

As evidence of the high esteem in which the staff of the department are held in the country, they are often invited to act as external examiners at other departments. Mr Swart examined the professional master's degrees at both the University of Cape Town and the University of Pretoria (UP). Prof. Raman examined the professional master's degree at the UP.

Ms Alet van der Merwe took part in several exhibitions in 2007, affording her the opportunity to show off her creative talent. These included an art exhibition at Gallery 88 in Sasolburg in June and the Bovidian young artist's exhibition in Bloemfontein in October. She also participated in the professional category of the Freshford Museum's photography competition.

Prof. Smit and his wife Ms Jooste-Smit, practising as Smit Architects, received awards for architecture from the Free State Institute of Architects for two houses in Bloemfontein, namely the houses Uys and Enkalweni. Mr Henry Pretorius from the

department collaborated on House Enkalweni. Prof. Smit was also invited by *VISI* magazine to be a panel member to nominate the designer of the year in the *VISI* Designer of the Year Award. Smit Architects was one of ten architecture firms in the country to be invited by *VISI* magazine to convert ordinary containers into living units. Henry Pretorius and Conrad Stofberg, a third-year student, collaborated with them on this project.

The Unit for Earth Construction (UEC), run from the department under Ms Jooste-Smit and Mr Gerhard Bosman, focuses on the use of earth as a building material. The UEC, in collaboration with Prof. Das Steyn, Departmental Chairperson of the Department of Urban and Regional Planning at the UFS, completed a three-year research project entitled: *A South African Building Renaissance, acceptability of sustainable, high quality, earth-constructed public and private buildings to support local economic development*. The final report was handed to the Eindhoven University of Technology, a partner in the programme, for final revision. This research was part of the South Africa Netherlands Research Programme on Alternatives in Development (SANPAD).

Prof. Pattibi Raman continued to be the technical adviser to the Freedom Park development in Gauteng.

Sixteen students received the M. Arch.(Prof.) degree during the autumn graduation ceremony. This was the largest number of master's degrees conferred at the same time in the history of the department.

As part of their service learning module, the fourth-year students took part in a housing project at Lerato Park informal settlement in Kimberley under the leadership of Ms Carin van der Westhuizen, a practising architect from Johannesburg and Ph.D. student at the department. The students worked in groups and documented the participants' housing needs with regard to ideals, reality and the current situation, using sketches, photo collages, surveys of family profile and current structures in which the participants lived.

The second winter school for learners interested in studying architecture was presented on the Main Campus in Bloemfontein, under the leadership of Mr Kobus du Preez. This two-day event was attended by 37 pupils from all over the country.

Prof. Jo Noero of Cape Town presented the 19th Sophia Gray Memorial Lec-



An honorary doctorate was awarded to Prof. Bannie Britz, former head of the department, for his contribution to architecture. Here are, from the left: Profs Frederick Fourie, Rector and Vice-Chancellor of the UFS, Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Science at the UFS, and Prof. Britz.

ture and exhibition in August entitled: *The expedient and the ethical, the everyday and the extraordinary*. Prof. Noero is well-known in South Africa especially for his contribution to low-cost architecture. The third-year students were taken through the exhibition by the speaker himself as part of their academic history course.

As one of the events associated with the Sophia Gray Memorial Lecture, a mini-congress was held with guest speakers Messrs Henri Comri with a lecture entitled: *Looking around corners*, and Jonathan Jacobson who spoke about *Beau Constance*. Both speakers were from Cape Town. The annual lecture



Sixteen M. Arch.(Prof.) degrees were conferred during the autumn graduation ceremony. This is the largest number of master's degrees awarded at one time in the history of the department. Some of the students are, from the left: Mss Illani du Plessis, Zanie van Zyl, Prof. Jan Smit, Departmental Chairperson, Messrs Hendrik Auret, and Shawn Gravel. Mr Auret also received the Corobrik Student of the Year prize for the best final-year student in Architecture in the country.

sponsored by the Southern African Institute of Steel Construction (SAISC) was presented by Mr Michiel Cohen from the esteemed Dutch firm CEPEZED.

The first exhibition, in which staff from the department could exhibit their own creative work, was held in the Johannes Stegmann Art Gallery on the Main Campus as part of the Sophia Gray Memorial Lecture. The work exhibited included architectural projects, photography, paintings, mosaic, pewter art, sculptures and free hand sketches, amongst other things.

As part of a policy to expose students to good architecture, academic student tours took place to Clarens, Cape Town, Johannesburg (the Constitutional Court and Apartheid Museum) and Maputo. The students were also very successful in competitions in the past year. These competitions act as a barometer for gauging the department's position in the country.

The twentieth national Corobrik Student of the Year competition for the best final-year student in Architecture in the country was won by Mr Hendrik Aurret with his project in Upington entitled: *The poetics of Architecture: A house of culture*

for the Khomani San. The award was presented at a prestigious ceremony in Johannesburg.

Mr Kobus Smit, a third-year student, won the first prize worth R50 000 in the international Educad Open ThinkBox Timepod Design 2007 competition.

Another third-year student, Ms Nadia Engelbrecht, was one of ten finalists in the national Lafarge Gypsum Board competition. Mr Conrad Stofberg won the national Plascon competition. Two of his fellow fourth-year students, Messrs Jacques Verster and Gustav Roberts were among the top ten finalists.

Seven first-year students received awards in the annual Freshford Museum's photography competition. Their photos were among the 330 entries received that were exhibited at Oliewenhuis Art Museum.

The department was also appointed by Assa Abloy to organise the ASSA ABLOY national student competition for the design of door handles. Entries in this competition, called *Touching your building*, were exhibited in the Oliewenhuis Art Museum in Bloemfontein.



Prof. Pattibi Raman, discussing an urban design project with the second-year students.

Staff

Professor: Prof. Pattibi Raman

Associate Professor: Prof. Jan Smit

Senior Lecturers: Dr Pieter le Roux, Ms Petria Jooste-Smit

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

Junior Lecturers: Mr Henry Pretorius, Ms Alet van der Merwe

Contract Lecturers: Dr Zoë Henderson, Messrs Charl-Pierre Cilliers, Sergio Nunes, Pieter Venter, Ms 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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Students working with members of the Lerato community in Kimberley.



The 19th Sophia Gray Memorial Lecture was presented by Prof. Jo Noero of Cape Town. Prof. Noero, a well-known South African architect, has designed many community-based projects in South Africa. At the lecture are, from the left: Prof. Noero, Nr Nellis Beyers, third-year student in Architecture, Ms Lieze Swart, third-year student in Architecture, and Prof. Jan Smit, Departmental Chairperson.

Research outputs

Research articles

Le Roux, P.C. & Esterhuysen, W. 2007. Revitalization of a historic building through adaptive reuse. *Acta Structilia* 14(1): 1-32.

Raman, P. 2006. Context, container and content of museums: Some relational issues. *South African Museum Association Bulletin* 32: 88-94.

Raman, P. 2007. Museum of difference: The case of the origins centre, University of the Witwatersrand. *Architecture South Africa: Journal of the South African Institute of Architects* January/February: 82-86.

Raman, P. 2007. Thorsten Deckler - Three projects. *Architecture South Africa: Journal of the South African Institute of Architects* May/June: 32-36.

Raman, P. 2007. Uses of indigenous knowledge - Reflections on land art. *Architecture South Africa: Journal of the South African Institute of Architects* July/August: 16-20.

Raman, P. 2007. Architecture of empowerment and necessity. *Architecture South Africa: Journal of the South African Institute of Architects* July/August: 78-81.

Raman, P. 2007. Research ruminations at the Royal Institute of Architects. *Architecture South Africa: Journal of the South African Institute of Architects* November/December: 50-51.

Raman, P. 2007. Narrative shifts in Architecture. *South African Journal of Art History* 22(22): 250-276.

Chapters in books

Raman, P. 2007. Beyond lateral thinking in the design studio. In *A Black Hole*, edited by G. Sağlamr. Istanbul: Yapi-Endüstri Merkezi. pp. 55-71.

Conference contributions

Du Preez, K. 2007. *Rondawels and bay-windows: The influence of imported and indigenous forms on the other*. Paper presented at the Art Historical Work Group Conference, Technical University of Tswane, Pretoria, South Africa. 2 March.

Smit, J.D. 2007. *Feel, watch, think and do in the design process: Experiential learning*. Paper presented at the Connected 2007 International Conference on Design Education, University of New South Wales, Sydney, Australia. 9-12 July.

Raman, P. 2007. *Space lost and found*. Paper presented at the European Association of Schools of Architecture Winter School Workshop, Gazi University, Ankara. 29 January - 9 February.

Raman, P. 2007. *Towards an inclusive approach to development plans*. Invited paper presented to the staff and postgraduate students of Architecture and Urban Design, Istanbul Technical University, Istanbul. 5 April.

Raman, P. 2007. *Narrative shifts in contemporary South African architecture*. Paper presented at the Global studio, University of the Witwatersrand, South Africa. 28 June.

Raman, P., Hobbs, P. & Liebhammer, N. 2007. *From afdak to ziggurat, The glossary project*. Paper presented at the Society of Visual Arts Historians Conference, University of the Witwatersrand, South Africa. 14 September.



Prof. Basie Verster

Department of Quantity Surveying and Construction Management

Overview

During 2007 the Department of Quantity Surveying and Construction Management was involved in various actions, events and developments and experienced a variety of highlights. Students were trained either residentially or through open learning. The department had a total of 325 undergraduate students, 74 students at honours level, 35 students at master's level and four students at Ph.D. level.

As additional training endeavours, various registered short programmes and courses were delivered. Altogether 65 students registered for the QCP Open Learning Programme. The faculty's Management Programme (FMP) supported by the Association of Property Owners (SAPOA) was completed by 76 students. Forty-nine students who registered for the Project Management Programme also completed the Intensive Project Management Programme (IPMP) supported by SAPOA and 12 students attended the Occupational Health and Safety Programme that was supported by the Gauteng Master Builders Association (GMBA).

The UFS is currently the only university outside the United Kingdom (UK) that presents an open learning programme in quantity surveying, which is internationally accredited by the Royal Institution of Chartered Surveyors (RICS).

Over the past few years the department has delivered a significant contribution to the various professions and the industry, and is accredited by the South African Council for the Quantity Surveying Profession (SACQSP) and the South African Council for the Property Valuation Profession (SACPVP). Internationally the RICS in the UK and the Chartered Institute of Building (CIOB), also in the UK, accredits the relevant programmes presented by the department.

Alumni of the UFS practise mainly in South Africa but many also live in England, Ireland, Dubai and various African countries. To deliver services to the many branches of the industry, staff members from diverse backgrounds are appointed in quantity surveying, construction management, project management, engineering and property economics, amongst others.

Prof. Basie Verster, Head of the department, serves on the SACQSP, is the chairperson of the Educational Standards and Research Committee (ESR) and is a member of the board of the

Association of South African Quantity Surveyors (ASAQS). He also serves on the UFS Council.

Dr Hendrik Marx serves on the Council of the Central University of Technology (CUT) and is the chairperson and member of the board of the South African Association of Consulting Engineers (SAACE). Dr Marx has also been elected as a member of the national board of the Association of Schools of Construction of Southern Africa (ASOCSA). Mr Hendrik van Vuuren serves as committee member of the CIOB-SA.

At international level, members of the department are active on committees of the CIOB-SA and the International Cost Engineering Council (ICEC).

The prestigious gold medal of the ASAQS for outstanding students in quantity surveying in South Africa has been awarded to 15 students of the department over the past 38 years. In 2007, this sought-after medal was again awarded to a student of the UFS, Ms Pulane Mahloka. Ms Mahloka is the first black woman to achieve this honour. Also in 2007, Mr Franré Swanepoel, a student of the UFS, was awarded a grant from the ASAQS for the most outstanding first-year student in B.Sc. (Quantity Surveying).

The journal *Acta Structilia* is fully accredited by the SACQSP and the RICS. In 2007 the journal celebrated its 14th year of existence. This journal offers opportunities for local and international researchers in the field of physical and development sciences to publish independent refereed articles. The 23rd edition of the student journal, *Bouvaria*, was also published in 2007.

The department is one of 14 international research fellows that completed a joint research project with the Wirtschafts-universität in Vienna, Austria during 2007. Four papers on the South African results have already been delivered on invitation in Vienna.

The department is involved in research projects in cooperation with the RICS, the Bureau for Economic Research at the University of Stellenbosch, the Construction Industry Development Board (CIDB) and the ASAQS. During the year a research project on indicators for the construction industry was successfully completed for the CIOB.

Staff from the department delivered successful papers at a conference presented by the Pacific Association of Quantity Surveyors (PAQS) in Auckland, New Zealand.

The department's involvement in the community is characterised by the continued mentorship programme for upcoming entrepreneurs. Over the past 20 years the Centre for Construction Entrepreneurs has trained a number of upcoming building contractors. During the year, 16 students completed a special course in Occupational Health and Safety under the guidance of the Centre for Construction Entrepreneurs. This is presented with the support of the ASAQS.

The department delivers a continuous development service to upcoming building contractors and other interest groups by means of the accredited Construction Mentorship Programme. The principle of mentorship-based development programmes is currently a standard component of development in the construction industry. The highly acclaimed Expanded Public Works Programme (EPWP) has accepted the principle of using mentors for upcoming building contractors in their programme. Members of staff of the UFS, in cooperation with the Council for Scientific and Industrial Research (CSIR) and other consultants, are at the forefront of the development and implementation of mentorship. Mentors offering services as part of this programme are only accredited by the UFS.



Mr Franré Swanepoel received the award for the most outstanding first-year student in Quantity Surveying from the Association of South African Quantity Surveyors (ASAQS).



Three students received the M.L.P.M. degree in 2007. From left are: Mr Riekie Samuels, Ms Michelle Burger, Ms Benita Kotzé, Lecturer at the department, Mr Jan-Hendrik Munnik, and Prof. BasieVerster, Head of the department.



Ms Pulane Mahloka received the gold medal for Exceptional Final Year Student in South Africa for 2007 from the Association of South African Quantity Surveyors (ASAQS). She is the first black woman to receive this prestigious award. She is the fourteenth UFS student since 1970 to receive this medal, six of whom were women. Here are, from the left: Mr Hendrik van Vuuren, Lecturer at the department, Ms Mahloka, and Ms Benita Kotzé, Lecturer at the department.



Students at a sports day.

Staff

Professors: Profs Basie Verster, 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 Assistant: Mss Alna Beukes, Alet Esterhuyse, Marie-Louise Roux

Secretary: Ms Elza van der Walt

Administrator: Distance Learning: Ms Elize Scholtz

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Research outputs

Research articles

Ramabodu, M.S., Kotzé, B.G. & Verster, J.J.P. 2007. Diversity and value in Africa's real estate: Challenges facing property development in South Africa. *Journal of Property Investment and Finance* 25(1): 7-22.

Chapters in books

Verster, J.J.P., Hauptfleisch, A.C., Oosthuizen, P.M. & Kotzé, B.G. 2007. Project management maturity models and analyses. In *SAPOA Real Estate Research Handbook*, edited by N. Gopal, S. Garrun & K. Clinton. Roseveld Park, South Africa: Pangram Publishing (Pty) Ltd. pp. 217-221.

Conference contributions

Berry, F.H. 2007. *The influence of quantity surveying procedures on communication and communication instruments in the construction industry.* Paper presented at the Pacific Association of Quantity Surveyors (PAQS) 2007 Congress: Construction from a different perspective, Auckland, New Zealand. 10-12 June.

Hauptfleisch, A.C. & Verster, J.J.P. 2007. *Mentoring: A key intervention in small construction contractor capacity building in South Africa.* Paper presented at the Association of Researchers in Construction Management (ARCOM) 23rd Annual Conference, University of Ulster, Belfast. 3-5 September.

Hauptfleisch, A.C., Lazarus, S., Knoetze, T. & Liebenberg S. 2007. *An integrated emerging contractor development model for the construction industry: Practical implementation and statistical quantification.* Paper presented at the International Council for Research and Innovation in Building and Construction (CIB) World Building Congress: Construction for Development, Cape Town, South Africa. 14-17 May.

Lazarus, S. 2007. *Project management: Key components of an integrated emerging contractor development model for the construction industry.* Paper presented at the Project Management Days '07 Workshop, Project Management Group & Wirtschafts University, Vienna, Austria. 5-8 May.

Marx, H.J. 2007. *An improved approximate estimating method for the early planning phases.* Paper presented at the Pacific Association of Quantity Surveyors (PAQS) 2007 Congress: Construction from a different perspective, Auckland, New Zealand. 10-12 June.

Marx, H.J. 2007. *Improved elemental cost factors for early estimation.* Paper presented at the 2nd Built Environment Conference: Association of Schools of Construction of Southern Africa (ASOCSA) and the Council

for the Built Environment (CBE), Port Elizabeth, South Africa. 17-19 June.

Oosthuizen, P.M., Kotzé, B.G. & Hauptfleisch, A.C. 2007. *Professional project management maturity of quantity surveyors in South Africa.* Paper presented at the Pacific Association of Quantity Surveyors (PAQS) 2007 Congress: Construction from a different perspective, Auckland, New Zealand. 10-12 June.

Swart, B.J. & Van der Westhuizen, L. 2007. *The modern quantity surveyor: Jack of all trades.* Paper presented at the Pacific Association of Quantity Surveyors (PAQS) 2007 Congress: Construction from a different perspective, Auckland, New Zealand. 10-12 June.

Tiruneh, G.G., Verster, J.J.P. & Kotzé, B.G. 2007. *A study on the application of alternative dispute resolution (ADR) methods in South Africa.* Paper presented at the Pacific Association of Quantity Surveyors (PAQS) 2007 Congress: Construction from a different perspective, Auckland, New Zealand. 10-12 June.

Van Vuuren, H.J. 2007. *Skills transfer: The training and mentoring of new entrants to the construction industry.* Paper presented at the 2nd Built Environment Conference: Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Built Environment (CBE), Port Elizabeth, South Africa. 17-19 June.

Van Zyl, C.H. 2007. *Training and professional development: Construction industry needs.* Paper presented at the 2nd Built Environment Conference: Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Built Environment (CBE), Port Elizabeth, South Africa. 17-19 June.

Verster, J.J.P. & Hauptfleisch, A.C. 2007. *Project management maturity in the South African construction industry.* Paper presented at the 2nd Built Environment Conference: Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Built Environment (CBE), Port Elizabeth, South Africa. 17-19 June.

Verster, J.J.P. & Lazarus, S. 2007. *Project Management: Maturity of project oriented companies in South Africa.* Paper presented at the Project Management Days '07 Workshop, Project Management Group & Wirtschafts University, Vienna, Austria. 5-8 May.

Verster, J.J.P. & Van Zyl, C.H. 2007. *Managing differences and disputes: A search for an effective and efficient construction dispute resolution method.* Paper presented at the Pacific Association of Quantity Surveyors (PAQS) 2007 Congress: Construction from a different perspective, Auckland, New Zealand. 10-12 June.



Prof. Das Steyn

Department of Urban and Regional Planning

Overview

The Department of Urban and Regional Planning has embarked upon a process in the master's degree programme in terms of which students can specialise in sustainable rural development, tourism and development, planning for communities or integrated development planning. In this way students can do more work that is region and community-related. For instance, if students are working in rural areas of the Eastern Cape, the problems experienced in their immediate vicinity could influence their choice of topic.

The first student has completed the new master's degree programme and 32 students have enrolled for the first time for the honours degree. In total the department had 77 students enrolled for the various graduate programmes in 2007. One of the Ph.D. students, Mr Henk Theron, successfully finished his thesis entitled: *Lessons from the strategic management of integrated development planning in KwaZulu-Natal from 1994 to 2006*.

Two staff members, Dr Marlène Campbell and Ms Denie Steenkamp, are actively involved in the university's strategic cluster for "New frontiers in poverty reduction and sustainable development" with a focus on local development and resource-poor environments. Dr Campbell is supervising a project on homelessness while Ms Steenkamp conducted research on the acceptability of dry alternatives to water-borne sewerage in the Karoo area. The department has decided to focus on arid areas in their research with students for the next couple of years because a large proportion of the Free State, Eastern and Northern Cape fall under this description.

Staff members were also actively involved with professional institutions. The department hosted the annual general meeting of the South African Planning Institution (SAPI), where the president of the South African Council of Planners (SACPLAN) was the guest speaker. The Royal Town Planning Institute (RTPI) visited the department in a benchmarking exercise for the eleven schools of planning in South Africa.

Students were taken to Pretoria as part of their practical training programme, to gain an understanding of how the city of Tswane approached and executed their integrated development programme. Several shorter tours to local development sites in Bloemfontein were also undertaken as a large number of pro-

jects are in different phases of development due to the upswing in the economy.

The department is also home to the only accredited journal in planning, known as *Stads- en Steekbeplanning/Town and Regional Planning/Mesalo ya Detoropo le Mabatowa*. Prof Das Steyn, Departmental Chairperson, is the editor of this multi-lingual journal which was started in Stellenbosch in 1974. In collaboration with the Council for Scientific and Industrial Research (CSIR) a special edition was published on Integrated Planning in South Africa. The department was also actively involved in another accredited journal *Acta Structilia*, published by the Department of Quantity Surveying and Construction Management at the UFS.

Community service is encouraged by the offering of three postgraduate programmes in urban and regional planning for full time, part time and compact learning students. Through the compact learning programme, senior students who are in town planning positions, varying from assistant town planners to directors in planning as well as a few private practitioners, come to the department, where they attend the classes which are a duplication of the full time lectures, but where they do the work of one term in one week. In this way students who have positions in planning, but who may not have the correct qualifications, are empowered to do the jobs they are paid for.



Students in front of the Union Buildings during a visit to Tswane.



Ms Denie Steenkamp and students in Hanover busy with fieldwork on the arid areas project.



The department celebrated World Planning Day with a lecture by Prof. Martin Drake, a retired professor from the University of the Witwatersrand (Wits). In his lecture, Prof. Drake discussed the development of urban planning and the need for planning, with a focus on Africa. Some of the guests at the lecture are, from the left, front: Mr Jacques Janse van Rensburg, student, Prof. Peter Bikam, Head of the Department of Urban and Regional Planning at the University of Venda, and Prof. Drake; back: Mr J.J. Pienaar, student, and Prof. Das Steyn, Departmental Chairperson.

Staff

Professor: Prof. Das Steyn

Senior Lecturer: Dr Marlène Campbell

Lecturers: Mr Pieter Potgieter, Ms Lize Barclay

Part-time Lecturers: Prof. Wynand Senekal, Dr Henning Stapelberg, Messrs Neil Devenish, Schalk Grobbelaar, Danie Krynauw, George Masuabi, Ms Erika van der Westhuizen

Senior Professional Officer: Ms Denie Steenkamp

Typist/Clerk: Ms Riana Hugo

Assistant Officer: Ms Antoinette Nel

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Research outputs

Research articles

Campbell, M.M., De Kock, J. & Van der Westhuizen, T. 2007. Secure tenure for the urban poor: Lessons from community based land tenure approach in Windhoek, Namibia. *Town and Regional Planning* 52: 7-16.

Steyn, J.J. & Du Plessis, R. 2007. A case study of four small-scale job-creation project in Philippolis and lessons for local economic development projects in small towns. *Town and Regional Planning* 51: 60-66.

Conference contributions

Barclay, E. 2007. *The spatial integration of a segregated post-apartheid community: Case study of BaPhalaborwa Municipality, Limpopo Province, South Africa.* Paper presented at the Regional Studies Association Winter Conference: Transport, Mobility and Regional Development, London, UK. 23 November.

Campbell, M.M. 2007. *Land management and informal settlement regulation: The case of Mangaung.* Paper presented at the Land Man-

agement and Informal Settlement Conference, Institute for Housing and Urban Development Studies, Erasmus University, Rotterdam, The Netherlands. 13 Augustus.

Campbell, M.M. 2007. *The impact of major sporting events on the economy and the people of a developing region: The case of South Africa.* Paper presented at the International Regions in Focus Conference of the Regional Studies Association, Lisbon, Portugal. 2-5 April.

Potgieter, P.J. & Steyn, J.J. 2007. *How the city of Bloemfontein did the tango alone in the Inner City Renewal Project.* Paper presented at the 43rd International Society of City and Regional Planners (ISOCARP) International Conference, Antwerp, Belgium. 19-23 September.

Potgieter, P.J. & Steyn, J.J. 2007. *How the city of Bloemfontein did the tango alone in the Inner City Renewal Project.* Proceedings of the 43rd International Society of City and Regional Planners (ISOCARP) International Conference, Antwerp, Belgium. 19-23 September. [Electronic].

Steenkamp, G.M. 2007. *From a paper base to e-learning module.* Paper presented at the Higher Education Learning and Teaching Association of South Africa (HELTASA) Conference, Central University of Technology, Bloemfontein, South Africa. 19-21 November.

Steyn, J.J. 2007. *New uses in old shapes: Africa meets the west in Bloemfontein's central business district.* Paper presented at the 14th International Seminar on Urban Form (ISUF), Ouro Preto, Minas Gerais, Brazil. 28 Augustus - 1 September.

Steyn, J.J. 2007. *New uses in old shapes: Africa meets the west in Bloemfontein's central business district.* Proceedings of the 14th International Seminar on Urban Form (ISUF), Ouro Preto, Minas Gerais, Brazil. 28 Augustus - 1 September. [Electronic].

Steyn, J.J. 2007. *Town and regional planning: A scarce skill in the new South Africa.* Paper presented at the Joint Initiative on Priority Skills Acquisition (JIPSA) Free State Conference, Bloemfontein, South Africa. 6-7 September.





Departments in *the Natural Sciences*



Prof. André Roodt

Department of Chemistry

Overview

In pursuit of the strategic priorities of the UFS and the faculty, the Department of Chemistry experienced a further revival in quality and excellence.

Three postdoctoral associates, 20 M.Sc. and 25 Ph.D. students in different sub-disciplines led to a significant sustained research output for 2007. More than 60 research articles were published in international accredited journals and numerous local and international congress presentations were made.

Several prominent scientists visited the department, such as Profs Roger Alberto (Zurich, Switzerland), Ola Wendt (Lund University, Sweden), Rui Carvalho (University of Coimbra, Portugal), Daneel Ferreira (University of Mississippi, United States of America (USA)), Alexander Vinkelstein and Sasha Efimov (both from the Moscow State University, Puschino Campus, Russia), Dr Ettiene Snyders (South African Nuclear Energy Corporation (NECSA)), Prof. Mikhail Kritskey (Aleksey Nikolaevich Bach Institute of Biochemistry, Russian Academy of Sciences, Moscow State University, Russia), Dr Johann Nel (NECSA), Dr Willem van Otterloo (University of the Witwatersrand (Wits)), Dr Cassie Carstens (NECSA), Prof. Åke Oskarsson (Lund University, Sweden), Dr Marco Zappa (Mettler Toledo, Zurich, Switzerland), and Dr Andy Cammidge (University of East Anglia, Norwich, United Kingdom (UK)).

These scientists presented lectures and held research discussions with the department's researchers and postgraduate students in the departmental research seminar programme, which continued very successfully with around forty research presentations during 2007.

The upgrading of the Moerdyk and associated annexed building, which house the department continued. The project, to the value of R40 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 2007, in spite of several unfortunate delays.

Furthermore, the further upgrading of the department's chemistry equipment contributed to a sustained high research output. This new equipment strategy forms part of the faculty's vision to be internationally visible with quality research outputs in niche areas, to provide leadership in advanced training to the

African continent student corps and to establish the UFS as an important player amongst South African universities as well as a competitor internationally.

During August 2007, a fire destroyed four laboratories in the department, causing damage of tens of millions of rand to the building structure and research infrastructure. Moreover, it caused significant emotional trauma and research result losses to a number of postgraduate researchers. This, together with the interruptions due to the renovation of the complete 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 this setback, the enthusiasm of Chemistry personnel was illustrated by the fact that most activities were back on track within a month after the incident.

The way the staff of the department responded after the fire was simply remarkable and all inputs are highly appreciated and applauded. The support of senior management, particularly from faculty level in the person of Prof. Herman van Schalkwyk, Dean 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.

The three-year agreement between the UFS and SASOL, worth R9 million, 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 focus of the department. The content of first-year modules was further upgraded and packaged differently in order to improve the success rates of distance learning, extended learning and main stream students. The continued teaching in parallel medium on the Main Campus was quite demanding on individuals; this challenges 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.

A special course focusing on computer skills specifically for disadvantaged students was presented by Dr Jeanet Conradie.

Web-based tutoring and expansion of teaching methods via WebCT were significantly expanded in 2007, specifically in Physical Chemistry, where many learners struggle with primary chemical knowledge due to backlogs and disadvantaged school teaching environments.

Advanced topics in a number of courses in the B.Sc. honours programme were further introduced and refined by outside scholars, exposing the department's students to international teachers. These included lectures on nuclear magnetic resonance (NMR) by Prof. Carvalho, natural product chemistry by Prof. Ferreira, industrial and organometallic chemistry by Prof. Bezuidenhout, and computational chemistry by Drs Petrie Steynberg 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 of FARMOVS-PAREXEL, and in Crystallography by Prof. Oskarsson. Furthermore, courses on heterogeneous catalysis by Dr Thys Botha from SASOL, protein physics and chemistry by Profs. Vinkelstein and Efimov, and thermal analysis by Dr Zappa were included.

The 13th 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 Mrs 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 2007 where they were exposed to information on career opportunities in Chemistry, Physics and Geology. Prizes were awarded to the six winning schools in order to improve their science laboratory facilities.

Many colleagues in the department were involved in different committees, notably Prof. Swarts, who continued to contribute significantly in planning and negotiations to expand the equipment infrastructure of the Faculty of Natural and Agricultural Sciences. Others served on faculty and UFS committees, acted as external reviewers for the National Research Foundation (NRF) and for 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



The department bade farewell to Prof. Steve Basson after 49 years at the UFS: From the left are: Profs André Roodt, Departmental Chairperson, Ben Bezuidenhout, Steve Basson, Walter Purcell, Jan van der Westhuizen, and Robbie Dennis.

research councils (Profs. Swarts: Irish Health Council, and André Roodt, Departmental Chairperson: Swiss National Science Foundation). 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.

Prof. Steve Basson, head of the Analytical division and former Chair of the department, retired at the end of 2007 after a career of 49 years at the UFS.

Fifteen 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 60 research papers published.

The NRF's Thrust for Industrially Related Projects (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 R2.37 million for the upgrade of equipment and extended capacity building.

The **Physical Chemistry** division has two research groups, one headed by Prof. Swarts, and the other by Dr Conradie, both of whom are rated researchers with the NRF. Mr Ernie Langner is in the final stages of his Ph.D. studies, and while both NRF-rated researchers hold NRF research grants, Mr Langner is the holder of a Thuthuka NRF grant. The Swarts group is also funded by the Cancer As-

sociation of South Africa (CANSAs), the NRF's THRIP, and industrially by research grants from SASOL.

During 2007 the Physical Chemistry division supervised eight Ph.D. and two M.Sc. students, who are at various stages of their studies.

The main research question of the research group of Prof. Swarts concerns synthetic and physical chemistry aspects of multinuclear metallocenes. The group currently focuses on six projects:

- Porphyrin 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
- Polymer and protein chemistry in association with metallocenes
- Industrial studies on carboxylato complexes in collaboration with SASOL.

A research highlight from the Swarts group included results from an electrochemistry study on porphyrin-ferrocene conjugates with implications for structure and reactivity. This research received much international acclaim in that it reached the cover page of *Dalton Transactions* – (Auger, A., Muller, A.J. & Swarts, J.C. 2007.

Remarkable isolation, structural characterization and electrochemistry of unexpected scrambling analogues of 5-ferrocenyl-10,20-diphenyl porphyrin, *Dalton Transactions*, 3623-3633).

The Swarts group has international collaboration with Prof. Mike Cook at the University of East Anglia, Norwich, UK on phthalocyanine chemistry, Prof. Manuel Aquino at the St. Francis Xavier University, Antigonish, Canada on metal carboxylates, and Prof. William (Bill) Geiger at the University of Vermont, USA, on electrochemistry.

During 2007, Prof. Swarts paid research visits to Profs Cook, Geiger and Aquino as well as to Prof. Van Lier at Sherbrooke University, Canada (medicinal chemistry). Mr Langner visited Prof. Cook and purchased a Cyclograph capable of separating and purifying newly-synthesised compounds with much greater ease and speed.

The Swarts research group hosted international scholars from Russia (Prof. Alexander Vinkelstein from Moscow University, Moscow, a protein physicist), Switzerland (Dr Marco Zappa from Mettler Toledo, Zurich, a thermodynamic materials chemist), and the UK (Dr Andy Cammidge, University of East Anglia, Norwich, UK a porphyrin and phthalocyanine chemist).

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.

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 Conradie group has international collaboration with Prof. Abhik Ghosh (Department of Chemistry and Centre for Theoretical and Computational Chemistry, University of Tromsø, Tromsø, Norway), Prof. Mark Gladwin (Chief, Vascular Medicine Branch National Heart Lung and Blood Institute, Critical Care Medicine Department Clinical Centre, Maryland, USA), Prof. Daniel Kim-Shapiro (Physics, Wake Forest University, Winston-Salem, North Carolina, USA), Prof. Stephen Lippard (Massachusetts Institute of Technology, Cambridge,

Massachusetts), Prof. Stephen Koch (State University of New York at Stony Brook, New York, USA) and Prof. Penny Brothers (Auckland, New Zealand).

A highlight of the research activities of the Conradie group included a publication in the high impact factor science journal (12.4), *Nature*. (Basu, S., Grubina, R., Huang, J., Conradie, J., Huang, Z., Jeffers, A., Jiang, A., He, X., Azarov, I., Seibert, R., Mehta, A., Patel, R., King, S. B., Ghosh, A., Gladwin, M. T. & Kim-Shapiro D. B. 2007. Catalytic Generation of N_2O_3 by the Concerted Nitrite Reductase and Anhydrase Activity of Hemoglobin, *Nature Chemical Biology*, 3, 785-794).

Another key research result was published in the *Journal of the American Chemical Society*, a flagship of the American Chemical society (Jeanet Conradie, Duncan A. Quarless, Jr., Hua-Fen Hsu, Todd C. Harrop, Stephen J. Lippard, Stephen A. Koch & Abhik Ghosh. 2007. Electronic structure and FeNO conformation of nonheme iron-thiolate-NO complexes: A combined experimental and DFT study, *J. Am. Chem. Soc.* 129, 10446-10456).

Dr Conradie was invited to visit the Scientific Computing & Modelling offices in Amsterdam, the Netherlands in May 2007. During this visit, she identified three 'bugs' in the Amsterdam Density Functional (ADF) programme that led to the improvement thereof. She also paid a research visit to Prof. Ghosh at the University of Tromsø, Tromsø, Norway.

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 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 11 postgraduate students. Over 30 research articles and more than 20 conference contributions, of which ten were invited oral presentations, were produced.



Renowned guest speakers in the department are, from the left: Prof. Alexei Vinkelstein, Russia, Dr Marco Zappa, Mettler, Switzerland, Prof. Jannie Swarts, Professor at the department, and Dr Thys Botha, SASOL.

Dr Meijboom obtained a 'promising young scientist' rating from the NRF, while Dr Mtshali was successfully evaluated under the Thuthuka programme and obtained good funding for the next two years. Prof. Roodt as principal applicant successfully obtained funding of R700 000 under the NRF's Economic Growth and International Competitiveness (EGIC) programme for the next three years.

The homogeneous catalysis research 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. A highlight of this research was a paper published in the high impact factor science journal (10.2), *Angewandte Chemie, International Edition* (Ferreira, A.C., Crous, R., Bennie, L., Meij, A.M.M., Blann, K., Bezuidenhout, B.C.B., Young, D.A., Green, M.J. & Roodt, A. 2007. Borate esters as alternative acid promoters in the palladium-catalyzed methoxycarbonylation of ethylene. *Angewandte Chemie, International Edition* 46: 2273-2275.)

Similarly, the medical research focus, in collaboration with the Universities of Missouri, USA (Dr Hendrik Engelbrecht), Lund, Sweden (Profs. Ola Wendt and Ake Oskarsson), Zurich, Switzerland (Prof. Roger Alberto), CANSA (Prof. Connie Medlen, Pharmacology, UP) 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.

The equipment in the 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 visit of the RheManTec International symposium delegates from Switzerland to PETLabs Pharmaceuticals, Pretoria. Here are: Dr Gerdus Kemp, Operations Manager: PETLabs, in the white coat, and Prof. Roger Alberto, University of Zurich, Switzerland in the grey shirt.



Mr Ernie Langner, Lecturer in Physical Chemistry, demonstrates experiments to MINQUIZ delegates.

The Computational Chemistry infrastructure was significantly expanded by financial inputs from UFS senior management, the Dean of Natural and Agricultural Sciences and the Inorganic Section, to establish a computing cluster of more than 130 central processing units (CPUs). Software was obtained by support from SASOL (Dr Petrie Steynberg and Prof. Bezuidenhout). The inputs of Dr Steyl and Messrs Sakkie van Rensburg and

Albert van Eck of the UFS Computer Services Division were invaluable in this regard to establish one of the best computer clusters in South Africa.

A high-pressure stop flow unit of 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



Students busy at a glove box for super-pure experiments. From the left are: Messrs Wade Davis, Chris Joubert, Ms Nicola Barnard, and Mr Henno Gericke.

mechanisms, and makes the department the only one in South Africa with this equipment, and one of only two in the Southern Hemisphere.

Funding under the STAC/STAFF programme allowed students from the UFS and the University of Lund, Sweden, to visit each other's research facilities. Ms Alice Brink, Truidie Venter, Messrs Leo Kirsten and Inus Janse van Rensburg visited Lund during 2007. Prof. Roodt, in partnership with Prof. Ola Wendt from the Lund University, sourced R900 000 under the Swedish International Development and Co-operation Programme (SIDA) for the next three years to continue this collaboration. Ms Alice Brink attended a course on High Pressure Gas Chromatography and was the only delegate in a class of 30 (from different industries) to complete the course 'cum laude'. Mr Inus Janse van Rensburg visited High-Tech Scientific in Manchester, UK, to obtain experience in high pressure stopped flow. Later in 2007 he won the third prize for best poster presentation at the Annual Conference of the Catalytic Society of South Africa in Richards Bay. Ms Marietjie Schutte visited the group of Prof. Alberto in Zurich, Switzerland for a month early in 2007 to gain experience in nuclear medicine. Her visit was partly sponsored by the Swiss National Science Foundation.

In collaboration with Prof. Roger Alberto (University of Zurich, Switzer-

land), Prof. Roodt successfully obtained funding from the NRF and the Swiss National Science Foundation to host the first International Symposium on the chemistry of the Mn triad of elements (Rhenium, Manganese and Technetium), RheManTec, at the UFS during November 2007. More than 50 delegates from nine countries attended this very successful meeting. Ms Marietjie Schutte visited the group of Prof. Alberto for a month early in 2007, partly sponsored by the Swiss National Science Foundation.

The **Organic Chemistry** division is headed by Profs Jan van der Westhuizen, Ben Bezuidenhout and Dr Susan Bonnet. One postdoctoral associate, Dr Ivana Jarak, and 19 students supported the research during 2007. Three M.Sc. dissertations and one Ph.D. thesis were completed by the end of 2007.

A counter-current chromatographic system was purchased in 2007, making the department the only laboratory in South Africa currently to boast such equipment. Collaboration with the Agricultural Research Council (ARC) on the synthesis and purification of water soluble organic compounds depends critically on this modern system.

Three different research thrusts were identified in the Organic Chemistry group, the first being the synthesis of internal standards for pharmaceutical com-

pounds in collaboration with FARMOVS-PAREXEL (M.Sc. programme and THRIP project).

The second project involves bio-analytical chemistry in collaboration with FARMOVS-PAREXEL and Applied Biosystems (Canada) (Ph.D. programme in the identification of potentially bioactive compound from South African plants). This project is part of the Advanced Biomolecular Research Cluster of the UFS and the NRF Institutional Research Development Programme. Under this programme, the Organic section synthesised and delivered eight internal standards to FARMOVS-PAREXEL that were used to develop novel bio-analytical procedures. They also documented the synthetic procedures as standard operating procedures and supplied FARMOVS-PAREXEL with a certificate of analysis for each internal standard.

The third thrust includes flavonoid chemistry, since the UFS has a long tradition of excellence therein, which is partly funded by the wattle industry. Mr Benji Elfaki, Lecturer in Organic Chemistry at the University of Khartoum, Sudan, visited Bloemfontein for eight months in 2007 to study structure elucidation of natural products with NMR and to work on his Ph.D. thesis.

Ms Anette Allemann attended the Chemical Research Applied to World Needs (Chemrawn) XII Conference in Stellenbosch, Prof. Van der Westhuizen attended the Eighth Tetrahedron Symposium in Berlin, Germany, and Prof. Van der Westhuizen and Dr Bonnet attended the International Symposium on Advances in Synthetic and Medicinal Chemistry, in St. Petersburg, Russia.

The **Process Chemistry** thrust, which was established in early 2006, is headed by Prof. Ben Bezuidenhout, SASOL-seconded Chair in Organic Chemistry. In 2007, the group already consisted of six M.Sc. and two Ph.D. students, which includes a full-time employee of SASOL, working on a collaborative project. Apart from these, two students are shared with the Physical Chemistry division.

The focus of the Bezuidenhout group includes a sub-thrust on organometallic synthetic procedures, while other research concentrates on the production of oxygenated compounds from olefins via epoxidation utilising phthalocyanine-based catalysts, the development of improved technology for the synthesis of m-cresol from xylene, utilisation of borosaliclic

acid in organic synthesis and hydrogenation of alpha-beta unsaturated ketones.

A collaborative agreement was negotiated with HE Essential Oils, who will sponsor two student bursaries at B.Sc. honours and M.Sc. level.

Several large pieces of equipment were acquired during 2007, which include a Premix autoclave reactor to the value of R350 000, a Gas Chromatograph from SASOL to the value of R120 000, and a MALDI-TOFF spectrometer to the value of R1.8 million. The latter will assist in evaluating catalysts in their active form, and will be the second facility in the world, complemented by the utilisation of X-ray crystallography, for the characterisation of reactive organometallic catalysts.

Prof. Bezuidenhout visited Profs Cathy Cutler, Delbert Day and Dr Hendrik Engelbrecht at the University of Missouri in the USA, Prof. Deryn Fogg at the University of Ottawa, Canada, Prof. David Cole-Hamilton, University of St Andrews, Scotland and Bruker Daltonics in Bremen, Germany, and discussed mutual research collaboration, which is anticipated to commence during 2008.

The **Polymer Science** research area is headed by of Prof. Riaan Luyt in Chemistry at the Qwaqwa Campus. His group comprises nine 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 high work load.

The Luyt group has national research collaboration with Prof Walter Focke, Institute for Applied Materials, University of Pretoria (UP) which culminated in combined student research seminars held at Qwaqwa (May 2007) and the UP (September 2007), as well as with Dr Suprakas Sinha Ray, Nanotechnology Research Group, Council for Scientific and Industrial Research (CSIR). Prof. Luyt is co-supervisor of three Ph.D. students working under the supervision of Dr Ray.

Furthermore, Prof. Luyt has research collaboration under the Formal South Africa-India bilateral project on latex-based nanocomposites with Prof Sanra Thomas, Institute for Macromolecular Science and Engineering, Mahatma Gandhi University, Kottayam, India, as well as a project on polymer phase



Here are Ph.D. students Mss Nicoline Cloete (left) and Tania Hill at the microscopes, probing for high quality single crystals.

change materials with Dr Igor Krupa, Polymer Institute, Slovak Academy of Sciences, Bratislava, Slovak Republic.

Another two formal collaborations were approved by the NRF during 2007, the first being a project on nanoparticles for polymer reinforcement with Prof M. Messori, University of Modena and Reggio Emilia, Modena, Italy, and the second on the development and investigation of injection moulded, natural fibre-reinforced composites using biodegradable matrixes, with Prof. Tibor Czigany, Department of Polymer Engineering, Budapest University of Technology and Economics Budapest, Hungary.

The Luyt group hosted international visitors Prof. Bert Klumperman, Professor at the Eindhoven University of Technology, the Netherlands and Department of Science and Technology Research Professor at the Polymer Institute, University of Stellenbosch, South Africa, as well as Prof. Azman Hassan, Head of the Polymer Engineering Department, Technology University of Malaysia, Malaysia.

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.

Prof. Purcell is currently involved in 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 Emission Spectroscopy (ICP-OES), Atomic Absorption (AA) and ultraviolet (UV)/visible spectroscopy are mainly employed in the research. Preliminary investigations, in collaboration with Soil Sciences, are also involved in determining 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 UV/visible, Infrared (IR), Nuclear Magnetic

Staff

Main Campus:

Professors: Profs Steve Basson, André Roodt, Jannie Swarts, Ben Bezuidenhout

Affiliated Professors: Profs Daneel Ferreira, Rui Carvalho, Tinus van der Merwe, Ken Swart

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

Affiliated Associate Professor: Prof. Fanie Otto

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

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

Junior Lecturer: Dr Thato Mtshali, Ms Rebotsamang Shago

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

Senior Professional Officers: Dr Gabre Kemp, Mr Wade Davis, Ms Ina du Plessis

Professional Officers: Mss Magda van Tonder, Annette Alleman, Anke Wilhelm

Assistant Professional Officers: Mr Michael Coetzee, Ms Nicoline Cloete

Supervisory Technician: Mr Charles Smith

Senior Administrative Officer: Ms Tessa Swarts

Administrative Officers: Mss Marietjie Havenga, Alet van Rooyen, Alice Stander

Technical Assistants: Messrs Jafta Masedi, Solly Leroala, Daniel Fish, Henry Ramokone, Ms Jeanette Mmope

Messenger: Ms Maria Seithisho

Qwaqwa Campus:

Professor: Prof. Riaan Luyt

Lecturers: Mss Moipone Mokoena, Buyiswy Jacobs, Messrs Tsietsi Tsoetsi, Percy Hlangothi

Junior Lecturers: Mss Dorine Dikobe, Mpondi Stuurman, Mr Rantooa Moji

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Resonance (NMR), Cyclic-Voltammetry, Quantum Computational Chemistry (ADF & Gaussian) and X-ray Crystallography are employed in these studies.

Co-operation with NECSA was established and they are currently funding an M.Sc. student research project on the establishment of digestion methods and element quantification in plasma dissociated and natural zircon. NECSA further funded a new hydrogen fluoride (HF)-resistant plasma burner for the ICP which will allow the Analytical section to become the preferred Zr-F analytical facility for the Advanced Metals Initiative (AMI) of the South African Department of Science and Technology (DST). New ICP-OES and AA spectrophotometers were introduced into the Analytical section and two students are currently doing their research, mainly using these pieces of equipment. Mr Steven Lötter, M.Sc. student, attended a week-long course on the practical aspects of ICP in Pretoria in August 2007.

Dr Von Eschwege, a Thuthuka grant holder, was successful in his application for

the NRF's Institutional Research Development Programme (IRDP) funding under the Nanotechnology focus area. He was also awarded the Bruker prize for best Ph.D. student in 2007, and attended the "Summer School on Quantum Computing and Information" held in Durban during January 2007 and the Bruker NMR Seminar thereafter. Dr Von Eschwege also hosted Prof. Andrew Crouch of the University of Stellenbosch, who explored cooperation possibilities in his research field involving new dithizonato ligands.

Additional research related outputs:

Prof. Roodt, as member of the Executive Committee of the European Crystallographic Association (ECA), attended the Executive Meetings in Manchester, UK (February 2007) and Marrakech, Morocco in August 2007, as member of the International Scientific Committee of 24th European Crystallographic Meeting. He served as Chairperson of the committee awarding the

prestigious Max Perutz Prize of the ECA, which was presented to Prof. Dave Stuart of Oxford University, UK. Prof. Roodt further served on the THRIP panel for 'Process Manufacturing' of the South African NRF, and also acted as Inorganic Editor for the South African Journal of Chemistry, 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*.

Dr Bonnet visited the University of Mississippi in the USA (Prof. Daneel Ferreira) for a month in April 2007 and studied synthetic techniques and the synthesis flavonoids, while Prof. Van der Westhuizen visited Prof. Herbert Kolodziej in Münster, Germany to discuss pharmaceutical collaboration.

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

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Conference contributions

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of Pure and Applied Chemistry (IUPAC), Stellenbosch, South Africa. 2-5 December.

Brink, A., Cloete, N., Roodt, A. & Visser, H.G. 2007. *Ring a ring of roses, a pocket full of phosphines*. Oral presentation at the RheManTec International Symposium on the Mn-triad in Life Sciences and Catalysis, Bloemfontein, South Africa. 19-24 November.

Brink, A., Roodt, A. & Visser, H.G. 2007. *The effect of group 15 ligands on selective rhodium(I) model complexes*. Poster presented at the Conference of the Catalysis Society of South Africa (CATSA), Richards Bay, South Africa. 11-14 November.

Coetzee, M.P., Venter, J.A. & Purcell, W. 2007. *[Rh(LL)(CO)(DPP)] as potential catalytic model*. Oral presentation at the Symposium in the Natural Sciences, University of Pretoria, South Africa. 2 November.

Conradie, J. & Conradie, M.M. 2007. *Chemical kinetics and stereochemistry of the reaction mechanism of Rh(I)-beta-diketonato complexes [Rh(C₅H₄SCoCHCOR)-(CO)(PPh₃)] with iodomethane: An NMR study*. Oral presentation at Bruker NMR User Meeting, Coffee Bay, South Africa. 24-26 January.

Dikobe, D.G. & Luyt, A.S. 2007. *Thermal and mechanical properties of PP/EVA-WF and MAPP/EVA-WF polymer blend composites*. Poster presented at the International Conference on Natural Polymers, Bio-Polymers, Bio-Materials, their Composites, Blends, IPNS and Gels: Macro to Nano Scale, Mahatma Gandhi University, Kottayam, India. 19-22 November.

Han, Z., Bonnet, S.L. & Van der Westhuizen, J.H. 2007. *Synthesis of xanthine derivatives by photochemical transformations of pentoxifylline: A bidentate chromophore*. Poster presented at the International Symposium on Advances in Synthetic and Medicinal Chemistry of the European Federation for Medicinal Chemistry (EFMC), St Petersburg, Russia. 27-31 August.

Janse van Rensburg, J.M., Muller, A. & Roodt, A. 2007. *Kinetic studies on various rhodium(I) oxinato phosphine complexes*. Poster presented at the Conference of the Catalysis Society of South Africa (CATSA), Richards Bay, South Africa. 11-14 November.

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Kirsten, L., Steyl, G. & Roodt, A. 2007. *Rhodium carboxylato phosphite and phosphonite complexes as catalysts*. Oral presentation at the RheManTec International Symposium, Bloemfontein, South Africa. 19-24 November.

Luyt, A.S. & Dikobe, D.G. 2007. *Thermal and mechanical properties of PP/EVA-WF and MAPP/EVA-WF polymer blend composites*. Oral presentation at the Fibre Reinforced Composites Conference 2007, Port Elizabeth, South Africa. 9-12 December.

Luyt, A.S. & Mngomezulu, M.E. 2007. *Phase change materials based on polyethylene, paraffin*

wax and wood flour. Invited oral presentation presented at the International Conference on Natural Polymers, Bio-Polymers, Bio-Materials, their Composites, Blends, IPNS and Gels: Macro to Nano Scale, Mahatma Gandhi University, Kottayam, India. 19-22 November.

Luyt, A.S., Mishra, A.K. & Mishra, S.B. 2007. *Effect of sol-gel derived nano-silica on the thermal and mechanical properties of low-density polyethylene/wood fibre composites.* Oral presentation at the 3rd China-Europe Conference on Processing and Properties of Reinforced Polymers, Budapest University of Technology & Economics, Budapest, Hungary. 11-15 June.

Luyt, A.S., Mishra, S.B. & Mishra, A.K. 2007. *Influence of organic peroxides on morphology and properties of EVA-organoclay nanocomposites.* Oral presentation at the 46th Micro Symposium On Nanostructured Polymers And Polymer Nanocomposites, Academy of Sciences of the Czech Republic, Prague, Czech Republic. 8-12 July.

Mavunkal, I.J., Noll, B.C., Meijboom, R., Muller, A. & Felner, T.P. 2007. *Hypoelectronic clusters: Are they deviant clusters or part of the same class?* Oral presentation at the RheManTec International Symposium on the Mn-triad in Life Sciences and Catalysis, Bloemfontein, South Africa. 19-24 November.

Meijboom, R. 2007. *Pandora's box and Medusa's molecule – dendrimers as drug delivery vehicles.* Oral presentation at the RheManTec International Symposium on the Mn-triad in Life Sciences and Catalysis, Bloemfontein, South Africa. 19-24 November.

Mogudi, B.M., Meijboom, R. & Roodt, A. 2007. *Phosphite modified cobalt catalysts for 1-alkene hydroformylation.* Poster presented at the Conference of the Catalysis Society of South Africa (CATSA), Richards Bay, South Africa. 11-14 November.

Montsho, R.M., Bonnet, S.L. & Van der Westhuizen, J.H. 2007. *The reaction between α -keto acids and phloroglucinol.* Poster presented at the International Symposium on Advances in Synthetic and Medicinal Chemistry of the European Federation for Medicinal Chemistry (EFMC), St Petersburg, Russia. 27-31 August.

Mtshali, T., Purcell, W. & Basson, S.S. 2007. *A Crystallographic and kinetic study of the formation of tricyanonitrido ($\kappa^3\text{N}_3\text{O}$)rhenate(V) ions.* Oral presentation at the RheManTec International Symposium on the Mn-triad in Life Sciences and Catalysis, Bloemfontein, South Africa. 19-24 November.

Roodt, A. 2007. *Implications for nuclear medicine from mechanistic studies on substitution reactions in complexes of the manganese triad.* Keynote lecture presented at the RheManTec International Symposium on the Mn-triad in Life Sciences and Catalysis, Bloemfontein, South Africa. 19-24 November.

Roodt, A. 2007. *Solving difficult coordination chemistry problems with multi-nuclear NMR.* Invited oral presentation at Bruker NMR User Meeting, Coffee Bay, South Africa. 24-26 January.

Roodt, A. & Botha, J.M. 2007. *Implications for nuclear medicine from a kinetic and high-pressure mechanistic study on substitution in Re(V) and Tc(V) complexes.* Invited oral presentation at the 4th Cancer Association of South Africa (CANSA) Colloquium, Pretoria, South Africa. 2-4 September.

Roodt, A., Meijboom, R. & Venter, G.J.S. 2007. *Supramolecular coordination chemistry of silver phosphine complexes.* Invited oral presentation at the Inorganic Chemistry Conference INORG 007, Conference of the South African Chemical Institute, Club Mykonos, Langebaan, South Africa. 8-12 July.

Schutte, M., Roodt, A. & Visser, H.G. 2007. *Rhenium(I) compounds in nuclear medicine: Crystallographic and kinetic investigation of different $[\text{Re}(\text{CO})_3(\text{L1})(\text{L2})]^+$ complexes.* Oral presentation at the RheManTec International Symposium on the Mn-triad in Life Sciences and Catalysis, Bloemfontein, South Africa. 19-24 November.

Steyl, G. 2007. *UFS-HPC and chemistry: A review.* Invited oral presentation at the National Super Computing Congress (CHPC), Cape Town, South Africa. 3-5 December.

Steyl, G., Roodt, A. & Engelbrecht, H.P. 2007. *Spectroscopic and theoretical investigation of the isomerisation of $[\text{Re}(\text{O})_2(\text{Eten})_2]^+$ and related complexes.* Oral presentation at the

RheManTec International Symposium, Bloemfontein, South Africa. 19-24 November.

Steyn, M., Steyl, G. & Roodt, A. 2007. *Speciation and interconversion mechanism of mixed fluoro and O,O- and O,N-bidentate ligand complexes of Zirconium.* Oral presentation at the RheManTec International Symposium on the Mn-triad in Life Sciences and Catalysis, Bloemfontein, South Africa. 19-24 November.

Swarts, J.C. 2007. *An overview of metallocene-containing anticancer drugs.* Invited oral presentation at the 4th Cancer Association of South Africa (CANSA) Colloquium, Pretoria, South Africa. 2-4 September.

Venter, G.J.S., Meijboom, R. & Roodt, A. 2007. *Silver(I) coordination with group 15 ligands and the ligand exchange mechanism.* Oral presentation at the RheManTec International Symposium on the Mn-triad in Life Sciences and Catalysis, Bloemfontein, South Africa. 19-24 November.

Venter, G.J.S., Roodt, A. & Meijboom, R. 2007. *Coordination of selective coin metals by group 15 ligands and the ligand exchange mechanism.* Oral presentation at the DST-NRF c*change Symposium, Richards Bay, South Africa. 9-10 November.

Venter, G.J.S., Roodt, A. & Meijboom, R. 2007. *Silver(I) complexes with group 15 ligands: Model hydroformylation catalysts?* Poster presented at the Conference of the Catalysis Society of South Africa (CATSA), Richards Bay, South Africa. 11-14 November.

Venter, J.A., Basson, S.S. & Purcell, W. 2007. *Evaluation of ligand and solvent effects on a potential catalyst using a rhodium cupferrate system as model.* Oral presentation at the RheManTec International Symposium on the Mn-triad in Life Sciences and Catalysis, Bloemfontein, South Africa. 19-24 November.

Visser, H.G., Kemp, G., Schutte, M. & Roodt, A. 2007. *Rhenium(I) carbonyl complexes as model radiopharmaceuticals.* Oral presentation at the RheManTec International Symposium on the Mn-triad in Life Sciences and Catalysis, Bloemfontein, South Africa. 19-24 November.



Prof. Janse Tolmie

Department of Computer Science and Informatics

Overview

The efforts of the Department of Computer Science and Informatics are geared towards contributions on three fronts: research, IT-related training and community service. The department is represented on the Main and Vista Campuses in Bloemfontein and on the Qwaqwa Campus.

A highlight of the year was the participation in a virtual conference on the Digital Divide as part of Accenta – a week-long Expo held in Belgium. Video conferencing facilities were used and presentations were made both in Bloemfontein and in Ghent. The conference was concluded with the signing of a memorandum of understanding between the UFS and the University of Ghent.

The department has trained thousands of students in computer literacy and students in more advanced IT topics such as Internet Programming, Databases, Software Engineering, etc. More than 40 honours students were registered at the department in 2007, while 16 international students were hosted: six enrolled for M.Sc., eight for B.Sc. Honours and two for B. Com. Honours.

Human-computer Interaction (HCI) is one of the department's main research focuses and some interesting research in this area was conducted in 2007. The department is the proud owner of eye-tracking equipment that enables it to determine the gaze patterns of a person looking at a computer screen. A combined project is run with the Department of Occupational Therapy at the UFS to analyse the problems of sensory integration amongst young children. A framework has been developed which can identify limitations with regard to mid-line crossing and other perceptual problems at a very early stage. Another project involves the testing of chess players by giving them on-screen problems to solve.

The department is in the process of setting up a framework, which will enable chess trainers to identify perceptual and diagnostic shortcomings of their students. Other promising research involves the quantification of usability evaluations. Numerous international publications in HCI were delivered.

Research conducted in the field of Data Warehousing focused on the application of this technology in the context of a developing country. Publications were presented at international conferences in Portugal, the United Kingdom (UK) and Canada.

After completing her Ph.D. in 2005 (related to meaningful blended learning in an IT teaching environment), Dr Liezel Nel continued the direct application and continual integration of her research results in the classroom. By applying her own process planning model (devised in her Ph.D. study) in an action research setting, she has continued her search for the optimal use of blended learning to encourage student contact/interaction and enhance the student learning experience as a whole. Some of her research findings were presented at conferences in South Africa and Italy.

The department offered a number of short computer literacy courses to the community on the Vista Campus. There seems to be a high demand for these courses and the department is looking at expanding its arsenal of short courses for use at both the Main and Qwaqwa Campuses. Staff from the department also took part in a project aimed at training previously disadvantaged learners.



Three staff members of the department presented papers at the international HCI Human-computer Interaction (HCI) conference in Beijing, China. Here are, from the left: Mr Andries Burger, Prof. Pieter Blignaut, Mr Aaron Marcus, a renowned HCI researcher, and Ms Engela Dednam.



Staff from the department took part in a virtual video conference on the Digital Divide as part of Accenta – a week-long expo held in Belgium, in which Bloemfontein and the Free State were guests of honour. At the video conference broadcast from the Main Campus in Bloemfontein are, from the left: Profs. Janse Tolmie, Departmental Chairperson, Hendri Kroukamp, Programme Director of Public Management at the UFS, Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS, and Pieter Blignaut, Professor at the department and co-ordinator of the video conference.



The department's eye tracker registers the eye fixations of computer users. The UFS is the first tertiary institution in Africa to acquire this apparatus.

Staff

Main Campus:

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

Senior Lecturers: Dr Lizette de Wet

Lecturers: Drs Liezel Nel, Anelize Van Biljon, Ms Engela Dednam, Messrs Andries Burger, Deon du Plessis, Dana Kotze, Eduan Kotze, Wynand Nel.

Junior Lecturers: Messrs Rouxan Fouche, Jaco Marais

Administrative Officers: Mss Marina Botha, Erna Dippenaar, Coreen Human

Technical Officers: Messrs Jacob Buys, Stefan Coetzee

Qwaqwa Campus:

Junior Lecturers: Mss Nidhi Mary-John, Ruth Wario, Messrs Jacques Eyesele, Molapo Jonathan, Isaac Mokhotla, Frederick Mudavanhu, Fani Radebe, Benedict Sebastian

Technical Officer: Mr Teboho Lesesa

Vista Campus:

Lecturers: Ms Nancy de Sousa

Junior Lecturers: Messrs Timothy Mahloko, Ray Shih

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Research outputs

Research articles

Blignaut, P.J., Dednam, E.H. & Beelders, T.R. 2007. Die opleiding van persone uit benadeelde groepe in rekenaar gebruik: Is die afstand nie té groot om te oorbrug nie? *Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 26(3): 216-235.

Messerschmidt, J.J.E. & Messerschmidt, H.J. 2007. Beeldskemas van tydskuur: Die polisemiese aard van terwyl, onderwyl en wyl. *Southern African Linguistics and Applied Language Studies* 25(1): 57-73.

Chapters in books

Du Plessis, D. & Mc Donald, T. 2007. The double wave data warehouse lifecycle model. In *Data Mining VIII: Data, Text and Web Mining and their Business Applications*, edited by A. Zanasi, C.A. Brebbia & N.F.F. Ebecken. New Forest, UK: WIT Press. pp.105-114.

Conference contributions

Beelders, T.R., Blignaut, P.J., McDonald, T. & Dednam, E. 2007. *The impact of different icon sets on the usability of a word processor*. Proceedings of the 12th International Conference on Human-Computer Interaction (HCI), Beijing, China. 22-27 July. pp. 250-257.

Burger, A.J. & Blignaut, P.J. 2007. *Predicting the outcome of a computer literacy course based on a candidate's personal characteristics*. Proceedings of the 12th International Conference on Human-Computer Interaction (HCI), Beijing, China. 22-27 July. pp. 173-182.

Dednam, E.H., Blignaut, P.J. & Dippenaar, G.J.J. 2007. *Is it necessary to create new icons for African users of Office packages?* Proceedings of the 12th International Conference on Human-Computer Interaction (HCI), Beijing, China. 22-27 July. pp. 279-283.

Du Plessis, D. & Mc Donald, T. 2007. *Challenges in building and maturing of a telecommunications business intelligence solution in a developing country*. Proceedings of the 18th Annual Information Resources Management Association (IRMA) International Conference, Vancouver, Canada. 19-23 May.

Du Plessis, D. & Mc Donald, T. 2007. *Strategic framework to implement a telecommunications business intelligence solution in a developing country*. Proceedings of the 9th International Conference on Enterprise Information Systems (ICEIS 2007), Funchal, Portugal. 12-16 June.

Du Plessis, D. & Mc Donald, T. 2007. *The double wave data warehouse lifecycle model*. Paper presented at the 8th International

Conference on Data, Text and Web Mining and their Business Applications including Information Engineering Management, The New Forest, UK. 18-20 June.

Kotze, E. & Mc Donald, T. 2007. *Challenges in developing a data warehouse to manage the rollout of antiretroviral therapy in a developing country*. Proceedings of the 18th Annual Information Resources Management Association (IRMA) International Conference, Vancouver, Canada. 19-23 May.

Mc Donald, T. & Blignaut, P.J. 2007. *Search string analysis from a socio-economic perspective*. Proceedings of the 12th International Conference on Human-Computer Interaction (HCI), Beijing, China. 22-27 July. pp. 234-242.

Nel, E. 2007. *Communication and interaction in the blended learning environment: Perspectives gained in an action inquiry*. Paper presented at the Higher Education Learning and Teaching Association of South Africa (HELTASA) Conference, Central University of Technology, Bloemfontein, South Africa. 19-21 November.

Nel, L. & Wilkinson, A. 2007. *Blended learning, collaboration and cultural diversity: South African perspectives*. Paper presented at the Annual Conference of the European Distance and E-Learning Network Secretariat (EDEN 2007), Naples, Italy. 13-16 June.



Prof. Johan Spies

Department of Genetics

Overview

The Department of Genetics was re-established as an independent department on 1 October 2007, after having been a division of the Department of Botany and Genetics (1989-2001) and then a division of the Department of Plant Sciences (2002-2007). Prof. Johan Spies was elected as the first Chairperson of the new department.

The mission of the department is to acquire and disseminate knowledge on Genetics to the benefit of all. This is done by research, tuition at under- and postgraduate levels, and by community service.

During 2007 Mr Frank Maleka joined the department as Lecturer in Molecular Genetics. He completed his M.Sc. thesis at the University of Pretoria (UP) under the guidance of Profs Zander Myburg and Paulette Bloomer.

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

Prof. Antoinette Kotze is a council member of SAWMA, chairperson of the African Association of Zoos and Aquariums Research and Monitoring Working Group, chairperson of the National Zoological Gardens of South Africa Research and Ethics Committee, serves on the board of directors of the Mabula Ground Hornbill Research and Conservation Project, steering committee member of the South African Biodiversity Information Facility, member of the National Cheetah Conservation Forum and member of the management of the Vulture Conservation Programme.

Various national and international congresses were attended during the year. On international level, Prof. Spies delivered the keynote address at the Annual General Meeting of the Clivia Society. Six of his postgraduate students also attended the meeting. The Annual Meeting of the Society for Conservation Biology (SCB), which was held at the Nelson Mandela Metropolitan University in Port Elizabeth, was attended by Profs Grobler and Kotze. Prof. Kotze also attended the 6th Inter-

national Zoo and Wildlife Research Conference on Behaviour, Physiology and Genetics in Berlin, Germany.

On national level, Profs Grobler and Kotze attended the Annual Meeting of SAWMA at Didima Camp in the Drakensberg Reserve where they chaired sessions. Prof. Kotze also attended the 18th Annual Conference of the African Association of Zoos and Aquariums at Plettenberg Bay and the 2nd Conference of the Animal Keepers Association of Africa at Ushaka Seaworld, Durban, where she was an invited speaker.

Research on *Lachenalia* resulted in an invitation to Ms Paula Spies, a doctoral student in the department, to present a paper at the fourth Monocot Symposium during 2008. This paper will conclude the research on *Lachenalia*. A study on genetic diversity in different *Clivia* species and the possible application of these results in forensics, is currently being conducted. Research on the genes involved in the formation of flower colour in *Clivia* is also progressing well.

The animal genetics team of Profs Grobler, Kotze and Ms Karen Ehlers is conducting 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 (Pretoria);
- the National Museum (Bloemfontein), and conservation officers from the Free State and KwaZulu-Natal), a DNA profiling of black rhino in the Weenen Game Reserve (together with Ezemvelo KZN Wildlife), the genetic management of baboon populations (in collaboration with the Gauteng Department of Agriculture);
- a national genetic database for cheetah (in collaboration with the National Zoological Gardens, Pretoria, the Department of Genetics at the UP, the De Wildt Cheetah and Wildlife Trust, and the Hillsdale College, USA), population management of crane species (in collaboration with the National Zoological Gardens, Pretoria; and
- the Endangered Wildlife Trust), genetic and population studies on ground hornbills (in collaboration with the National Zoological Gardens, Pretoria, and the Endangered Wildlife Trust, Ground Hornbill Working Group.

Staff

Professor: Prof. Johan Spies

Associate Professor: Prof. Paul Grobler

Affiliated Associate Professor: Prof. Antoinette Kotze

Lecturers: Dr Adèle Strydom, Ms Karen Ehlers, Mr Frank Maleka

Professional Officer: Ms Susan Reinecke

Administrative Officer: Ms Beverley Henn

Contact details

Prof. Johan Spies

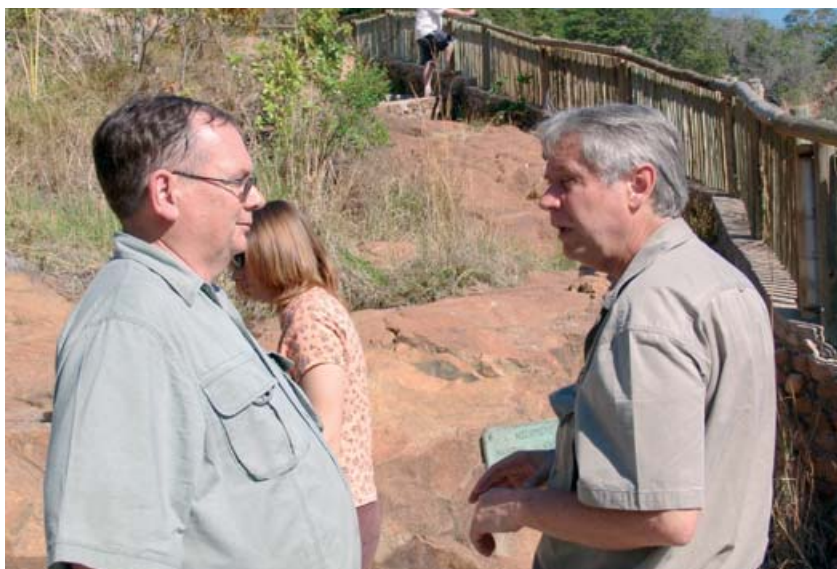
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Prof. Johan Spies (left), Departmental Chairperson, in conversation with Mr Willem Froneman, Director of the Lowveld National Botanical Garden, Nelspruit.



Prof. Trudy Turner (left) of the University of Wisconsin-Milwaukee, United States of America (USA) and Ms Letecia Jonker, M.Sc. student of the department, busy with measurements and collection of material from a sedated vervet monkey.

Other projects by the animal genetics team are: The Mabula Ground Hornbill Research and Conservation Project, (UP), the compilation of an atlas for haemoglobin profiles in wildlife (in collaboration with BIORAD, Germany, SANParks, and the University of Limpopo), white rhino conservation and genetics (in collaboration with the Mpumalanga Tourism and Parks Agency), genetic variation in freshwater mussels from Botswana and an investigation of the geographic genetic structure among vervet monkeys populations, to regulate the release of monkeys from

sanctuaries (University of Wisconsin-Milwaukee, USA).

Prof. Trudy Turner of the Department of Physical Anthropology at the University of Wisconsin-Milwaukee, USA, visited the department in February and again in July 2007. During the February visit she presented a seminar and conducted a joint field trip with Prof. Grobler and postgraduate students, to collect vervet monkey samples near Kimberley. In July she accompanied Prof. Grobler and another group of postgraduate students to sample vervet monkeys in the Upington area.

Another visitor to the department was Mr Jess Jones of the Department of Fisheries and Wildlife Sciences at Virginia Tech, Blackburg, USA. Mr Patrick Schwab from the University of Kiel in Germany also visited the department.

Prof. Spies acts as information officer for the distribution of knowledge obtained during the research of *Clivia* and handles many enquiries from *Clivia* breeders. Prof. Grobler presented in-service training to agricultural educators (teachers) in the province, to improve knowledge on basic and applied genetics.

Research outputs

Research articles

Kinahan, A.A., Ingle-Moller, R., Bateman, P.W., Kotze, A. & Scantlebury, M. 2007. Body temperature daily rhythms and adaptations in African savanna elephants (*Loxodonta africana*). *Journal of Physiology & Behaviour* 92: 560-565.

Strydom, A., Kleynhans, R. & Spies, J.J. 2007. Amaryllidaceae: Chromosome studies on African plants 20: Karyotypes of some *Cyrtanthus* species. *Bothalia* 36: 103-108.

Chapters in books

Hallerman, E.M., Grobler, J.P. & Jones, W.J. 2007. Application of DNA markers for population genetic analysis. In *Aquaculture Genome Technologies*, edited by J. Liu. Ames, Iowa (USA): Blackwell Publishing. pp. 109-136.

Conference contributions

Grobler, J.P., Kotze, A., Ehlers, K., Bloomer, P., Rushworth, I., Brink, J. & Vrahimis, S. 2007. Hybridization between black- and blue wildebeest (*Connochaetes gnou* and *C. taurinus*): Approaches to the genetic management of sympatric congeners. Poster presented at the 21st Annual International Meeting of the Society for Conservation Biology (SCB), Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 1-5 July.

Ingle-Moller, R., Kinahan, A. & Kotze, A. 2007. The use of captive African savanna elephants at the National Zoological Gardens of South Africa to determine temperature regulation. Paper presented at the 18th Annual Conference of the African Association of Zoos & Aquaria (PAAZAB), Plettenberg Bay, South Africa. 30 May-1 June.

Jones, J., Grobler, J.P., Neves, R. & Hallerman, E.M. 2007. Complex patterns of genetic variation in freshwater mussels (*Bivalvia: Unionidae*) of the United States: implications for conservation genetic studies. Poster presented at the 21st Annual International Meeting of the Society for Conservation Biology (SCB), Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 1-5 July.

Kleynhans, R., Spies, J.J. & Spies, P. 2007. Cross-ability in the genus *Lachenalia*. Paper presented at the 6th International Symposium on New Floriculture Crops, Madeira, Portugal. 11-15 June.

Kotze, A. 2007. Community-based research approaches to biodiversity conservation. Key-note address presented at the Gauteng Nature Conservation Research Symposium, Suikerbosrand Nature Reserve, Gauteng, South Africa. 15-16 November.

Kotze, A. 2007. The importance of research in animal facilities. Invited paper presented at



Prof. Paul Grobler, Associate Professor at the department, busy collecting material from a vervet monkey as part of a study on phylogeography of vervet monkeys.

the 2nd Conference of the Animal Keepers Association of Africa, Ushaka Seaworld, Durban, South Africa. 14-15 August.

Kotze, A., Grobler, J.P. & Ehlers, K. 2007. An investigation of the origin of cheetah translocated into South Africa. Poster presented at the 21st Annual International Meeting of the Society for Conservation Biology (SCB), Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 1-5 July.

Kotze, A., Grobler, J.P., Ehlers, K., Bloomer, P., Rushworth, I., Brink, J. & Vrahimis, S. 2007. Wildebeest hybridization in South Africa. Paper presented at the 6th International Zoo and Wildlife Research Conference on Behaviour, Physiology and Genetics, Berlin, Germany. 7-10 October.

Lane, E.P., Kotze, A., Espie, I. & Bartels, P. 2007. Wildlife disease monitoring at the National Zoological Gardens, South Africa. Paper presented at the 25th Annual Meeting of the European Society for Veterinary Pathology, Munich, Germany. 29 August - 1 September.

Lane, E.P., Michel, A., Espie, I., Gey van Pittius, N.C. & Kotze, A. 2007. Case report: Mycobacterium xenopi mesenteric lymph node adenitis in an adult Black and White Ruffed Lemur (*Varecia variegata*). Poster presented at the 25th Annual Meeting of the European

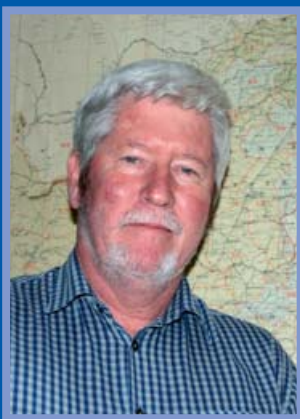
Society for Veterinary Pathology, Munich, Germany. 29 August - 1 September.

Reiter, B., Lekgethisho, D., Kotze, A. & York, D. 2007. Genetics and zoos: An overview of the Genetics Unit of the National Zoological Gardens of South Africa. Paper presented at the 18th Annual Conference of the African Association of Zoos & Aquaria (PAAZAB), Plettenberg Bay, South Africa. 30 May - 1 June.

Schwab, P., Witt, T., Hartl, G. & Grobler, J.P. 2007. Genetic diversity in South African impala (*Aepyceros melampus*). Poster presented at the 21st Annual International Meeting of the Society for Conservation Biology (SCB), Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 1-5 July.

Spies, J.J. 2007. Clivia research at the University of the Free State. Keynote address presented at the Annual General Meeting of the Clivia Society, Bloemfontein, South Africa. 12 May.

Turner, T., Lorenz, J., Whitten, P., Jacquier, M., McAuliffe, K., Beller, D. & Grobler, J.P. 2007. Genetics, taxonomy and conservation of vervet monkeys in South Africa. Poster presented at the 21st Annual International Meeting of the Society for Conservation Biology (SCB), Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 1-5 July.



Prof. Peter Holmes

Department of Geography

Overview

The Department of Geography continued to grow its student numbers significantly on both the Main Campus in Bloemfontein and the Qwaqwa Campus. While undergraduate teaching demanded considerable input from academic staff, postgraduate teaching and supervision was not left behind. Published research outputs and conference attendance reflect departmental inputs in the increasingly important area of research. The department continued to align itself with the strategic aims of the university.

A highlight of 2007 was the creation of a new postgraduate study facility in the Geography building on the Main Campus with ten individual cubicles for honours, masters and doctoral students. All of these were equipped with network points and computers. In addition, secure locker space was made available to postgraduate students. The idea behind this considerable capital investment on the part of the department is to encourage postgraduate students to base themselves within the department, thereby promoting a culture of research.

The numbers of postgraduate students remained positive, with five doctoral students (including one from Malawi), 11 masters and 14 honours students registered across the two campuses in 2007. The honours students again attended the annual Student Conference which preceded the conference of the Society of South African Geographers in Port Elizabeth.

The Geographical Information Systems (GIS) laboratory, under the direction of Dr Charles Barker, was further expanded, bringing the number of GIS-dedicated computers to 35. The laboratory continues to run, under license and direct purchase, the latest and most up-to-date GIS software. Interactive on-screen teaching ensures optimal interaction between instructor and student. GIS is increasingly perceived by students as a potential career direction, and the department's GIS resources are fully engaged, with limited capacity for expansion.

International visitors to the department included Prof. Margaret Marker from the University of Oxford in the United Kingdom (UK). She and Prof. Peter Holmes, Departmental Chairperson, visited the ULCO quarry and cement works in the Northern Cape to investigate limestone tufas. This visit was followed by a second, consecutive annual visit by Dr Giles Wiggs, also from the University of Oxford. Dr Wiggs is an expert on

aeolian sediment transfer and is a principal collaborator on a National Research Fund (NRF) initiative into environmental change in the western Free State under the leadership of Prof. Holmes. Drs Mark Bateman from the University of Sheffield in the UK and Andrew Carr from the University of Leicester in the UK, also visited the Main Campus. They undertook fieldwork on coastal dune evolution in the southern and eastern Cape as part of an ongoing research initiative with Prof. Holmes. After this the trio attended the biennial conference of the Southern African Society for Quaternary Research (SASQUA) in Howick, KwaZulu-Natal.

Profs Holmes and Visser presented papers at international and local conferences during the year. Prof. Holmes attended the XVII INQUA Congress in Cairns, Australia where he presented a paper and was co-author of two other presentations. The abstracts were published in *Quaternary International* (2007) volumes 167-168. He also presented a paper and was co-author of two others at the biennial conference of SASQUA in Howick,



Honours students Mr Tshupo Moselesele (left) and Ms Molalao Rabumbulu investigating wind erosion and wind-blown dunes near Florisbad in the Free State province.

KwaZulu-Natal. Prof. Visser presented papers at international conferences in Ghent in Belgium, Amsterdam in the Netherlands and at the biennial conference of the Society of South African Geographers in Port Elizabeth. Mrs Tobeka Mehlomakulu also attended the conference of the Society of South African Geographers and presented a paper.

Community service continued to manifest itself in terms of Prof. Willie van Zyl and Mr Alex Adjei's tourism training initiative. Prof. Visser continued to serve as a member of the Standards Generating Body for Geography. He was also elected as President of the Society of South African Geographers. Both the Qwaqwa Campus and the Main Campus were actively involved in hosting Geography learners from various Free State and Northern Cape high schools.

Dr Hennie Claassen was re-elected as subject head on the Qwaqwa Campus. Mr Pululu Mahasa took over a vacancy on the Qwaqwa Campus on a contract basis. Prof. Van Zyl was seconded to a management position on the Qwaqwa Campus.

On the Main Campus in Bloemfontein, Mr Gijsbert Hoogendoorn was appointed to a one-year contract position, thus helping to relieve the teaching load which resulted from a large increase in the number of first-year students. Ms Eldalize Kruger continued to carry the responsibility for environmental management courses, an important facet of the department's academic profile.

Mrs Sheila Vrahimis continued to work with large numbers of students in the four-year B.Sc. degree programme, while Mrs Tobeka Mehlomakhulu convened the honours class on the Main Campus.



Prof. Peter Holmes, Departmental Chairperson, attended INQUA XVII in Cairns, Queensland, Australia. Behind him is one of the famous Glasshouse Mountains, an exhumed volcanic plug.

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 Cronjè

Qwaqwa Campus:

Associate Professor: Prof. Willie van Zyl (on secondment in 2007)

Senior Lecturer: Dr Hennie Claassen

Lecturer: Mr Alex Adjei

Junior Lecturer: Mr Pululu Mahasa

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Research outputs

Research articles

Carr, A.S., Bateman, M.D. & Holmes, P.J. 2007. Developing a 150 ka luminescence chronology for the barrier dunes of the Western Cape, South Africa. *Quaternary Geochronology* 2: 110-116.

De Villiers, G.D.U.T., Viljoen, M.F. & Booysen, H.J. 2007. Standaard residensiële vloedskadefunksies vir Suid-Afrikaanse toestand. *S.A. Tydskrif vir Natuurwetenskap en Tegnologie* 26(1): 26-36.

Ferreira, S. & Visser, G. 2007. Creating an African Riviera: Revisiting the impact of the Victoria and Alfred Waterfront development in Cape Town. *Urban Forum* 18(3): 227-246.

Holmes, P.J., Bateman, M.D., Carr, A.S. & Marker, M.E. 2007. The place of aeolian coversands in the geomorphic evolution of the southern Cape coast, South Africa. *South African Journal of Geology* 110: 125-136.

Hoogendoorn, G. & Visser, G. 2007. The evolving South African neighbourhood: The case of Westdene, Bloemfontein. *Urban Forum* 18(4): 329-349.

Visser, G. 2007. Homonormalising (white) heterosexual middle-class leisure spaces: The case of white gay men in Bloemfontein, South Africa. *International Journal of Diversity in Organisations, Communities and Nations* 7(1): 217-228.

Visser, G. 2007. On citations, rating games and other pesky animals: Which zoo for South African human geography? *South African Geographical Journal* 89(2): 135-144.

Visser, G. 2007. Urban tourism in Bloemfontein: Current dynamics, immediate challenges and future prospects. *Urban Forum* 18(4): 351-370.

Chapters in books

Hoogendoorn, G., Mellett, R. & Visser, G. 2007. Second homes tourism in Africa: Reflections on the South African experience. In *Urban tourism in the developing world: The South African experience*, edited by C.M. Rogerson & G. Visser. New Brunswick, London: Transaction Press. pp. 127-166.

Rogerson, C.M. & Visser, G. 2007. International tourism flows and urban tourism in South Africa. In *Urban tourism in the developing world: The South African experience*, edited by C.M. Rogerson & G. Visser. New Brunswick, London: Transaction Press. pp. 41-56.

Rogerson, C.M. & Visser, G. 2007. Tourism in urban Africa: Setting the scene. In *Urban tourism in the developing world: The South African experience*, edited by C.M. Rogerson & G. Visser. New Brunswick, London: Transaction Press. pp. 1-9.

Rogerson, C.M. & Visser, G. 2007. Tourism research and urban Africa: The South African experience. In *Urban tourism in the developing world: The South African experience*, edited by C.M. Rogerson & G. Visser. New Brunswick, London: Transaction Press. pp. 13-40.

Visser, G. 2007. Festival tourism in urban Africa: Reflections on the South African experience. In *Urban tourism in the developing world: The South African experience*, edited by C.M. Rogerson & G. Visser. New Brunswick, London: Transaction Press. pp. 101-126.

Visser, G. 2007. Gay tourism in South Africa: The Cape Town experience. *Urban tourism in the developing world: The South African experience*, edited by C.M. Rogerson & G. Visser. New Brunswick, London: Transaction Press. pp. 185-203.

Visser, G. 2007. The tourism geography of South Africa. In *Tourism Management in South Africa*, edited by R. George. Cape Town: Oxford University Press. pp. 34-52.

Reports

Visser, G. 2007. *On citations, rating games and other pesky animals: Which zoo for South African human geography?* Ad-hoc unsolicited report on NRF ratings and human geography in South Africa to the University of the Free State, Bloemfontein, South Africa.

Conference contributions

Bateman, M.D., Carr, A.S., Holmes, P.J., Murray-Wallace, C.V. & Roberts, D.L. 2007. Long-term dune evolution on the Southern Cape Coast, South Africa. Paper presented at



Dr Giles Wiggs of the University of Oxford in the United Kingdom (UK) oversees the setting up of equipment to monitor wind erosion on ploughed fields north of Bloemfontein.

the XVII Congress of the International Union for Quaternary Research (INQUA): The Tropics - Heat Engine of the Quaternary, Cairns, Australia. 28 July - 3 August.

Bateman, M.D., Carr, A.S., Holmes, P.J., Roberts, D.L. & Murray-Wallace, C.V. 2007. Long-term dune evolution on the Southern Cape Coast, South Africa. Paper presented at the Southern African Society for Quaternary Research (SASQUA) XVII Biennial Congress, Umgeni Valley Nature Reserve, Howick, South Africa. 11-13 April.

Carr, A.S., Bateman, M.D., Murray-Wallace, C.V., Holmes, P.J. & Roberts, D.L. 2007. Quaternary sea-level change and coastal geomorphic response, southern Cape. Paper presented at the Southern African Society for Quaternary Research (SASQUA) XVII Biennial Congress, Umgeni Valley Nature Reserve, Howick, South Africa. 11-13 April.

Carr, A.S., Bateman, M.D., Murray-Wallace, C.V., Holmes, P.J. & Roberts, D.L. 2007. Quaternary sea-level changes and coastal geomorphic responses 140-80 ka, Western Cape Province, South Africa. Paper presented at the XVII Congress of the International Union for Quaternary Research (INQUA): The Tropics - Heat Engine of the Quaternary, Cairns, Australia. 28 July - 3 August.

Ferreira, S.L.A. & Visser, G. 2007. *Creating an African Riviera (V&AW): Meaning of place and ownership.* Paper presented during the Seventh Biennial Conference of the Society of South African Geographers (SSAG2007), Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 8-10 July.

Ferreira, S.L.A. & Visser, G. 2007. *Creating an African Riviera: From local regeneration project to global playground.* Paper presented at the Annual Conference of the Association of American Geographers (AAG), San Francisco, California, USA. 17-21 April.

Holmes, P.J., Bateman, M.D., Thomas, D.S.G. & Barker, C.H. 2007. A palaeo-aeolian record from pan-fringing lunettes in the Western Free State Pan Field since the last glacial maximum. Paper presented at the Southern African Society

for Quaternary Research (SASQUA) XVII Biennial Congress, Umgeni Valley Nature Reserve, Howick, South Africa. 11-13 April.

Holmes, P.J., Bateman, M.D., Thomas, D.S.G. & Barker, C.H. 2007. A palaeo-aeolian record from pan-fringing lunettes in the Western Free State Panfield, South Africa, since the last glacial maximum. Paper presented at the XVII Congress of the International Union for Quaternary Research (INQUA): The Tropics - Heat Engine of the Quaternary, Cairns, Australia. 28 July - 3 August.

Mehlomakulu, T. 2007. *Better living conditions in Orangefontein (re)settlement camp near Herschel Village, Sterkspruit: a dream or reality.* Paper presented during the Seventh Biennial Conference of the Society of South African Geographers (SSAG2007), Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 8-10 July.

Visser, G. 2007. *Free State Tourism: Current dynamics, immediate challenges and investment prospects.* Paper presented at the Accenta Trade Fair, Ghent, Belgium. 15-23 September.

Visser, G. 2007. *Homonormalising (white) heterosexual leisure spaces: The case of white gays and lesbians in Bloemfontein, South Africa.* Paper presented during the Seventh Biennial Conference of the Society of South African Geographers (SSAG2007), Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 8-10 July.

Visser, G. 2007. *Homonormalising (White) heterosexual leisure spaces: The case of white gays and lesbians in Bloemfontein, South Africa.* Paper presented at the Seventh International Conference on Diversity in Organisations, Communities and Nations, Amsterdam, Netherlands. 3-6 July.

Visser, G. 2007. *On citations, rating games and other pesky animals: Which zoo for South African Human Geography?* Paper presented during the Seventh Biennial Conference of the Society of South African Geographers (SSAG2007), Nelson Mandela Metropolitan University, Port Elizabeth, South Africa. 8-10 July.



Prof. Willem van der Westhuizen

Department of Geology

Overview

The Department of Geology continues to live up to its goal of providing quality teaching and producing innovative research. Learning programmes include specialisation in geology, where students can graduate with a combination of geological and geochemical subjects, as well as geology and management where the programme is constituted of a combination of geology and management subjects. Another programme is scheduled for students who prefer to combine geology with another science major.

According to the newsletter from the Council for Geosciences, *Geoclips*, there has never been a better time to be involved in the Geosciences. Companies in various countries are actively competing for the same geoscience skills and the department is working hard to address this skills shortage.

A high growth in student numbers was experienced during 2007. The upward trend started around 1999 and is continuing. In 2007, the first semester course on Introduction to Geoscience had 275 registered students. The reason for the increase is the upswing in the global demand for minerals.

A postgraduate programme in Mineral Resource Management was initiated in 2001 and has become increasingly popular. Nine students enrolled in 2007 with 17 previously enrolled students currently completing their studies in this field.

Mr Pieter Botha of the Council for Geosciences completed his M.Sc. degree with Prof. Reyno Scheepers as supervisor. The title of his thesis was: *The petrology of the Lower Paleozoic Kuboos Batolith*.

Three M.Sc. studies were initiated during 2007:

- Ms Ulrike Rantzsch with a thesis entitled: *Mineralogical and geochemical investigation of uranium conglomerate ores of the Dominion Reef Group, western Witwatersrand*, with Dr Christoph Gauert and Prof. Willem van der Westhuizen, Departmental Chairperson, as supervisors;
- Mr Sebastian Fuchs with a thesis entitled: *Mineralogical and geochemical variations of the Main Zone and uppermost Critical Zone rocks of the north-eastern Bushveld Complex at Phoshiri*, with Dr Gauert as supervisor; and
- Mr Jens Kirste with a thesis entitled: *Reconstruction of contact metamorphism of the Uitkomst Complex near Badplaas, Mpumalanga Province, South Africa, based on mineralogical and*

petrological investigations of the contact aureole, and with Dr Gauert as supervisor.

Two Ph.D. studies were also initiated during the year.

- Ms Janine Kottke-Levin with a thesis entitled: *A geochemical study of the Middle Group chromitites, Helena mine, Bushveld complex, South Africa*, with Prof. Marian Tredoux and Dr Gauert as promoters; and
- Mr Rodney M. Douglas with a thesis entitled: *A new perspective on the geohydrological and surface processes controlling the depositional environment at the Florisbad Archaeozoological site*, with Profs Tredoux and Peter Holmes of the university's Department of Geography as promoters.

Several international conferences were attended by members of staff. Dr Gauert attended the 9th biannual meeting of the Society of Geology applied to Ore Deposits (SGA) in Dublin, Ireland and presented research results on Ni-Cu-PGE deposits. Dr Gauert also attended the meeting of the European Union of Geologists (EUG) in Vienna, Austria and presented a poster on sustainable land usage in the Free State. Prof. Wayne Colliston attended the 16th Deformation, Rheology and Tectonics Conference in Milan, Italy. He presented the results of tectonic and metamorphic research on the western Namaqua Mobile Belt and also participated in a workshop on metamorphic and tectonic processes in the Alps.

Research was conducted in several areas. Uranium research is continuing with mining companies in South Africa and a postgraduate student is involved in mineralogical investigations on the Dominion Group. Two students are involved in research on the Witwatersrand gold deposits and are in the process of submitting their theses for examination. Staff members are still involved in research on the interesting geology pertaining to the Namaqua Metamorphic Complex. The Ventersdorp Supergroup has formed an important part of research in the department for many years. Although recently scaled down, this research will receive renewed attention in the years to come.

Sedimentological research on the Karoo Supergroup is receiving attention and aspects such as stratigraphy, sedimentology and mineralisation are regarded as priorities. Economic geology research on ore genesis is being investigated by Dr Gauert and his students, and platinum geochemistry is researched by Prof. Tredoux and her students.



About 300 students and scientists from the industry attended a seminar on mining exploration and the advantages of interdisciplinary sciences in South Africa presented by the department on the Main Campus in Bloemfontein. Some of the guests are, from the left, front: Mr Solly Kara, former student of the department from BHP Billiton plc., Ms Annegret Lombard, Junior Lecturer; back: Messrs Nico Scholtz, Lecturer, Oageneg Thekisho, second-year student in Geology, and Braam Jankowitz, Jankowitz and Lyons Consulting, Ventersdorp.



Several distinguished academics visited the department during the year. Prof. Ruth Blake, of Yale University, United States of America (USA) was one of them. Here are, from the left: Dr Esta van Heerden, Department of Microbial, Biochemical and Food Biotechnology at the UFS, Prof. Ruth Blake, Marian Tredoux, Associate Professor at the department, Ms Annegret Lombard, Junior Lecturer at the department and Prof. Blake's sister.

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.

During the year several distinguished academics visited the department. These included Prof. Roger Buick from the University of Washington, Seattle, United States of America (USA) who presented a lecture entitled: *The antiquity of life on Earth: carbon isotopic data from the 3.52 Ga Coonterunah Group, Australia*. Prof. Buick also collected information on 2.7 billion-year-old raindrop imprints that occur in the Ventersdorp Supergroup north of Britstown.

Dr Dave Bell from the Arizona State University, USA also visited the department during September 2007. He presented a talk entitled: *Carbon storage in and releases from the mantle*. During October 2007, Prof. Ruth Blake of Yale University, USA presented a lecture entitled: *Oxygen isotope fractionation in phosphates and the recycling of phosphorous in the earth's deep biosphere*.

Dr Günter Mylius of the Federal Institute of Raw Materials and Earth Sciences, Hanover, Germany visited the department for three days in October 2007 and presented three lectures on geohydrology and geohazards. The topics were: *Georisks after the 8th October 2005 earthquake in the southern Himalaya area of Pakistan*, *Case studies and descriptive environmental geology in city and regional planning from Malawi*, and *Decision support systems (DSS) for integrated water resource management (IWRM) from the near East (Libanon, Syria, Egypt and Morocco)*.

A new stage for fluid inclusion research was purchased during 2007 and this equipment will be of much use to students and staff alike. An additional ten petrographic microscopes were purchased to bring the total number of new microscopes to 20. In order to accommodate increasing student numbers, changes were made to lecture halls and additional chairs were supplied by the faculty. A Linkam heating/cooling stage for fluid inclusion studies was purchased and ten Olympus microscopes were also added to the ten bought during 2006.

Various geological excursions were undertaken during the year. Prof. Tredoux and Ms Lombard accompanied the third-year students to the Vredefort Impact structure near Parys. Prof. Marthie

Coetzee of the North-West University presented a guest lecture on the geology of the area.

The annual structural geology honours field course was held at Rosh Pinah in the southern Gariep Belt, Namibia. The students were given a course on geological mapping, structural geological applications and hydrothermal mineralisation, and made use of Global Positioning System (GPS) and Geographic Information System (GIS) technology. Course instruction and supervision was by Prof. Colliston and Dr Gauert.

The honours student excursion took place in July 2007 and was led by Dr Hermann Praekelt and Ms Lombard. They visited platinum mines in the Rustenburg area as well as gold mines in the Barberton Mountain Land.

Another excursion of second and third-year students visited the Namaqua Mobile Belt (eastern Namaqualand) where structural features and metamorphic rocks were investigated. Again Dr Praekelt and Ms Lombard accompanied the students.

Second-year students studying sedimentology visited the Brandfort area (two excursions) to become acquainted with the intricacies of Karoo sedimentology and stratigraphy. The third-year mine excursion took students to the Gold Fields Beatrix Mine in Welkom.

The first-year students undertook excursions to the Korannaberg (two excursions) in the first semester and to the Edenburg district (two excursions) during the second semester. During these excursions their knowledge was increased on aspects of Karoo geology and stratigraphy, dolerite occurrences, sedimentology and geomorphology.

The staff profile underwent some changes during 2007 with the resignation of Mr Nicolaas Scholtz and Prof. Reyno Scheepers. Prof. Michael Haschke will be joining the department from January 2008 to teach igneous petrology. Prof. Aylva Schoch finally bade farewell to teaching undergraduate students and has left a legacy of excellence in teaching. He will be retaining his office to continue his research interests.

Collaboration

The department has worked in collaboration with a number of institutions both locally and internationally:

Local

- African Rainbow Minerals (Pty) Ltd.
- BHP Billiton plc.
- Council for Geosciences, Pretoria
- Department of Geology, University of Pretoria
- Department of Geology, University of the Witwatersrand
- Eysizwe Coal
- Harmony Mining Company Ltd.
- Kumba Resources
- South African Committee for Stratigraphy

- UraniumOne Africa (Pty) Ltd.

International

- Department of Geology, Imperial College, London, UK
- Department of Geology, Martin Luther University of Halle-Wittenberg, Germany
- Department of Geology, Royal School of Mines, UK
- Federal Institute for Geosciences and Natural Resources (BGR) in Hanover, Germany (German Federal Survey of Geology)
- GFZ Potsdam
- GKSS Research Centre Geesthacht, Hamburg, Germany
- Inkaba Phase 2 Bilateral RSA/German research
- University of Leipzig, Germany

Staff

Professor: Prof. Willem van der Westhuizen

Associate Professors: Profs Wayne Colliston, Marian Tredoux, Reyno Scheepers

Senior Lecturers: Drs Christoph Gauert, Hermann Praekelt

Junior Lecturer: Ms Annegret Lombard

Part-Time Professor: Prof. Aylva Schoch

Part-Time Lecturer: Mr Leon Nel

Affiliated Lecturers: Profs Gerhard Beukes, Krige Visser, Messrs Johan Looock, PG Laurens, Petrus Grobler, André Dunne, Derek Hall, Phillip Viljoen, Mss Judith Diedericks, Vanessa Lickfold

Secretary: Ms Petro S. Swart

Professional Officer: Mr Peet H. Roodt

Senior Officer: Ms Rina Immelman

Technician: Mr Andries Felix

Assistant Aid: Mr Jonas Choane

Technical Aid: Mr Daniel Radikgomo

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Honours students and staff during the annual honours excursion to the Sheba Mine, Barberton. Dr Hermann Praekelt, Senior Lecturer, is on the right and Ms Annegret Lombard, Junior Lecturer, is in the front row, second from the right.

Research outputs

Research articles

Joubert, P.L. & Gauert, C. 2007. Deformasie van die chroomagtige harzburgietlaag in die Uitkomst Kompleks. *South African Journal for Science and Technology* 26(2): 157-158.

Pinetown, K.L., Ward, C.R. & Van der Westhuizen, W.A. 2007. Quantitative evaluation of minerals in coal deposits in the Witbank and Highveld Coalfields, and the potential impact on acid mine drainage. *International Journal of Coal Geology* 70: 166-183.

Conference contributions

Barker, C. & Gauert, C. 2007. Sustainable land use interpretation of remote sensing data of the Modder, Seekoei and upper Orange River catchment areas, Eastern Free State, South Africa. Poster presented at the European Geosciences Union (EGU) General Assembly 2007, Vienna, Austria. 15-20 April.

Colliston, W.P. & Schoch, A.E. 2007. The Namaqua mobile belt, Southern Africa: ductile deformation in a midcrustal Meso-Proterozoic collision zone. Proceedings of the 16th Conference on Deformation Mechanisms, Rheology and Tectonics (DRT), Milaan, Italy. 27 Sep-

tember – 2 October. (Abstracts in: *Rendiconti della Societa Geologica Italiana* v: 60-61).

Gauert, C. 2007. Integrated exploration and exploitation of Ni-Cu-PGE deposits in dynamic magmatic systems. Proceedings of the 9th Biennial Society for Geology Applied (SGA) to Mineral Deposits Meeting: Mineral Exploration and Research – Digging Deeper, Dublin, Ireland. 20-23 August. pp. 469-472.

Gauert, C.G., Colliston, W.P. & Mouton, E. 2007. Volcano-sedimentary stratigraphy of the Spitskop area within the Rosh pinah Formation of the Port Nolloth Zone, in the eastern Gariep Belt. Proceedings of the 107th Annual Meeting of the Geological Society of South Africa (GSSA): Geoforum 2007, Eskom Convention Centre, Midrand, Gauteng, South Africa. 10-13 July. pp. 75.

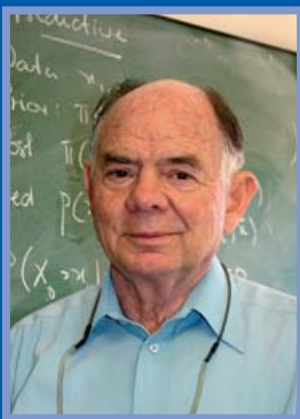
Jacobsen, L., Van der Westhuizen, W.A. & Huffman, T. 2007. Zhizo beads: Key to the Shashe-Limpopo region's links to the wider world between the 8th and mid-10th C. Paper presented at the Shashe-Limpopo Basins Research Symposium, Department of Anthropology and Arcgaeology, University of Pretoria, Pretoria, South Africa. 26-30 September.

Jacobson, L. & Van der Westhuizen, W.A. 2007. The geo-anthropology of pottery production: An aide to provenance studies. Paper presented to the Pottery Colloquium: William Humphreys Art Gallery, Kimberley, South Africa. 26 June.

Laurens, P.G. 2007. Mineral resource throughput management: From an iron ore mine to steel in India. Paper presented at the Mineral Resource Management Colloquium, Southern African Institute of Mining and Metallurgy, Johannesburg, South Africa. 29-30 March.

Litthauer, A., Tredoux, M. & Scholtz, N. 2007. The mobility of uranium, molybdenum and tungsten in the ground and surface water of the farm Mooifontein, South Africa: A preliminary report. Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Van der Westhuizen, W.A. & Laurens, P.G. 2007. Mineral resource management: Of definitions, semantics and finally, process optimization. Paper presented at the Mineral Resource Management Colloquium, Southern African Institute of Mining and Metallurgy, Johannesburg, South Africa. 29-30 March.



Prof. Daan de Waal

Department of Mathematical Statistics

Overview

Due to a general interest in the commercial and actuarial/financial risk programmes offered by the UFS, the year 2007 was characterised by a growing enthusiasm among students in Statistics and Mathematical Statistics and Actuarial Science.

More than 3 000 students were served by the Department of Mathematical Statistics during the year, of which 30 were postgraduate students. The department presented 61 courses and 11 Ph.D. students were supervised. Two of these students, Dr Vince Micali from Eskom and Ms Andréhette Nel, a lecturer in the department, completed their studies in 2007. In the Actuarial programme Mr Von Maltitz achieved great success by securing a 90% pass rate.

Prof. Max Finkelstein's research on survival analysis is a major research output in the department. A textbook on his research will be published in the near future. Other research, focusing on the mixed linear model and Bayesian posterior constructions of certain parametric functions, was initiated by Prof. Abrie van der Merwe. Profs Finkelstein and Van der Merwe retained a National Research Foundation's (NRF) evaluation of C1 and B3 respectively.

The research by Prof. Daan de Waal on extreme value analysis resulted in two Ph.D.s being completed in 2007. The interest in the area of data mining by Dr Isabelle Garisch is proceeding well. She presented a paper at an international conference on Artificial Intelligence and Pattern Recognition in Orlando, United States of America (USA), as well as a course on Data Mining at Long Beach, California in the USA.

Other staff members who attended conferences and conducted research visits abroad were Profs De Waal, Van der Merwe, Finkelstein, and Mr Kobus Bekker. Mr Bekker visited his promoter, Prof. Jan Dhaene, a visiting professor of the department, at the Katholieke Universiteit Leuven, Belgium for a month to do research for his Ph.D. in Actuarial Science.

The Eskom project on the forecasting of availability of water in the upper Orange River for the generation of hydro power at the Gariep and Van der Kloof dams is ongoing and regular forecasts are made by Mr Sean van der Merwe.

The department presented weekly seminars on research by staff, postgraduates, and visitors. Two visitors from abroad,

namely Profs Jan Dhaene and Marc Goovaerts from the Katholieke Universiteit Leuven, as well as Dr Vince Micali from Eskom made presentations.

Dr Nel, Messrs Bekker, Michael von Maltitz and Van der Merwe attended the Short Programme on Assessment of Learning in Higher Education (SPALHE) at the UFS.

Two staff members have been promoted, namely Prof. Finkelstein to Senior Professor in June 2006, and Ms Linda van der Merwe to Senior Lecture as from 2008. Dr Robert Schall, a director at Quintiles, was appointed Professor in the department on a part time basis with the opportunity to become a full time staff member from 1 October 2008.

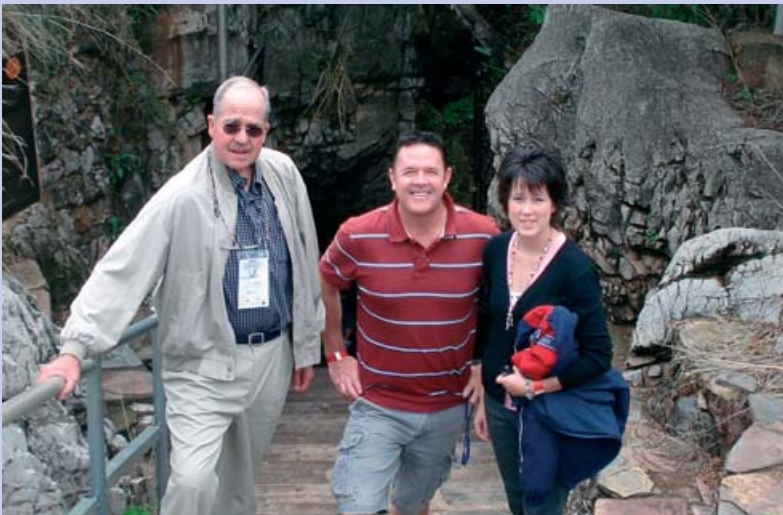
Two staff members, namely Profs Van der Merwe and De Waal, retired in 2006 and were appointed on a contract basis. Prof. Kobus de Wet retired in 2007 after 15 years of service and Ms Ella Hayes, Administrative Officer, also retired the same year. Both have been appointed on a contract basis for 2008.



Prof. Max Finkelstein of the department was awarded the Sichel Medal by the South African Statistical Association for the best publication of 2006.



PPS Insurance awarded a bursary to the value of R30 000 to Mr Michael Hill, an honours student in Actuarial Science. The bursary recognises overall excellence by tertiary students in South Africa and is awarded only once a year to a deserving student. Attending the award ceremony are, from the left: Mr Kobus Bekker, Programme Director of Actuarial Science at the department, Mr Barry Pretorius, Area Sales Manager of PPS Insurance, Mr Hill, and Prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS.



From left are: Prof. Kobus de Wet, of the department, Mr Chris Muller, University of Stellenbosch, and Ms Andréhette Nel, Lecturer at the department, during the conference of the South African Statistical Association. The photo was taken at the Sterkfontein Caves.

Staff

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

Senior Lecturers: Drs Isabelle Garisch, Martin van Zyl

Lecturers: Drs Carin Lombaard, Inet Kemp, Mss Linda van der Merwe, Andréhette Nel, Messrs Delson Chikobvu, Dries Naudé, Kobus Bekker, Michael von Maltitz, Sean van der Merwe

Part Time Lecturers: Dr Cay van der Merwe, Mss Maryn Brüssow, Lizanne Raubenheimer, Walina Oosthuizen, Elizabeth Girmay, Mr Frans Koning

Secretary: Ms Elize Mathee

Assistant Officer: Ms Ella Hayes

Messenger: Mr William Baranye

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Research outputs

Research articles

De Waal, D.J., Van Gelder, P.H.A.J.M. & Nel, A. 2007. Estimating joint tail probabilities of river discharges through the Logistic Copula. *Environmetrics* 18: 621-631.

Finkelstein, M.S. 2007. Aging: Damage accumulation versus increasing mortality rate. *Mathematical Biosciences* 207: 104-112.

Finkelstein, M.S. 2007. Imperfect repair and lifesaving in heterogeneous populations. *Reliability Engineering and System Safety* 12: 1671-1676.

Finkelstein, M.S. 2007. On some ageing properties of general repair processes. *Journal of Applied Probability* 44: 506-513.

Finkelstein, M.S. 2007. On statistical and information based virtual age of degrading systems. *Reliability Engineering and System Safety* 92: 676-682.

Finkelstein, M.S. 2007. Shocks in homogeneous and heterogeneous populations. *Reliability Engineering and System Safety* 92: 569-575.

Finkelstein, M.S. & Esaulova, V. 2007. Bounds for the failure rate in heterogeneous populations. *South African Statistical Journal* 41: 23-39.

Van der Merwe, A.J. & Bekker, K.N. 2007. A computational Bayesian approach to the balanced Bühlmann Credibility Model. *South African Statistical Magazine* 40(2): 65-103.

Van der Merwe, A.J. & Hugo, J. 2007. Bayesian tolerance intervals for the balanced Two-Factor Nested Random Effects Model. *Test* 16(3): 598-612.

Chapters in books

Finkelstein, M.S. 2007. Virtual age versus chronological age. In *Statistical Models and Methods for Biomedical and Technical Systems*, edited by F. Vonta, M. Nikulin, N. Limnios & C. Huber-Carol. Boston: Birkhäuser. pp. 69-82.

Reports

Bezuidenhout, E., Schall, R. & Karelsen, G. 2007. Accuracy and precision of AUC and AUC as characteristics of relative bioavailability in bioequivalence studies. Report nr. 372 to the Department of Mathematical Statistics, University of the Free State, Bloemfontein, South Africa.

Bezuidenhout, M. & Schall, R. 2007. The empirical coverage of student's t -confidence interval. Report nr. 376 to the Department of Mathematical Statistics, University of the Free State, Bloemfontein, South Africa.

Chikobvu, D. & Van der Merwe, A.J. 2007. A Bayesian simulation solution to the supplier selection problem using capability indices. Report nr. 374 to the Department of Mathematical Statistics, University of the Free State, Bloemfontein, South Africa.

Chikobvu, D. & Van der Merwe, A.J. 2007. A process capability index for averages of observations from new batches in the case of the balanced random effects model. Report nr. 378 to the Department of Mathematical Statistics, University of the Free State, Bloemfontein, South Africa.

De Waal, D.J. 2007. Applying the Dirichlet mixture as the spectral distribution on modelling multivariate extremes. Report nr. 371 to the Department of Mathematical Statistics, University of the Free State, Bloemfontein, South Africa.

De Waal, D.J. 2007. Considering tail probabilities on multivariate extremes using the spectral density. Report nr. 375 to the Department of Mathematical Statistics, University of the Free State, Bloemfontein, South Africa.

Jandrell, N. & Van der Merwe, A.J. 2007. Tolerance intervals using Bayesian simulation. Report nr. 373 to the Department of Mathematical Statistics, University of the Free State, Bloemfontein, South Africa.

Lowings, J. & Garisch, I. 2007. Bayesian networks versus decision trees. Report nr. 369 to the Department of Mathematical Statistics, University of the Free State, Bloemfontein, South Africa.



Mr Wim Els, Executive Director of the Actuarial Society of South Africa (ASSA) and former student of the UFS, presented a talk on a proposed new examination system South African actuarial students will need to follow from 2010 in order to qualify as actuaries. The new examination system will be fully managed by the local actuarial profession and will still have international recognition and high professional standards at its core. The UFS has an exemption agreement under the current examination system for the professional subjects CT1 to CT8 (first level) with the Faculty and Institute of Actuaries in the United Kingdom. Attending the talk are, from the left: Mr Kobus Bekker, Programme Director of Actuarial Science at the department, Prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS, and Mr Els.

Raubenheimer, L. & Van der Merwe, A.J. 2007. Bayesian estimation of functions of poisson and binomial rates with applications to reliability. Report nr. 377 to the Department of Mathematical Statistics, University of the Free State, Bloemfontein, South Africa.

Van der Merwe, S. 2007. Improved reporting of classification error rates – The Doggy finder. Report nr. 370 to the Department of Mathematical Statistics, University of the Free State, Bloemfontein, South Africa.

Von Maltitz, M.J. & Van der Merwe, A.J. 2007. An application of sequential regression multiple imputation on panel data. Report nr. 379 to the Department of Mathematical Statistics, University of the Free State, Bloemfontein, South Africa.

Conference contributions

Chikobvu, D. & Van der Merwe, A.J. 2007. A bayesian simulation solution to the supplier selection problem using capability indices. Paper presented at the 50th Annual Conference of the South African Statistical Association, Misty Hills, Muldersdrift, Johannesburg, South Africa. 29 October - 2 November.

De Waal, D.J. & Nel, A. 2007. The spectral distribution in terms of a mixture of Dirichlet's for modelling multivariate extremes. Oral presentation at the 50th Annual Conference of the South African Statistical Association, Misty Hills, Muldersdrift, Johannesburg, South Africa. 29 October - 2 November.

Finkelstein, M.S. 2007. On stochastic models of biological aging. Paper presented at

the 6th European Gerontology Congress, St. Petersburg, Russia. 5-8 July.

Finkelstein, M.S. 2007. On the competing risks model with frailty parameter. Paper presented at the Mathematical Methods in Reliability Conference, Glasgow, England. 1-4 July.

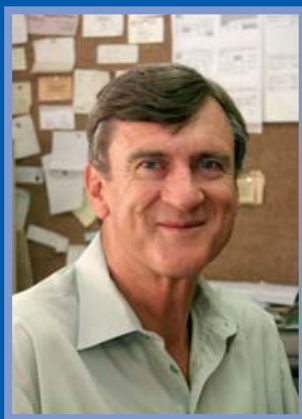
Garisch, I. 2007. Calculating the probability of consensus decision-making using expert information. Paper presented at the International Conference on Artificial Intelligence and Pattern Recognition, Orlando, USA. 7-22 July.

Garisch, I. & Groenewald, P.C.N. 2007. Calculating the probability of consensus decision-making using expert information. Proceedings of the International Conference on Artificial Intelligence and Pattern Recognition, Orlando, Florida, USA. 7-22 July. pp. 82-87.

Van der Merwe, A.J. & Brussow, M. 2007. Bayesian calibration using more than one experiment for polynomial regression. Poster presented at the 6th Workshop on Objective Bayesian Analysis, Università de Roma Sapienza, Rome, Italy. 8-12 June.

Van der Merwe, S. & Van der Merwe, C.A. 2007. Student success: Data mining measures what matters. Oral presentation delivered at the European Association of Institute Research Conference, Innsbruck, Austria. 26-29 August.

Von Maltitz, M.J. 2007. An application of sequential regression multiple imputation (SRMI) on panel data. Oral presentation delivered at the 50th Annual Conference of the South African Statistical Association, Misty Hills, Muldersdrift, Johannesburg, South Africa. 29 October - 2 November.



Prof. Dana Murray

Department of Mathematics and Applied Mathematics

Overview

The Department of Mathematics and Applied Mathematics offers a wide range of courses at both undergraduate and postgraduate level. Many of the staff members are active in research and community service.

Prof. Schalk Schoombie, in collaboration with Prof. Eben Maré of the Department of Mathematics and Applied Mathematics at the University of Pretoria (UP), 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, as well as the Duffing equation and a predator-prey system were investigated. A further research article on this topic is in preparation.

In addition, Prof. Schoombie, in collaboration with Mr Christiaan Venter, continued 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.

Prof. Jo Schröder attended the Colloquium on Combinatorics, an annual event held at various German universities for the last 25 years. The Otto-von-Guericke-University in Magdeburg, Germany hosted the conference. (Otto von Guericke was Mayor of Magdeburg at the end of the Thirty Years' War and is famous for his experiments on air pressure.) Prof. Schröder presented a lecture on Schröder numbers. After the conference he spent several weeks at the Free University of Berlin, Germany where he participated in talks and projects of the Discrete Mathematics section, and took part in a topology seminar.

Prof. Johan Meyer was elected as a member of the problems committee of the Pan African Mathematics Olympiad (PAMO). He was invited to Abuja, Nigeria in April 2007 to assist in the setting of the paper for the annual PAMO. He also helped to compile the final round paper for the senior division (Grades 10-12) of the South African Mathematics Olympiad.

Prof. Meyer attended the biennial International Conference on Near-rings and Near-fields in Linz, Austria where he

delivered a talk on bijective matrix maps and identity elements. He attended a symposium on training and research during the Pan African Mathematics Olympiad at the University of Ouagadougou, Burkina Faso, where he also delivered talks on mathematical inequalities.

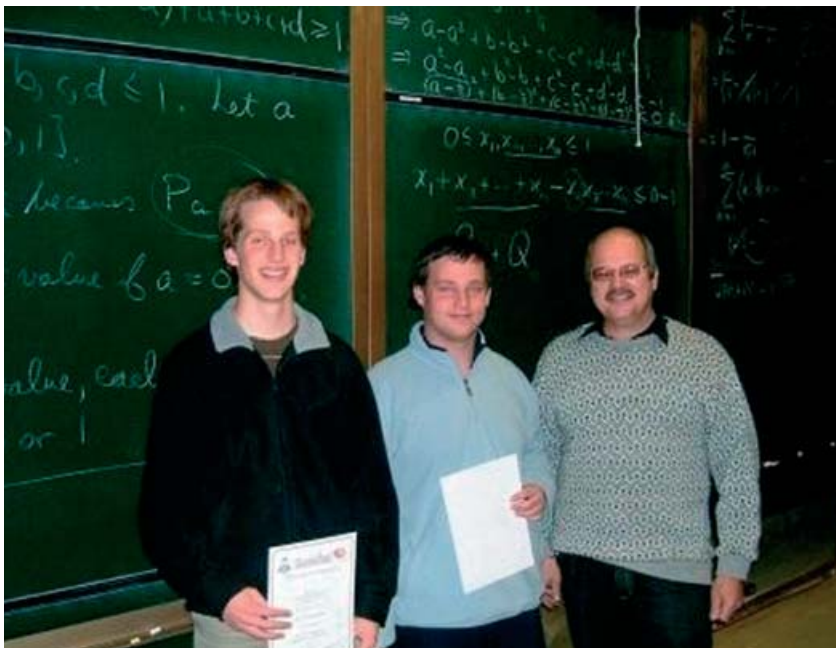
Prof. Meyer received a research visit from Prof. Jenő Szigeti of the University of Miskolc in Hungary during November 2007. The ideas that evolved from this visit will be pursued during a follow-up visit of Prof. Meyer to Prof. Szigeti.

Prof. Alain Clout continued his fundamental research on the topic of partial derivatives of non-integer orders and their applications in groundwater modelling. He began, in collaboration with colleague and M.Sc. student, Mr Willem van Wyk, to investigate the possibility of applying this concept in the field of Image Processing.

Prof. Thomas Acho continued to lecture on the Vista Campus, which was incorporated into the UFS in 2004, until June 2007 when he moved to the Main Campus. Prof. Acho attended the International Conference "Days on Diffraction" in St. Petersburg, Russia where he delivered a paper entitled: *Derivation of eigenvalues for the Sturm-Liouville boundary value problem with Interior Singularities*. During his visit to Russia he met and re-established contacts with several researchers and in particular with a prominent researcher on Diffraction Theory, Prof. Piergiorgio Uslenghi.

In the area of community service, Prof. Meyer and Mr Venter were closely involved with the Nautilus Mathematics Project, which is presented quarterly at the Brandwag Primary School in Bloemfontein and also on the university's Main Campus. The department, in co-operation with Nautilus, presented the KopsieNaut Mathematics Olympiad. Prof. Meyer set the paper and approximately 100 persons from across the Free State participated.

The department took part in the UFS 2007 Open Day and made an important contribution as one of the representatives of the Faculty of Natural and Agricultural Sciences at the 11th Science Festival (SciFest) held in Grahamstown in March 2007.



Prof. Johan Meyer congratulates the winners of the KovskyNaut Mathematics Olympiad.



Lecturers of the department during a visit to a game park.

Staff

Main Campus:

Professors: Profs Johan Meyer, Schalk Schoombie, Dana Murray, Alain Clout

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, Mr Ricus Erasmus

Administrative Officer: Ms Marinda Venter

Qwaqwa Campus:

Associate Professor: Prof. Jo Schröder

Temporary Lecturers: Messrs Patrick Mbambo, Nallapan Sebastian, Neo Tsosane, Ms Christa Faber

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Research outputs

Research articles

Acho, T.M. 2007. Derivation of eigenvalues for the Sturm-Liouville boundary value problem with Interior Singularities. *Quarterly of Applied Mathematics* 65(2): 375-383.

Schröder, J. 2007. Delannoy and Tetrahedral numbers. *Commentationes Mathematicae Universitatis Carolinae* 48(3): 389-394.

Schröder, J. 2007. Generalized Schröder numbers and the rotation principle. *Journal of Integer Sequences* 10(7): 1-15.

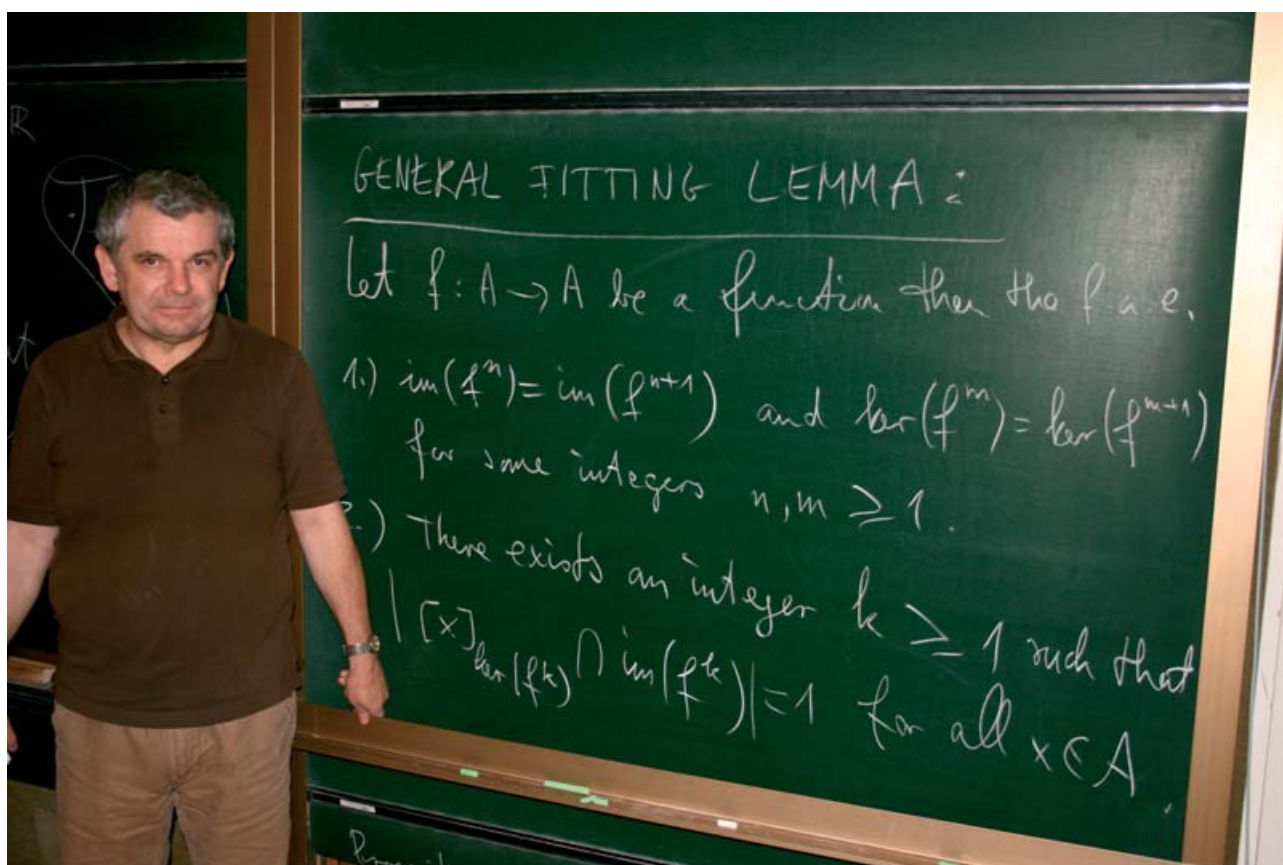
Conference contributions

Acho, T.M. 2007. Derivation of eigenvalues for the Sturm-Liouville boundary value problem with Interior Singularities. Paper presented at the International Conference: Days on Diffraction, St. Petersburg, Russia. 28 May - 1 June.

Meyer, J.H. 2007. Bijective matrix maps and identity elements. Paper presented at the International Conference on Near-rings and Near-fields, Johannes Kepler University, Linz, Austria. 22-27 July.

Schoombie, S.W. & Mare, E. 2007. High frequency induced instability in some non linear numerical schemes. Paper presented at the South African Symposium for Numerical and Applied Mathematics, Stellenbosch, South Africa. 2-4 April.

Schröder, J. 2007. Generalized Schröder numbers and the rotation principle. Paper presented at the Kolloquium Kombinatorik, Magdeburg, Germany. 15-17 November.



Prof. Jenő Szigeti, of the University of Miskolc in Hungary, delivered a lecture entitled: The Fitting Lemma.



Prof. James du Preez

Department of Microbial, Biochemical and Food Biotechnology

Overview

One of the highlights of the year for the Department of Microbial, Biochemical and Food Biotechnology was the inauguration of the BioPAD Platform for Metagenomics in March 2007, which forms part of a network of specialist platforms for research in South Africa. BioPAD is a Biotechnology Regional Innovation Centre established by the national Department of Science and Technology (DST).

This biotechnology research contract, worth R13.7 million and which includes equipment, student bursaries and postdoctoral fellowships awarded by the BioPAD Board of Trustees, is one of the biggest research contracts awarded to the UFS in recent years. The platform is managed by Dr Esta van Heerden, who also leads the research together with her two colleagues, Prof. Derek Litthauer and Dr Lizelle Piater. The steering committee includes representatives from BioPAD and the UFS. The focus of the research is the screening of mostly unculturable extremophiles and their (meta)genomes, since these are constantly exposed to ever-changing micro-environments that necessitate their perception of and adaptation to such conditions in order to survive.

Successful micro-organisms, probably better described as specialist communities, are believed to have evolved a variety of mechanisms, specifically genes and gene products, in this regard. Bioprospecting of these extreme biodiversities through the construction of metagenomic libraries presents infinite possibilities of unearthing extraordinary and unique micro-organisms and genes or gene products (especially extremozymes) that, ultimately, may contribute significantly to industrial processes, improved products, bioremediation of contaminated sites and, ultimately, the economy of the country. This research will also contribute to our understanding of the significance of our own extreme ecosystems. It is further anticipated that the research project will contribute to the preservation of biological and genetic material that is unique to South Africa.

The research infrastructure of the department for molecular biology was further improved as a result of Prof. Koos Albertyn's successful application for R760 000 from the National Research Foundation's (NRF) National Equipment Programme towards the purchase of a DNA sequencer, namely an ABI PRISM 3130XL-16 Capillary Genetic Analyser. The department also acquired a Molecular Dynamics GenePix4000B

microarray slide scanner and a Bio-Rad Pharos Plus two-dimensional proteomics gel scanner, funded by an NRF National Equipment grant awarded to Prof. Hugh Patterson in 2007. In addition, an Applied Biosystems QTRAP 4000 hybrid ion-trap mass spectrometer fitted with an Agilent 1200 Nanoflow High Performance Liquid Chromatography system was acquired with partial funding from the Strategic Cluster initiative of the university. These items, housed in the departmental Facility for Genomics and Proteomics, provides a platform for modern, high-throughput biological research.

Another highlight in October was the start of construction of a Bioinformatics laboratory that will include a 30-workstation lecturing facility for bioinformatics and related teaching, adjacent to the Biotechnology building. This is the final result of a grant to Prof. Patterson for the establishment of a bioinformatics node at the UFS as a faculty facility that will link with the National Bioinformatics Network. The aim of the university's node is to perform internationally competitive research in bioinformatics, contribute to capacity building in bioinformatics by the training of students at under- and postgraduate levels, and to host training workshops for students and staff. The bioinformatics node will also be involved in providing computational support to projects that include bioinformatics components.

Planning has also started for upgrading the Biotechnology building, which will make provision for the increased demand for laboratory space by adding a wing that will include new undergraduate laboratories so that the existing undergraduate laboratories may be converted to research laboratories to accommodate the increase in research activities in the department.

The department has 11 NRF-rated academics, including four B-rated scientists. In the 2007 *Evaluation and Rating Facts and Figures* publication of the NRF, the university is listed in second place under the top performing higher education institutions in terms of the number of rated researchers (11) in the specialist field of Microbiology and Plant Pathology. Eight of these 11 rated scientists are members of the department.

The department is represented on the editorial boards of several international journals. Prof. Bennie Viljoen serves on the editorial board of the journal *Food Microbiology* and Prof. James du Preez, Departmental Chairperson, is an associate editor of



Some of the foreign postgraduate students and postdoctoral fellows in the department during 2007 are front, from the left: Mss Kulsum Kondiah, Kenya, Kasweka Kakoma, Zambia, Mai Nguyen, Vietnam, Chikondi Mattaka, Malawi, Dr Khajamohiddin Syed, India, and Mr Simbarashe Mabwe Zimbabwe; back: Messrs Rudolf Schäfer, Germany, Joseph Katongole, Uganda, Mss Ji-Yun Lee, South Korea, Limpho Ramorobi, Nthabiseng Matsoha, both from Lesotho, Prof. James du Preez, Departmental Chairperson, Mr Olukayode Kulooy, Ms Elizabeth Ojo, both from Nigeria, and Dr Antonio García- Moyano, Spain. Mr Schäfer is a chemical engineering undergraduate from the Mannheim University of Applied Science in Germany participating in a research programme to gain practical experience in fermentation biotechnology as part of his course requirements.

the *World Journal of Microbiology and Biotechnology* and serves on the editorial boards of *FEMS Yeast Research* and the e-journal *Biotechnology for Biofuels*.

The department was well represented at international congresses. Prof. Lodewyk Kock and six of his postgraduate students from the Lipid Biotechnology Group presented their research at the Asian Mycology Congress (AMC2007) and 10th International Marine and Freshwater Mycology Symposium held on the island of Penang in Malaysia. At this congress Mr Desmond Ncango, a Ph.D. student, was awarded first prize in the Biochemistry and Industrial Mycology section for his poster presentation and Mr Olihile Sebolai presented a lecture. These students were fully sponsored by the South African Fryer Oil Initiative (SAFOI), which is part of the Lipid Biotechnology Group. The 26th International Specialised Symposium on Yeasts (ISSY 26), held in Sorrento, Italy, was attended by Profs Kock, Du Preez (both members of the International Commission for Yeasts, which convened during the symposium), and Betty Lodolo (of the South African

Breweries Limited (SAB) and also affiliate associate professor in the department) who presented a keynote lecture with Prof. Kock as co-author. The other members of the group were Profs Albertyn, Viljoen, Ms Chantal Smith, Ms Andri van Wyk and Ms Olga de Smidt who presented a paper from her Ph.D. thesis at this symposium. Prof. Kock also served on the International Scientific Committee of this symposium and acted as chair of one of the sessions. In addition, SAFOI partly sponsored ISSY 26.

Prof. Du Preez attended the 13th European Congress on Biotechnology held in Barcelona, Spain. Dr Van Heerden, Prof. Litthauer and Mr Dirk Opperman, a Ph.D. student, attended the 9th International Thermophiles Conference held in Bergen, Norway. Mr Opperman received a travel grant from the Oppenheimer Trust and the faculty contributed towards his conference registration. Participation in other congresses included the Deutsche Gesellschaft für Fettwissenschaft (DGF) Symposium in Hamburg, Germany attended by Dr Manjusha Joseph, Biocatalysis-2007, Moscow, St. Petersburg, Russia attended by Prof. Martie Smit, BIOTRANS

2007 in Oviedo, Spain attended by Prof. Smit and the World Veterinary Poultry Association Congress in Beijing, China where Prof. Rob Bragg presented seven lectures and chaired one of the sessions at the congress.

Other overseas visits included that of Prof. Litthauer and Dr Van Heerden to the Department of Biology at the University of Bergen to discuss collaboration on phage diversity in the environment. Dr Van Heerden, who is a member of the local organising committee for the international Extremophiles 2008 conference, also met with the international organising committee for the conference and visited the Department of Georadiochemistry at the Institute for Interdisciplinary Isotope Research in Leipzig, Germany to discuss collaborative projects. Prof. Smit visited the group of Dr Vlada Urlacher at the Institute for Technical Biochemistry in Stuttgart, Germany and attended a three-day workshop to determine priorities for a South Africa-UK Science Network in Catalysis in Cardiff, Wales.

Profs Du Preez and Viljoen were invited to the University of Lund in Sweden

and the Norwegian University of Life Sciences in Norway, respectively, as the opponents in a Ph.D. defence. Prof. du Preez also presented a lecture on the role and regulation of alcohol dehydrogenases in *Saccharomyces cerevisiae* at the University of Lund. Prof. Patterson visited the Joliot-Curie Laboratory of the *Ecole Normale Supérieure de Lyon* as invited professor from April to May and presented invited seminars at the Joliot-Curie Laboratory, CNRS in Lyon (with Dr Philippe Bouvet as his host), the Laboratoire de Biologie Moléculaire Eucaryote, CNRS in Toulouse (with Dr Michael Georgiev as his host), the Institut André Lwoff, CNRS in Paris (with Dr Ali Hamische as his host), and at the Université Joseph Fourier in Grenoble (with Dr Stefan Dimitrov as his host).

Members of the department participated in various collaborative research programmes. The Food Biotechnology group under the leadership of Prof. Viljoen was successful in obtaining a South Africa/Norway collaborative project based on a project entitled: *Prospecting probiotics and antimicrobials in indigenous fermented milks*. An amount of more than R2 million was allocated over a three-year period. The project on indigenous fermented foods in Southern Africa was expanded to include researchers from Zambia, Mozambique, Swaziland, Zimbabwe and Lesotho. Part of this work is sponsored by the Norwegian Council of Universities Committee for Development, Research and Education (NUFU). Prof. Viljoen is currently the external programme co-ordinator for the Institute of Food, Nutrition and Family Sciences at the University of Zimbabwe, and the School of Agricultural Sciences at the University of Zambia.

The department is also involved in the international National Earthquake Laboratory in South African Mines project (NELSAM) and has active contracts with GFZ (GeoForschungs Zentrum Potsdam) and the Oklahoma University in the United States of America (USA) for a five-year period to facilitate expertise transfer, student bursaries and equipment donations to the department.

Collaborative research projects are in place with the Laboratoire de Génétique des Microorganismes of the Institut National Agronomique, Paris-Grignon in France on the non-conventional yeast *Yarrowia lipolytica*, and with the Institute of Technical Biochemistry at the University of Stuttgart in

Germany on the engineering of self-sufficient cytochrome P450 monooxygenases. Future collaboration with the department of Botany and Microbiology at the University of Lagos in Nigeria on the cloning of alkane degrading P450s from polluted environments is being investigated. Prof. Bragg has research agreements with Ewabo (Germany) and Mercordi (Belgium) for product testing.

Other research collaboration includes the Obihiro University of Agriculture and Veterinary Medicine in Japan and the University College of Cork in Ireland.

Prof. Philippe Bouvet from the Laboratoire de Biologie Moléculaire de la Cellule at the Ecole Normale Supérieure de Lyon visited the department at the end of March as part of the CNRS/NRF collabo-



The "international" team that was the winner of the UFS section of the National Innovation Fund competition for students are, from the left: Ms Kasweka Kakoma, Zambia, Mr Lehlohonolo Mathengtheng, South Africa, Prof. Rob Bragg, mentor, and Ms Ji-Yun Lee, South Korea.



Some of the guests attending the launch of the BioPAD Platform for Metagenomics research contract are: Drs Siyabulela Ntutela, Deputy Director: Biotechnology at the Department of Science and Technology, Godfrey Netswera, Manager of Thuthuka and the Support Programme at the National Research Foundation (NRF), Esta van Heerden, Platform Manager and lecturer at the department, Mr Butana Mboniswa, Chief Executive Officer of BioPAD, and Mr Vuyisele Phehani, Portfolio Manager for BioPAD.

rative exchange programme. Prof. Bouvet, who obtained his Ph.D. from Harvard University in the USA and completed postdoctoral training at the National Institute of Health, gave a seminar on the role of nucleolin in chromatin structure and gene expression and also met with several research groups in the department. Prof. Judy Narvhus (Norway), Dr Tony Mutukumira (Swaziland) and Dr Henry Gadaga (Lesotho) again visited the department in December as part of the Food Biotechnology programme. Prof. Bärbel Hahn-Hägerdal of the University of Lund in Sweden was appointed as Professor Extraordinary in the department. Prof. Edgar Da Silva from Paris, a current Professor Extraordinary in the department and former director of the United Nations Educational, Scientific, and Cultural Organisation's (UNESCO) Division of Life Sciences, visited the department in September and presented several lectures. Sadly, he passed away shortly afterwards while on a visit to India. This tragic loss was compounded by the death of Prof. Santosh Nigam, also a Professor Extraordinary in the department, in Berlin about a month earlier.

On national level the department collaborated on research with Onderstepoort Biological Products, ICA International Chemicals (Pty) Ltd., Mintek, Agave Distillers (Pty) Ltd., the NRF-DST Centre of Excellence in Catalysis hosted by the University of Cape Town (UCT), Stellenbosch University, the Tshwane University of Technology, the University of Fort Hare and Tiger Brands. Prof. Patterson collaborated with the National Bioinformatics Network on the development of bioinformatics in South Africa. Prof. Bragg of the Veterinary Biotechnology research group has an ongoing collaborative project with Prof. Ed Rybicki's group at UCT on the development of vaccines for the control of the Psittacine Beak and Feather disease virus. This virus is currently one of the major threats to the highly endangered and endemic Cape parrot. An experimental DNA vaccine has been successfully developed and testing in birds will start in January 2008.

Dr Arno Hugo undertook a project on Nguni meat quality in collaboration with researchers from the University of Fort Hare and the Nutrition and Food Science department of the Agricultural Research Council (ARC). In September, Dr Hugo presented the 32nd workshop on meat processing at the UFS. Also in September, Prof. Kock, Dr. Manjusha Joseph and students Ms Ntsoaki Leeuw

and Ms Vernita Reid, all from the Lipid Biotechnology Group, presented a workshop for the North West Department of Health at their headquarters in Vryburg. Prof. Kock participated in a *Carte Blanche* television programme on food labelling in April. He also served on the NRF's assessment panel for Microbiology and Plant Pathology, while Prof. Viljoen served on the NRF's project panel for Microbiology and Plant Pathology.

Apart from international research collaboration, the department also has a significant number of foreign postgraduate students and postdoctoral fellows from various countries. At the 2007 graduation ceremonies, two Ph.D., 12 M.Sc. and 17 Honours degrees were conferred. One student who excelled was Ms Ané van Heerden, who received her M.Sc. with distinction and was awarded the Van der Walt Prize, the Sasol Prize, the S₂A₃ bronze medal and university academic colours at the faculty prize-giving ceremony. A team from the Veterinary Biotechnology Research group was the winner of the UFS section of the National Innovation Fund competition for students, with their business plan on the use of bacteriophages to combat specific bacterial infections in poultry. This team comprised Ms Kasweka Kakoma, Ms Ji-Yun Lee and Mr Lehlohonolo Mathengtheng. The team will now submit their project proposal to the national competition, which will be adjudicated early 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 causes some activities to fall outside this field. Activities of these research groups not reported above are indicated below.

In the **Food Science division**, Dr Hugo focuses his research on the manipulation of meat quality by nutrition. He presented his research on nutrition and meat quality of pork in South Africa at the 53rd International Congress of Meat Science and Technology in Beijing, China. His observations of a seasonal variation in fatty acid composition of pork attracted great interest from a large number of congress participants. Prof. Garry Osthoff is researching milk from wild animals in order to improve our understanding of milk as food in the broader animal king-

dom. Not all compounds in milk are utilised for growth or energy. The oligosaccharides, for instance, have a prebiotic function, and are very important in some species. To research these molecules, Prof. Osthoff has entered into cooperation with a research group at the Obihiro University of Agriculture and Veterinary Medicine in Japan, where he spent some time during the year isolating and partially characterising oligosaccharides from elephant milk.

The **Lipid Biotechnology Group** led by Prof. Kock and Dr Carlien Pohl in collaboration with Prof. Pieter van Wyk (of the Centre for Confocal and Electron Microscopy at the UFS) and Prof. Lodolo (from SAB) concentrated on the uncovering of novel antifungals and antifloculants with antimitochondrion activity. This finds application in the brewing industry where the control of flocculation is important in beer clarification and in the termination of fermentation. This research is also of special medical importance since fungal infections annually contribute towards many deaths worldwide, including in South Africa. It was uncovered that inexpensive acetylsalicylic acid acts as a potent antimitochondrial antifungal in a large number of yeasts with potential for human application. This research resulted in seven articles published and accepted in ISI-accredited scientific journals and three students successfully completing their M.Sc. studies (all with distinctions). This work was also published as a review in one of the foremost specialised yeast journals, *FEMS Yeast Research* (2007;7:1207-1217). Dr Pohl is currently also investigating the effect of unusual non-methylene interrupted fatty acids, specifically sciadonic acid, on the opportunistic yeast pathogens *Candida albicans* and *Candida dubliniensis*. Sciadonic acid is an arachidonic acid homologue, but unlike arachidonic acid it cannot be metabolised to form prostaglandins – important virulence factors of these yeasts. This research will provide a better understanding of lipid metabolism in these yeasts and may also lead to the development of sciadonic acid as a novel antifungal agent against pathogenic yeasts.

The **Biocatalysis research group** of Prof. Smit participates in the DST-NRF Centre of Excellence in Catalysis, hosted by UCT and the High Throughput Biology Research Niche Area of the Advanced Biomolecular Research Cluster of the UFS. The main focus is on the terminal hydroxylation of alkanes and alkylben-

zenes by cytochrome P450 monooxygenases, but benzylic hydroxylation of alkyl phenols by vanillyl alcohol oxidases is also receiving attention. Previous work mainly involved the cloning of yeast P450s into the yeast *Yarrowia lipolytica* followed by whole cell biotransformations in shake flasks.

During 2007 the group ventured into a number of new activities that included P450 enzyme assays with cell free extracts and microsomal fractions; expression of P450s in *E. coli*; cloning of P450s into *Pseudomonas* strains; cloning and expression of bacterial P450s as well as enzyme modelling. Molecular biology projects are done in collaboration with Prof. Albertyn (**Molecular Biology research group**). During 2007 the group also commissioned an InFors Sixfors multireactor which was acquired during 2006 with funding from the UFS, the DST-NRF Centre of Excellence in Catalysis and the NRF. This multireactor system makes it possible to simultaneously run six small-scale bioreactor experiments with online monitoring of pH and oxygen and control of pH, stirring and substrate feed. A second postdoctoral fellow, Dr Rama Krishna Gudimanchi, joined the group in August.

In the **Fermentation Biotechnology research group**, led by Profs du Preez and Stephanus Kilian, work on the production and application of prebiotics continued. Previous work of Prof. Kilian, focusing on the prebiotic sugar neokestose, was extended to determine its potential to stimulate the growth of a known probiotic yeast strain and a number of other yeasts with potential probiotic properties. The resistance of neokestose to intestinal conditions and enzymes and the comparison of the properties of neokestose in this regard to inulin, a commercial prebiotic, is also under investigation. The research project of Prof. Du Preez together with Dr Carlien Pohl-Albertyn and Mr Piet Botes on the fermentation of Agave juice extract was continued. This research was undertaken in collaboration with Agave Distillers (Pty) Ltd., the only company in the world outside Mexico that produces Agave spirit (known in Mexico as tequila). A number of *Saccharomyces cerevisiae* yeast strains were evaluated in terms of their temperature-ethanol tolerance profiles and fermentation performance. A strain of *Kluyveromyces marxianus* was isolated from the juice and shows promise for use in the



Departmental delegates at the 26th International Specialised Symposium on Yeasts (ISSY 26) held in Sorrento, Italy are, from the left: Ms Olga de Smidt, Ph.D. student, Prof. Bennie Viljoen, Ms Chantal Smith, researcher, Profs Bettie Lodolo, Affiliate Associate Professor, Koos Albertyn, Lodewyk Kock and James du Preez, Departmental Chairperson, with Mount Vesuvius in the background.

process to improve the efficiency of the fermentation. The collaborative project of Prof. Albertyn (**Molecular Biology research group**) and Prof. Du Preez on the regulation and physiological role of the alcohol dehydrogenase (ADH) isozymes in *S. cerevisiae* has turned up some interesting results. The effect of multiple *adh* deletions in strains of *S. cerevisiae* on its phenotype is under further investigation, using aerobic glucose-limited continuous cultures.

Large numbers of new genes have become available due to the progress of various genome projects. This necessitates the development of highly efficient expression systems for the production of heterologous proteins, for both industrial and academic purposes. The **Molecular Biology research group**, led by Prof. Albertyn, is currently analysing the expression potential of three yeast hosts in collaboration with Prof. Gotthard Kunze of the Institut für Pflanzengenetik und Kulturpflanzenforschung in Germany. In this study a xylanase is expressed using an integration plasmid based on the conserved 26S rDNA locus which allows a single plasmid to be transformed in all three yeast hosts. These will subsequently be compared to the expression levels using host-specific plasmids. These include plasmids developed in a previous study

expressing epoxide hydrolase genes in *Y. lipolytica*. Analysis of the expressed protein will be performed to determine expression levels (on both mRNA and protein level) and glycosylation levels. Furthermore, this research group is in the process of developing a series of plasmid-based vectors to allow the transformation of and heterologous expression in various yeasts.

The Epigenomics and DNA Function research group of Prof. Patterson continued work on the role of chromatin structure on the regulation of gene expression on a genome-wide scale. Work showing that the linker histone H1 was absolutely required for compaction of chromatin in the stationary phase was completed. The surprising finding was made that H1 did not act as a general transcriptional repressor in the semi-quiescent state, despite its central structural position in the nucleosome. Instead, strong evidence was found for H1 being displaced by transcriptional activity. These findings suggested that in lower eukaryotes, such as *Saccharomyces cerevisiae*, the primary role of compaction of chromatin in the stationary phase may not be for gene shutdown, but may be related to an inhibition of homologous recombination, thus maintaining the genome integrity over extended periods of time during semi-quiescence.

Staff

Division Microbiology and Biochemistry:

Professors: Profs James du Preez, Rob Bragg, Stephanus Kilian, Lodewyk Kock, Derek Litthauer, Martie Smit, Bennie Viljoen

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Senior Lecturers: Drs Esta van Heerden, André van Tonder

Lecturers: Drs Lizelle Piater, Carlien Pohl-Albertyn

Researcher: Ms Laurinda Steyn

Professors Extraordinary: Profs Edgar DaSilva, Bärbel Hahn-Hägerdal, Santosh Nigam

Affiliate Associate Professors: Profs Mary DeFlaun, Bettie Lodolo

Secretary: Ms Millie Cohen

First Professional Officer: Mr Piet Botes

Senior Professional Officer: Dr Manjusha Joseph

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Research outputs

Research articles

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Prof. Hendrik Swart

Department of Physics

Overview

The Department of Physics is in the enviable position of having had a number of highlights in terms of academic excellence and its contributions to the benefit of the Faculty of Natural and Agricultural Sciences have been noteworthy.

One of the highlights was the number of awards students of the department received during the 2007 annual conference of the South African Institute of Physics (SAIP). The 52nd conference was held in Johannesburg and one of the winners was Mr Tobi Oluwafemi, for the best Ph.D. paper (he is a student from the University of Zululand but his research was done at the department). Mr Oluwafemi's promoters were Prof. Hendrik Swart, Departmental Chairperson, and Prof. Neerish Revaprasadu, University of Zululand). The prize for the best Ph.D. poster was awarded to Mr Simon Dhlamini, with Profs Swart, Koos Terblans and Dr Martin Ntwaeaborwa as promoters.

The prize for the best M.Sc. publication was awarded to Ms Lisa Coetsee, with Profs Swart and Terblans as promoters. The best M.Sc. paper in Astrophysics was produced by Mr Brian van Soelen, with Prof. Pieter Meintjes as promoter and the second best paper in Astrophysics was by Mr Edward Jurua, with Prof. Meintjes as promoter. The prize for second best M.Sc. poster was awarded to Mr Werner Jordaan, with Profs Terblans and Swart as promoters. Although this was not an official prize, Mr Jordaan was invited to write an article for the *SA Journal of Science*.

Students took part in the *Suid-Afrikaanse Akademie vir Wetenskap en Kuns* competition in Pretoria, where Mr Richard Harris and Ms Mariette Erwee shared the second prize. Ms Coetsee won a software prize with her paper while Ms Sonja Nieuwoudt was awarded second prize for her poster. Ph.D. degrees were awarded to Drs L.A. Venter and Rochelle Conradie. M.Sc. degrees were awarded to Messrs Werner Jordaan, Pheneas Nkundakakura, H-C Liu and Shaun Cronjé.

Research in the department is done by two groups, namely the Solid State and the Astrophysics groups:

The **Solid State research group** was successful in obtaining a grant from the National Research Foundation (NRF) to establish a Nano Solid State-lighting research niche area (RNA) (valued at R476 000). Prof. Swart, as leader of the niche area, received an

award from the NRF for the highest scoring developed RNA. Only two awards in the developed area were made from a total of more than 80 niche areas.

Prof. Swart was invited to become part of the NRF Assessment Panel for Physics as well as the NRF Niche Area Advisory Committee. The main objective of the research associated with the Nano Solid State-lighting RNA is to develop nanophosphors for applications in infrastructure and high technology flat panel displays. The fabrication and testing of nanophosphors for infrastructure development, and phosphors which will withstand degradation, for flat panel display applications, will be the main challenge. Nanotechnology will provide tools for high tech development as well as development in rural areas. The fabrication of nanophosphors, which have a long after-glow, will provide cheap lighting for people in rural areas, assisting with national infrastructure development, but may also be used in high technology plasma and field emission television screens. This project is done in collaboration with Prof. Neerish Revaprasadi of the Department of Chemistry at the University of Zululand.

Two postdoctoral fellows from India, namely Drs Shivani and Ajay Mishra, were appointed (with money from the joint project) and will be situated at the Council for Scientific and Industrial Research (CSIR) to further strengthen the department's collaboration with Dr Thembela Hillie and Prof. Wynand Steyn at the CSIR. Dr Martin Ntwaeaborwa spent three months with Prof. Paul Holloway at the University of Florida, United States of America (USA), for a sabbatical visit to learn more about synthesis of nanophosphors. Prof. James M. Fitzgerald of Virginia University in the USA made some good SEM and CL measurements for the nanogroup. The SEM images and light output images correlate with each other. A total of nine Ph.D. and four M.Sc. students form part of the solid state group this year.

The approved niche area consists of several sub-focus areas:

Dr Ted Kroon is one of the sub-focus area leaders of the niche area. He obtained a grant to investigate nanocrystalline metals (valued at R116 800). This led to a visit to the CSIR to discuss carbon nanotube production and nanotube composite materials, as well as to the Central University of Technology (CUT) to view mechanical engineering apparatus and laser prototyping tools. During the year Mr Gerhard Olivier, a Ph.D.



The team that came second in the Innovation Fund competition was from the department, with team leader Ms Lisa Coetzee. The team received R30 000 for their project entitled: Light of the future. Here are, from the left: Profs Hendrik Swart, Departmental Chairperson and research leader; Koos Terblans, from the department, Ms Sonja Nieuwoudt, M.Sc. student, Messrs Simon Dhlamini, Ph.D. student, Richard Harris, Ph.D. student, and Dr James Ngaruiya, postdoctoral student from Kenya.

student, designed an Equal Channel Angular Pressing (ECAP) which was manufactured by the Instrumentation division. He also visited Dr Thomas Moyo of the University of KwaZulu-Natal to perform ball milling experiments and research on the incorporation of carbon nanotubes in metal powders.

The nano-crystal segregation sub-focus area leader is Prof. Terblans. The focus of the project is to increase knowledge about the physical and chemical processes that are involved during the growth process of metallic nano-crystals and also to understand heat treatments of metallic nano-crystals better. A molecular dynamics software package was developed to study the movements of atoms in and on the surfaces of crystals. The MD Program was used to study the migration of atoms during heat treatments (diffusion in crystals). A second project focuses on segregation energy and the role segregation energy plays during the formation of nano-crystals.

Dr Francis Dejene of the Qwaqwa Campus is the sub-focus area leader of the combination of nano-materials and polymers. This research project focuses primarily on the preparation and characterisation of various types of semiconductor nano-particles blended in a polymer matrix with lattice structure that matches that of the semiconductor particles for light emitting diodes, intended for applications such as plastic optical fiber communications, displays and signal indications.

This project is planned as joint research with the polymer group in the Department of Chemistry.

Nanoparticle phosphors synthesised at the department were used for pulsed laser deposition (PLD) of thin luminescent films at the National Laser Centre (NLC). A grant of R221 000 was obtained from the NLC to be used by our research group for the PLD studies. Pt-based alloys are an alternative to Ni-based alloys with better hardness, oxidation and corrosion resistance. Since the Ni alloys, used in jet engine turbines, are already used at 90% of their melting point, the search for an alternative is of the utmost importance. PLD also provides a technique for growing thin films of Pt-based alloys. The PLD was therefore also used in collaboration with Mintek (valued at R200 000) to grow PtAl alloy thin films.

The sol-gel technique for the synthesis of luminescent nanomaterials was further improved under the leadership of Dr Ntwaeaborwa. He is a member of the sub-committee of the South African Nanotechnology Initiative (SANI) that is rolling out the nanotechnology awareness campaign in the country on behalf of the Department of Science and Technology (DST). He occasionally participates in strategic meetings organised by the DST and/or the NRF, which aims to promote nanoscience research and nanotechnology in the country. He was part of the DST delegation that held a

series of meetings and workshops which led to the signing of a bilateral agreement for collaborative research in nanoscience between South Africa and South Korea in November 2007. His name appears among the top 20 researchers participating in the Research Development Initiative for Black Academics (REDIBA) programme of the NRF. A successful proposal for the purchase of R1.3 million Raman spectroscopy apparatus was submitted to the NRF equipment programme.

Prof. Swart presented a review on the electron-stimulated surface chemical reaction (ESSCR) mechanism for phosphor degradation at the conference of the International Centre for Material Research (ICMR), in Richards Bay, South Africa. He was accompanied by Dr Ntwaeaborwa who also made a contribution at the conference. Dr Ntwaeaborwa also gave invited talks at iThemba Laboratory for Accelerator-Based Sciences, (the Materials Research Group) and at the CSIR's National Centre for Nanostructured Materials.

Staff members attended several other international conferences. Mr Richard Ocaya gave presentations at the 7th Symposium of the International Federation of Automatic Control (IFAC) on Nonlinear Control Systems (NOLCOS 2007) in Pretoria and at the 8th Conference of the Institute of Electrical and Electronics Engineers (IEEE), Africon 2007 in Windhoek, Namibia. Mr Msomi presented at NSTI-Nanotech 2007, Nanotechnology Conference, Santa Clara, USA and the Hyperfine Interactions XIV International conference on Hyperfine Interactions and XIII International Symposium on Nuclear Quadrupole Interactions (HFI/NQI 2007) at the Iguaçu Falls in Brazil, as well as at the EBASI International Conference, Western Cape. Drs Dejene, James Ngaruiya (postdoctoral student) and Daniel Bem all presented at the 4th International Conference of MRS-Africa, Dar es Salaam, Tanzania. Dr Dejene also presented at the 2nd International Conference on Renewable Energy Sources and Energy Efficiency in Athens, Greece.

Dr Matie Hoffman attended the 14th WIEN2k – WORKSHOP at the Institute of High Performance Computing in Singapore, Malaysia. Presentations were given by several members at the Conference on Photonic Materials, Kariega Game Reserve, South Africa.

The research project for the Armaments Corporation of South Africa (ARMSCOR), investigating the micro-

structure and high strain rate properties of copper and molybdenum shaped charge liner material was completed after a visit to the CSIR (Ms Retha Rossouw) for Electron backscattering diffraction (EBSD) measurement of grains in copper, with Mr Shaun Cronjé receiving his M.Sc. *cum laude*.

Mr Justice Msomi of the Qwaqwa Campus completed his Ph.D. degree from the School of Physics, University of KwaZulu-Natal, during 2007. His thesis is entitled: *Synthesis, structural and magnetic properties of bulk and nanosized (Zn, Cd, Cu)_{0.5}Ni_{0.5}Fe₂O₄ and NiFe₂O₄ ferrites*. Mr Richard Ocaya of the Qwaqwa Campus also finished his Ph.D. entitled: *Robustness in Non-Linear Feedback Control Systems with Power Electronic Converter Applications*. In the attempt to answer some important contemporary questions on robust stability and performance of natural or built nonlinear systems, this work defines a detailed framework for quantification of these feedback systems from both a theoretical and a practical perspective. Particular emphasis is laid on the control of affine systems. The plant chosen is the highly nonlinear boost power electronic converter (PEC). The strength of this contribution lies in its presentation and use of Lie symmetries for the exact nonlinear feedback system identification and linearisation from an engineering perspective. In particular, H^∞ control design and μ -analysis are used. Numerous original codes and models in Matlab and PSpice are written to complement the theory. Finally, validation of the design concepts is then done using the simulation results and actual measurements on a +48V prototype.

The **Astrophysics research group** is already considered a very active and dynamic research group in multi-wavelength astrophysics in South Africa. Important evidence of the progress that has been made is the invitation of Prof. Meintjes to become part of the high-profile international High Energy Stereoscopic System (HESS) gamma-ray astrophysics group, as well as his nomination to participate in a research committee to drive the development of the SKA radio telescope array in South Africa.

The Astrophysics group achieved success on several fronts in 2007, namely research publications, conference contributions and the successful completion of three M.Sc. dissertations, of which two passed with distinction (Messrs Nkundubakura and Van Soelen). The



Mr Pheneas Nkundakakura (left), a student of the National Astrophysics and Space Science programme (NASSP), obtained an M.Sc. in Physics in 2007. With him is his study leader, Prof. Pieter Meintjes from the department.



Here are, from left: Drs James Ngaruiya, postdoctoral student, Frances Dejene and Mr Bem Daniel at the 4th International Conference of MRS-Africa, Dar es Salaam, Tanzania.

Astrophysics group was once again joined by two students from the National Astrophysics and Space Science Programme (NASSP), namely Messrs Aniel Wium and Bosco Oruru. There are currently four Ph.D. and three M.Sc. students busy with graduate studies in astrophysics in the department. Dr Louis Venter, who completed his Ph.D. studies successfully in 2007, is currently doing postgraduate research in Paris, France.

In 2007, a special DST grant of R540 000 for promoting multi-wavelength astrophysics at the UFS, was obtained. This grant, in combination with

the NRF focus area grants (valued at R115 000), played an important role in expanding the department's research infrastructure. With these grants several new research computers were purchased for the Boyden observatory, personnel and graduate students. The Astrophysics group is particularly excited about the purchase of a 5-node parallel cluster (valued at R150 000), which is integrated with the 90-node cluster of the UFS, for high speed computing in astrophysics and surface physics research.

A very valuable addition to the research infrastructure is the develop-



A team from Eunice Primary School won the National Astronomy Quiz. Staff from the UFS Boyden Observatory provided advice and assistance to the Eunice team. Here are, from the left: Naomi Steinberg, Jacques Ras, Jodie Muller, Pragma Dawadi.

ment of an IRAF-based photometry programme to facilitate our photometric research at the Boyden Observatory. This programme was developed by Mr Hendrik van Heerden in fulfilment of his M.Sc. requirements.

New computerised experimental equipment (driven harmonic systems) for second-year students was purchased from PASCO, and equipment for experiments with microwaves was repaired and upgraded. Several new modules were successfully created and approved: new astrophysics modules on radiative processes (Prof. Meintjes) and a new module on service learning (Dr Hoffman and Mr van Jaarsveldt) will be presented for the first time in 2009. The B.Sc. Hons. in Physics was introduced at the Qwaqwa Campus. Four students enrolled in 2007, and three of them are currently busy with their M.Sc. studies.

A workshop on electricity and magnetism was presented to learners at the Sasol TechnoX exhibition in Sasolburg. Prof. Neil Heideman, Vice-Dean of the faculty, was accompanied by Dr Kroon to the Higher Education Quality Committee's (HEQC) evaluator training workshop in Johannesburg. A short overview of the department was presented by Prof. Meintjes at a workshop of the NRF and the Emerging Space Programme at the South African Astronomical Observatory (SAAO) in Cape Town. A new Trac science laboratory was established at the C&N Oranje Meisieskool in collaboration with the

Research Institute for Education Planning (RIEP) at the UFS.

The facilities at Boyden Observatory are being developed according to a master plan which was implemented in 2003. While the first phase of improvements was completed in 2004, the second phase of improvements really gained momentum during 2007 with a further extension of the Charl van der Merwe Education Walk with funds from private sponsorships; a number of interactive exhibits were also implemented, including an interactive skypointer, funded from a DST grant. A total of R550 000 was obtained for further improvements. Dr Hoffman and his team members reached more than 6 800 learners during 2007, with the interactive programme presented at the Boyden Observatory.

The National Science Week organised by the Boyden Science Centre in collaboration with the National Museum in Bloemfontein, the Free State National Botanical Gardens (FNBG), RIEP, the South African Institute for Civil Engineers (SAICE) and other participants provided a large variety of educational activities. The programme included educational activities presented to 63 school groups, reaching 108 teachers and 2 429 learners. Workshop programmes were presented to small groups of two to five teachers and learners from 114 schools, reaching 187 teachers and 200 learners. There were three small public events reaching a total of 163 people. Since most of the

Staff

Main Campus

Professor: Prof. Hendrik Swart

Associate Professors: Profs Koos Terblans, Pieter Meintjes, Wiets Roos

Senior Lecturers: Drs Matie Hoffman, Ted Kroon

Lecturer: Dr Martin Ntwaeaborwa

Part-Time Lecturers: Mr Gustav Smit, Dr Rochelle Conradie

Professional Officer: Mr Heinrich Joubert

Administrative Officer: Ms Elsa Pretorius

Qwaqwa Campus

Senior Lecturers: Dr Francis Dejene

Lecturers: Dr Justice Msomi, Messrs Jappie Dolo, Moses Mothudi, Richard Ocaya

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activities involved intensive educational activities of between two and three hours, approximately 6 300 "learning hours" were delivered in this project. Teachers were informed about global warming and how they can integrate this into their lesson plans to create awareness among learners about global warming and the need to prevent it. Manipulation skills learned by some teachers who had never before made use of a microscope in their teaching, was also a strong focus of some of the activities.

Research outputs

Research articles

Coetsee, E., Terblans, J.J. & Swart, H.C. 2007. Cathodoluminescence degradation of $Y_2SiO_5:Ce$ thin films. *Journal of Vacuum Science and Technology A* 25(4): 1226-1230.

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Reports

Harris, R.A., Swart, H.C. & Terblans, J.J. 2007. Preliminary report on growth of Pt86: Al11:Cr3:Ru2 - super alloy thin films via Pulse Laser Deposition (PLD). Report to Mintek, Johannesburg, South Africa.

Harris, R.A., Swart, H.C. & Terblans, J.J. 2007. Preliminary report (II) on growth of Pt86: Al11:Cr3:Ru2 - super alloy thin films via Pulse Laser Deposition (PLD). Report to Mintek, Johannesburg, South Africa.

Conference contributions

Asante, J.K.O. & Roos, W.D. 2007. Comparing segregation profiles of Sn and Sb in single and polycrystalline Cu. Poster presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

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Coetsee, E., Terblans, J.J. & Swart, H.C. 2007. Luminescent properties of $Y_2SiO_5:Ce$ thin films. Paper presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

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Prof. Jo van As

Department of Zoology and Entomology

Overview

The Department of Zoology and Entomology 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”.

The **Aquatic Parasitology group** spent the April 2007 recess at the De Hoop Nature Reserve in the Western Cape with the third-year Zoology students as part of the practical part of the Marine Ecology course. This has been ongoing for the past 15 years and since 2004 the group has held a combined excursion with students majoring in Zoology and Botany.

During the 2007 excursion the group was joined by Prof. Robin Overstreet and Dr Ash Bullard, both from the Gulf Coast Research Laboratory at the University of Southern Mississippi, Ocean Springs, United States of America (USA). Prior to the ecology excursion the Aquatic Parasitology Research group undertook a week-long field trip to the De Mond Nature Reserve in the South-western Cape where they sampled in the estuary as well as in the Zoetendalsvlei area. Although the group concentrated on mullets, they also searched for the fish hosts of the elusive *Argulus capensis* and other branchiurans. Fish collected in the De Mond estuary revealed a number of parasitic crustaceans, a variety of worms and numerous ciliates.

During the second week, Prof. Jo Van As, Departmental Chairperson, and Dr Liesl van As spent their time with the third-year students on the rocky shore at De Hoop. Prof. Overstreet and Dr Bullard accompanied Prof. Linda Basson and the postgraduate students in collecting and examining fish in the tidal pools of the rocky shore. Both visiting scientists gave lectures during the excursion to all the ecology students. Prof. Overstreet spoke about the eating habits of parasites, while Dr Bullard entertained the students by informing them about the life of a world-travelling scientist.

During October and November 2007, Prof. Van As and Dr Van As accompanied postgraduate students on a field trip to the

Leseding Research Camp in the Okavango. They were joined by Dr Paul Grobler of the Department of Genetics at the UFS and Prof. Louis Scott, well known pollen-paleontologist from the Department of Plant Sciences at the UFS.

During their seven-day visit samples were collected in the panhandle. They also spent a few days at Lake Ngami, where they collected pollen samples with a soil sampling tube. They collected water samples and tadpoles, and spent an afternoon at the Harry Oppenheimer Okavango Research Centre (HOORC) in Maun, Botswana. The director of the HOORC, Prof. Lars Ramberg, visited them in Leseding Research Camp at the end of the field trip. During this visit collaboration between the UFS and the University of Botswana was confirmed. Prof. Louis du Preez from the North-West University also joined the excursion to collect different frog species. He made use of this research trip and the infrastructure of the Leseding Camp to take photographs for a book he is presently working on. The book deals with tadpoles and frogs that specifically occur only in that area.

Another highlight of this trip was a two-day visit from the Matshwane Primary School in Botswana and their teacher, Ms Linda Kloppe. During their visit the children were introduced to the wonderful life of the delta. The school was also presented with six stereo-microscopes, donated to the group by the Microscopy Society of Southern Africa.

During a four-week survey in the Okavango the group mainly concentrated on water samples from various riverine localities. They collected tadpoles as part of the master's study of Ms Hanlie Groenewald. Tadpoles act as hosts to some of the same kinds of ciliophorans also found on fish. Part of the biodiversity project is to determine which species are also associated with non-fish hosts.

Ms Groenewald as well as other students in the department attended the 36th Congress of the Parasitological Society of Southern Africa at the Pestana Kruger Lodge, just outside Malelane in Mpumalanga. This congress was hosted by the industry, with the Intervet Pty (Ltd), Malelane Research Unit and Argos Veterinary Science/Volcano Life Science the main organisers of the conference.



Ms Deidre West doing water analysis with school children from the Matshwane Primary School in Botswana.

Profs Van As and Basson, and Drs Van As and Candice Jansen van Rensburg attended the Seventh International Symposium on Fish Parasites held in Viterbo, Italy in September 2007, where three papers were presented.

The **Arachnology group's** field work during 2007 involved visiting several reserves in KwaZulu-Natal during June-July 2007 to collect spiders. Included were the Ithala Game Reserve, Ophathe Game Reserve, Greater St. Lucia Wetlands Park, Tembe Elephant Park and Ndumo Game Reserve. Several postgraduate students from the department assisted with collecting spiders, and also spent time doing bird and mammal surveys in each reserve. During November-December 2007 a month was spent collecting spiders in southern Mozambique. This area is remarkably poorly studied compared to South Africa, with only 150 species recorded from Mozambique compared to the more than 2 000 species known from South Africa. It is also a biogeographically important region, forming the northern part of the Maputaland coastal plain, which is regarded as an important centre of endemism for plants and animals.

During earlier studies on the fauna of Ndumo and Tembe, more than 400 species of spiders were collected in each reserve, and the group was interested in assessing the relationships between Mozambican and KwaZulu-Natal fauna,

with particular reference to the family Corinnidae, the focus of the group's research. It came as no surprise that many KwaZulu-Natal species have extended distributions up the coast, and may occur even further north into East Africa.

Ms Robin Lyle undertook a trip to the natural history museums in Paris, Geneva, Brussels (Tervuren) and London during the June-July 2007 recess. She examined type material and other specimens of the sub-family Trachelinae (Araneae: Corinnidae) for her M.Sc. project. During her time in Belgium she met with Dr Jan Bosselaers, an experienced researcher working on the Corinnidae, and was able to obtain valuable guidance regarding her project. Her M.Sc. thesis will be submitted for examination in May 2008, and will include revisions of three genera from this group.

During August 2007 Mr Charles Haddad attended the 17th International Congress of Arachnology in Sao Pedro, Brazil, where he presented a paper on termitophily and termitophagy in spiders, and a poster on East African spider diversity patterns. This was the largest ever international meeting, with more than 250 delegates.

Ms René Fourie completed her B.Sc. honours during 2007. She studied the grass- and tree-dwelling spider communities in the Erfenis Dam Nature Reserve in the central Free State. This study has been expanded for her M.Sc. to include a

chapter investigating the impacts of controlled burning of grasslands on the succession processes and species diversity of spiders.

The research group of the **Pesticide Resistance Testing and Research Facility** is fully operational for the determination of tick resistance to chemical control by employing conventional resistance testing. Clients consist of companies such as Bayer, who are contracted for the use of the services of the research facility until 2009, Virback and Novartis, as well as private clients from farms in areas with serious resistance problems. Promotion of these services, as well as establishing possible research collaboration, was done by visiting Bayer, Virbac and a private consultant, Pierre van Niekerk, early in August 2007.

The group attended the Mooi Rivier Fat Stock Show organised by Voermol, where valuable contacts with pharmaceutical companies and producers were made. Various veterinarians in the KwaZulu-Natal problem areas were visited to identify needs in the field. The facility's website, www.ticks.co.za, describing the services of the facility, was also updated to promote the availability of information to the clients.

Equipment for use in the investigation and development of molecular techniques for the determination of tick resistance to chemical control was finalised at the end of 2007. The laboratory is now ready to commence with the development of molecular resistance testing procedures. Tick material (larvae) of the ticks *Rhipicephalus (Boophilus) decoloratus* and *R. (Boophilus) microplus* from various parts of South Africa was collected during 2007 to be tested for the presence of resistance mechanisms once the procedures are in place.

Research projects on the geographic distribution of *Ixodes* (Acari: Ixodidae) ticks in the Free State province and the seasonality of those associated with African Buffalo, were performed by Mr Whitey Jordaan as part of his M.Sc. dissertation entitled: *Geographic distribution of Ixodes (Acari: Ixodidae) ticks in the Free State Province and seasonality of those associated with African Buffalo*. A taxonomic description of all four stages of four *Ixodes* (Acari: Ixodidae) tick species is currently being done by Ms Sharon Terry. The study commenced at the beginning of 2007 and most of the fieldwork and identification work has been comple-

ted. Ms Terry's M.Sc. dissertation is entitled: *A Taxonomic description of all stages of four Ixodes (Acari: Ixodidae) ticks*. Her promoter is Prof. Ivan Horak.

Ms Octavia Motlogeloa did her honours degree dissertation on the *Influence of water quality on tick mortality*.

Ms Terry attended the student workshop of the South African Biosystematics Initiative (SABI) held in Pretoria, Gauteng. She was elected as a member of the student council and as member of the student website council of SABI. She was also elected President of the department's Postgraduate Forum.

Ms Ellie van Dalen and Christa Du Randt attended the WHO/TDR Good Laboratory Practice Training Workshop held at the Faculty of Health Sciences of the UFS.

Prof. Horak and Mr Jordaan presented a poster talk at the 36th Annual Conference of the Parasitological Society of Southern Africa, held at Pestana Kruger Lodge, Malelane, South Africa in September 2007.

Research projects undertaken by the **Etho Ecology group** investigated the general biology and ecology of larks in the central Free State as well as the general biology of the feral pigeon in the Bloemfontein area. The influence of eye size on the behaviour of some Free State bird species was also examined. Research on larger animals included the comparative behaviour and ecology of the red hartebeest and black wildebeest. The etho-ecology of the bles- and bontebok with special reference to hybridisation was undertaken in collaboration with the Department of Genetics.

Members of the group undertook an annual honours excursion to the Willem Pretorius Nature Reserve. Prof. Ordino Kok gave an oral presentation on bird hazards at inland airports, at an international congress in Kingston, Canada.

During 2007, 11 students were registered for the third-year Entomology course (ENT334), presented by the **Medical, Veterinary and Forensic Entomology group**.

One honours student, Mr Theo Viljoen, completed his research project on Forensic Entomology, in collaboration with the Department of Genetics at the UFS. Ms Karen Ehlers was the co-supervisor of this project. The project was entitled: *Blowfly crop analysis: The pre-*



South Africa has a shortage of forensic entomologists, Prof. Theuns van der Linde of the Medical, Veterinary and Forensic Entomology group said in his inaugural lecture as full professor. He is one of only two practising forensic entomologists in South Africa. Forensic entomology is used, among other things, in the solving of murder cases, suicide cases, rape and these days also in solving in transit robberies. The theme of his lecture was: *The detective was an insect - a short overview of forensic entomology*. At the lecture are, from the left: Profs Frederick Fourie, Rector and Vice-Chancellor of the UFS, Van der Linde, Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS, and Jo van As, Departmental Chairperson.



South African researchers at the 17th International Congress of Arachnology in Sao Pedro, Brazil are, from the left: Dr Lorenzo Prendini, American Museum of Natural History, New York, United States of America (USA), Dr Ansie Dippenaar-Schoeman, Agricultural Research Council's (ARC) Plant Protection Research Institute (PPRI), Pretoria, Mr Leon Lotz, National Museum, Bloemfontein, Mr Charles Haddad, Arachnology group, and Dr Stefan Foord, University of Venda, Thohoyandou.

sence of genomic DNA and the effect of degradation.

Mr Gert Venter completed his Ph.D. study in November and his thesis was submitted in December 2007. The title of his thesis is: *The oral susceptibility of South African livestock-associated Culicoides species to selected orbiviruses*.

Three publications in accredited scientific journals were published during 2007 by members of Prof. Theuns van der Linde's research group. Although Prof. Van der Linde was kept busy supervising his students, he did several crime investigations with the South African Police Services (SAPS) and wrote confidential reports, which were submitted to the SAPS and the State Pathologists during 2007.

Prof. Van der Linde was also an invited speaker at the congress of the International Organisation for Forensic Odonto-Stomatology (IOFOS) from 21-23 November 2007 at the Breakwater Lodge, V & A Waterfront, Cape Town. Prof. Van der Linde is also involved as co-organiser of the Medical and Veterinary Section of the 23rd International Congress of Entomology (ICE2008) to be hosted in Durban during July 2008. He is also co-organiser of the Symposium on Forensic Entomology at the same congress.

Currently two Ph.D. students in Forensic Entomology are nearing the completion of their studies. Mr Kobus Kolver is studying aspects of insect succession on burnt bodies, and Ms Sonja Brink is doing research on the morphology of the immature stages of various blowfly species of forensic entomological importance. A further two M.Sc. students and one B.Sc. (Hons.) student joined this research group in 2007, two of them in Forensic Entomology and one in Veterinary Entomology.

Various criminal investigations were undertaken during 2007 by members of the Forensic Entomology Research Group in collaboration with the SAPS and State Pathologists. Confidential reports were submitted.

The **Nematology research group** concentrates on plant parasitic nematodes occurring in the Free State Province, which in the long run will aid farmers in this area.

In 2006 Mr Theuns Louw received his B.Sc Honours in Entomology and registered for his M.Sc. in Nematology in 2007. In November 2006 Dr Candice



Here are Dr Liesl van As (background, left) and Prof. Jo van As, Departmental Chairperson (background, right) working with Dr Ash Bullard (front left) and Prof. Robin Overstreet (front right) from the Gulf Coast Research Laboratory of the University of Southern Mississippi, United States of America (USA) during the research trip to the De Mond Nature Reserve.

Jansen van Rensburg and Mr Louw visited the Agricultural Research Council's (ARC) Plant Protection Research Institute at Rietondale, Pretoria to make contact with the nematologists at this institution. The group also visited the ARC's Grain Crops Institute in Potchefstroom to establish possible collaboration projects.

During the autumn recess of 2007 Dr Jansen van Rensburg accompanied Dr Van As and Profs Van As and Basson on the annual third-year excursion to the Potberg Environmental Centre in the De Hoop Nature Reserve in the Western Cape.

Dr Jansen van Rensburg and Mr Louw also attended the Nematological Society of southern Africa's bi-annual conference held in Port Elizabeth at the beginning of May 2007 where they were exposed to a number of interesting and informative talks and got to meet world-class scientists in this field. During the June/July 2007 winter recess Dr Jansen van Rensburg and Mr Louw attended a two-week training course on laboratory techniques and identification of various plant parasitic nematode genera.

Dr Jansen van Rensburg, together with Dr van As and Profs Van As and Basson attended the 7th International Symposium on Fish Parasites in Viterbo, Italy in September 2007.

The Insects on New Crops Programme (INCroP) conducted research on pistachio (client: Industrial Development Corporation – Green Valley Nuts,

Prieska), cactus pear (client: SA CactusNet), kenaf (client: Sustainable Fibre Solutions, Cape Town), Hoodia (clients: Phytopharm and Unilever, United Kingdom (UK)) and agave (client: Agave Distillers, Graaff-Reinet).

Co-operative research was also conducted on lettuce cultivation under shade house conditions (with the Central University of Technology (CUT), Bloemfontein), wheat leaf miner biology (with the ARC's Small Grain Institute, Bethlehem and Griqualand West Corporation, Douglas), parasitoid complex on coral tree species (with the ARC's Plant Protection Research Institute, Pretoria), Russian wheat aphid biotypes (with the ARC's Small Grain Institute, Bethlehem); mango weevil population dynamics and management (research conducted at Bavaria Fruit Estates, Hoedspruit); Hemipteran insects as vectors of sorghum diseases (with the Department of Plant Sciences at the UFS); and arboreal insect stratification along the Omaruru River, Namibia (with Polytechnic of Namibia, Windhoek). Postgraduate students are involved in all these projects for degree purposes.

Mr Haddad, a lecturer in the department, carried out research on the systematics of the Corinnidae spider family for his Ph.D. degree, whilst Mr Vaughn Swart, a registered Ph.D. student in Environmental Management and Entomology, investigated the role of insects on new crops as bio-indicators in South African agribusiness.

Prof. Schalk Louw participated in the 6th International Congress of Cactus Pear and Cochineal hosted in João-Pessoa, Paraíba, Brazil during October 2007.

Prof. Louw was involved in the structuring of the UFS research cluster entitled: "Technologies for sustainable crop industries in semi-arid regions". He was co-recipient of a Technology Award of the National Departments of Trade and Industry and Science and Technology for research on and development of kenaf, a

new industrial crop for South Africa. Prof. Louw is also the Deputy Chairperson: Congress Management Committee of the prestigious 23rd International Congress of Entomology to be hosted in Durban during July 2008.

An M.Sc. dissertation in Entomology entitled: *Atelocera raptoria* (Hemiptera: Pentatomidae) on pistachio (*Anacardiaceae: Pistacia vera*) in South Africa: Implementation of a plant health management strategy was completed by Mr De Villiers Fourie.

Research outputs

Research articles

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Butler, H.J.B. & Kok, O.B. 2007. Habitats-voorkeure, voedafstande en vlieggrigtings van vee-reiers (*Bubulcus ibis*) in die sentrale Vrystaat. *Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 26(3): 196-204.

Grünewald, H., Butler, H.J.B. & Scholtz, N. 2007. Die effek van ongerehabiliteerde uraanmyne op kleinsoogdier populasies. *Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 26(1): 93-94.

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Van As, L.L. & Van As, J.G. 2007. *Lamproglana hepseti* n. sp. (Copepoda, Lernaeidae) gill parasite of the African Pike, *Hepsetus odoe* (Bloch, 1794) from the Okavango River and Delta, Botswana. *Systematic Parasitology* 67: 19-24.

Vidrine, M.F., Lötter, Z., Van As, J.G., Bogan, A.E. & Bastian-Stanford, M. 2007. *Unionicola* (*Coelaturicola*) *gledhilli* n. subgen., n. sp. (Acari: Unionicolidae) from freshwater mussels in Botswana and East Africa. *International Journal of Acarology* 33(2): 167-171.

Reports

Adendorff, J., Prinsloo, G.J. & Louw, S.VdM. 2007. *Aspects of the bio-ecology of the grass leafminer on wheat in central South Africa*. Report to Griqualand West Corporation, Douglas, South Africa.

Cronjé, M., Jankielsohn, A. & Louw, S.VdM. 2007. *The effect of different soil treatments on the reproduction rates of and damage caused to different wheat cultivars by the Russian wheat aphid biotype, Diuraphis noxia (RWASA2)*. Report to the Agricultural Research Council (ARC) Small Grain Institute, Bethlehem, South Africa.

Louw, S.VdM. 2007. *Towards the management of Paramacops stapeliae on Hoodia gordonii plants*. Annual report to Phytopharm plc, Godmanchester, UK & CePHMa, University of the Free State, Bloemfontein, South Africa. (Co-operative Agreement).

Conference contributions

Basson, L. & Van As, J.G. 2007. *An enigmatic relationship between fish trichodinids (Ciliophora: Peritrichia) and other hosts*. Paper presented at the 7th International Symposium on Fish Parasites (ISFP VII): Fish Parasitology in the 21st Century: From Biodiversity and Ecosystem to Global Warming, Viterbo, Italy. 24-28 September.

Basson, L. & Van As, J.G. 2007. *An enigmatic relationship between fish trichodinids (Ciliophora: Peritrichia) and other hosts*. Proceedings of the 7th International Symposium on Fish Parasites (ISFP VII): Fish Parasitology in the 21st Century: From Biodiversity and Ecosystem to Global Warming, Viterbo, Italy. 24-28 September. Volume 49: 123.

Christie, J., Basson, L. & Van As, L.L. 2007. *Mantoscyphidia (Ciliophora: Peritrichia) of gastropods in a marine environment*. Paper

Staff

Main Campus:

Professors: Profs Jo van As, Linda Basson, Ordino Kok, Schalk Louw, Theuns van der Linde

Extraordinary Professors: Profs Leon Fourie, Gerhard Prinsloo

Senior Lecturers: Drs Liesl Van As, Léan van der Westhuizen

Lecturers: Dr Candice Jansen van Rensburg, Ms Ellie van Dalen, Messrs Hennie Butler, Charles Haddad

Affiliated Researchers: Profs Dawie Kok, Ivan Horak, Dr Johan Welman

Permanent Non-Academic

Staff: Mss Christa du Rand, Ina Erasmus, Isabel Human, Sylvia Teele, Patrick Mohasi, Messrs Emmanuel Palesa, Andreas Tlou, William Lesoana

Qwaqwa Campus

Lecturers: Dr Michael Cunningham, Ms Hafeleni Matete, Messrs Sibusiso Mtshali, Johann van As

Contact details

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During the Nematology research group's visit to the Agricultural Research Council's (ARC) Plant Protection Research Institute (PPRI) were, from the left: Dr Antoinette Swart, from the ARC, Mr Theuns Louw, from the department, Dr Mariette Marais, from the ARC, Dr Candice Jansen van Rensburg, Lecturer at the department, and Dr Esther van den Berg, from the ARC.

presented at the 36th Annual Conference of the Parasitological Society of Southern Africa, Pestana Kruger Lodge, Malelane, South Africa. 18-20 September.

Groenewald, H., Basson, L. & Van As, J.G. 2007. *Trichodinid ectoparasites of Anuran larvae*. Paper presented at the 36th Annual Conference of the Parasitological Society of Southern Africa, Pestana Kruger Lodge, Malelane, South Africa. 18-20 September.

Jansen van Rensburg, C., King, P.H. & Van As, J.G. 2007. *Diplostomatids inducing behavioural changes in fish species of the Okavango River and Delta, Botswana*. Paper presented at the 7th International Symposium on Fish Parasites (ISFP VII): Fish Parasitology in the 21st Century: From Biodiversity and Ecosystem to Global Warming, Viterbo, Italy. 24-28 September.

Jansen van Rensburg, C., King, P.H. & Van As, J.G. 2007. *Diplostomatids inducing behavioural changes in fish species of the Okavango River and Delta, Botswana*. Proceedings of the 7th International Symposium on Fish Parasites (ISFP VII): Fish Parasitology in the 21st Century: From Biodiversity and Ecosystem to Global Warming, Viterbo, Italy. 24-28 September. Volume 49: 289.

Louw, S.VdM., Parau, J.V. & Olevano, J.C. 2007. *Bio-ecology of sap beetles, a new double impact pest on cactus pear in South Africa*. Poster presented at the VI International Conference on Cactus Pear and Cochineal and the VI General Meeting of the FAO-

CACTUSNET, João-Pessoa, Brazil. 22-26 October.

Modise, E.M., King, P.H., Baker, C. & Van As, J.G. 2007. *Monogenean parasites on gills of freshwater fish from the Okavango Delta, Botswana*. Paper presented at the 36th Annual Conference of the Parasitological Society of Southern Africa, Pestana Kruger Lodge, Malelane, South Africa. 18-20 September.

Modise, E.M., King, P.H., Baker, C. & Van As, J.G. 2007. *Morphology of two new monogenean species on the tigerfish and silver catfish from the Okavango Delta, Botswana*. Paper presented at the 7th International Symposium on Fish Parasites (ISFP VII): Fish Parasitology in the 21st Century: From Biodiversity and Ecosystem to Global Warming, Viterbo, Italy. 24-28 September.

Modise, E.M., King, P.H., Baker, C. & Van As, J.G. 2007. *Morphology of two new monogenean species on the tigerfish and silver catfish from the Okavango Delta, Botswana*. Proceedings of the 7th International Symposium on Fish Parasites (ISFP VII): Fish Parasitology in the 21st Century: From Biodiversity and Ecosystem to Global Warming, Viterbo, Italy. 24-28 September. Volume 49: 94.

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Rangaka, I.I., King, P.H. & Basson, L. 2007. *Diversity of myxosporeans from two fish species in the Okavango Delta, Botswana*. Paper presented at the 36th Annual Conference of the Parasitological Society of Southern Africa, Pestana Kruger Lodge, Malelane, South Africa. 18-20 September.

Rangaka, I.I., King, P.H. & Basson, L. 2007. *Myxosporeans of two fish species in the Okavango Delta, Botswana*. Paper presented at the 7th International Symposium on Fish Parasites (ISFP VII): Fish Parasitology in the 21st Century: From Biodiversity and Ecosystem to Global Warming, Viterbo, Italy. 24-28 September.

Rangaka, I.I., King, P.H. & Basson, L. 2007. *Myxosporeans of two fish species in the Okavango Delta, Botswana*. Proceedings of the 7th International Symposium on Fish Parasites (ISFP VII): Fish Parasitology in the 21st Century: From Biodiversity and Ecosystem to Global Warming, Viterbo, Italy. 24-28 September. Volume 49: 167.

Reed, C.C., Basson, L. & Van As, L.L. 2007. *Coelozoic myxozoans from the south coast of Africa*. Paper presented at the 7th International Symposium on Fish Parasites (ISFP VII): Fish Parasitology in the 21st Century: From Biodiversity and Ecosystem to Global Warming, Viterbo, Italy. 24-28 September.

Reed, C.C., Basson, L. & Van As, L.L. 2007. *Coelozoic myxozoans from the south coast of Africa*. Proceedings of the 7th International Symposium on Fish Parasites (ISFP VII): Fish Parasitology in the 21st Century: From Biodiversity and Ecosystem to Global Warming, Viterbo, Italy. 24-28 September. Volume 49: 168.

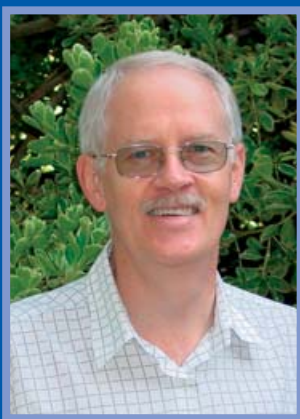
Terry, S., Jordaan, A.J. & Horak, I.G. 2007. *The geographic distribution and a taxonomic description of ticks in the Free State Province*. Poster presented at the 36th Annual Conference of the Parasitological Society of Southern Africa, Pestana Kruger Lodge, Malelane, South Africa. 18-20 September.

Van As, L.L. & Van As, J.G. 2007. *Crustacean ectoparasites of fishes from the Okavango River and Delta, Botswana*. Paper presented at the 7th International Symposium on Fish Parasites (ISFP VII): Fish Parasitology in the 21st Century: From Biodiversity and Ecosystem to Global Warming, Viterbo, Italy. 24-28 September.

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Centres



Prof. Pieter van Wyk

Centre for Confocal and Electron Microscopy

Overview

Research and educational outputs at the Centre for Confocal and Electron Microscopy, as a service to departments in the faculty and to external institutions, are determined by the usage times of all apparatuses and laboratories of the centre.

In 2007 the logged time at the scanning electron microscope (SEM) was 632 hours, at the transmission electron microscope (TEM) 149 hours and at the confocal laser scanning microscope (CLSM) 62 hours. The total microscope usage for 2007 was 844 hours compared to the 751 hours of 2006.

The average logged time per year calculated over the past four years for all of the microscopes is 430 hours for the SEM, 83 hours for the TEM and 80 hours for the CLSM. There has been an increase in the usage of the microscopes compared to the averages as calculated per year of research at the centre. Variation in the usage times is representative of the utilisation as students and researchers completed projects and new projects commenced.

The abovementioned usage only represents time spent while operating the microscopes. Time involved in experimental planning and preparative procedures is not included in the calculated assessment. Material preparation is an important element of microscopic research and occupies the majority of the time involved in utilising the facilities at the centre. The total usage of the centre, which includes material preparation and all other apparatuses amounts to 178 days of the potential 240 average university working days per year.

Research highlights of 2007 were the training of overseas students who continued their projects in South Africa. The Shimadzu scanning electron microscope with the EDX was specifically used in this case: three students from Germany, Ms Antje Wildau from the Martin Luther University in Halle (Saale), Mr Sebastian Fuchs from the University of Leipzig, and Ms Ulrike Rantzsch of the University of Leipzig all with Dr Christoph Gauert of the Department of Geology at the UFS made use of the facilities, each for the completion of an M.Sc. degree.

Other students who used the centre were an exchange student from India, Ms A. Parmeswaran Meera, with Prof. Riaan Luyt, Department of Chemistry at the UFS (Qwaqwa Campus) and Mr Joseph Katangole, a student from Uganda at the Department of Microbial, Biochemical and Food Biotechnology

with Prof. Bennie Viljoen. Part of his project included an ultrastructural study on the formation of biofilms on ethnic clay pots used for a sorghum beer product.

Research was also done for Dr Huang Zongjie of the School of Mechanical Engineering and Applied Mathematics, Central University for Technology (CUT) with the Jeol scanning electron microscope on nano structure, testing for strong but lightweight microcomputer components.

Another highlight for the centre was the upgrading of the Jeol scanning electron microscope, leading to this older model SEM now producing quality images similar to those of the newer Shimadzu SEM. A new high resolution digital image capture card with computer was installed and the existing computer programs were updated. Unfortunately the direct control of the Jeol SEM by computer could not be restored.

An additional highlight was that Ms Beanélrí Janecke represented the centre at the South African Wildlife Management Association's annual symposium by delivering a seminar with the title: *Application of scanning electron microscope technology in the identification of mammal species from hair remains in leopard scats*. This project in collaboration with the Department of Animal, Wildlife and Grassland Sciences, aroused a great deal of interest at the symposium.

Prof. Pieter van Wyk, Director of the centre, attended the 26th International Specialised Symposium on Yeasts (ISSY 26) in Sorrento, Italy, with Prof. Lodewyk Kock from the Department of Microbial, Biochemical and Food Biotechnology, where a poster was presented about research mainly done with the confocal microscope entitled: *Oxylipin production, inhibition and function in fermentative and other yeasts: a review*.

The standard courses of the centre were presented on material preparation and handling of the apparatus to honours students of departments Zoology and Entomology (DRK/ENT614); Genetics (GEN686); Medical Microbiology and Virology (MKM601); Microbial Biochemical and Food Biotechnology (MKB/BOC614) and Plant Sciences (PWS614). The duration of these courses is three days and they are presented to each group individually. Students of the Department of Physics attended an additional EDX lecture at the centre.

The second-year students of the Department of Zoology and Entomology attended an introductory course in microscopy. A beginners and/or refresher course was presented from 30 July-2 August 2007 in the practical handling of electron microscopes for students and researchers. Individual training was carried out for researchers wishing to prepare samples and to work with the microscopes independently.

The centre was also involved in three school projects. Hannelene Badenhorst, a Grade 11 learner from Northern Cape High School, Kimberley did a project on the application of gold in scanning elec-

tron microscopy. Willem and Niel van Schalkwyk, Grades 5 and 7, respectively, both from Grey College Primary School, did projects on scale patterns of hairs from pets and humans as observed with the SEM.

The centre had a learner from the C&N Oranje Meisieskool, Chantel Carroll, for two days as part of the school's guidance service concerning future career choices. Grade 10 learners had the opportunity to visit one or more institutions for a week, to consider various occupations as an aid in future decision-making on their careers.



Staff

Affiliated Professor: Prof. Pieter van Wyk

Research Officer: Ms Beanélri Janecke

Contact details

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Ms Beanélri Janecke from the centre, and students from the Department of Hematology in the Faculty of Health Sciences during a course on the functioning of the transmission electron microscope.

Research outputs

Research articles

Guduri, B.R. & Luyt, A.S. 2007. Comparison of the influence of different compatibilizers on the structure and properties of ethylenevinyl acetate copolymer/modified clay nanocomposites. *Journal of Applied Polymer Science* 105: 3612-3617.

Kock, J.L.F., Sebolai, O.M., Pohl, C.H., Van Wyk, P.W.J. & Lodolo, E.J. 2007. Oxylin studies expose aspirin as antifungal. *FEMS Yeast Research* 7: 1207-1217.

Krupa, I., Miková, G. & Luyt, A.S. 2007. Phase change materials based on low-density polyethylene/paraffin wax blends. *European Polymer Journal* 43: 4695-4705.

Krupa, I., Mikova, G. & Luyt, A.S. 2007. Polypropylene as a potential matrix for the creation of shape stabilized phase change materials. *European Polymer Journal* 43: 895-907.

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., Nigam, S. & Kock, J.L.F. 2007. Acetylsalicylic acid as antifungal in *Eremothecium* and other yeasts. *Antonie van Leeuwenhoek* 91: 393-405.

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Reed, C., Basson, L., Van As, L.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., Strauss, C.J., Van Wyk, P.W.J., Botha, A. & Kock, J.L.F. 2007. 3-Hydroxy fatty acids found in capsules of *Cryptococcus neoformans*. *Canadian Journal of Microbiology* 53: 809-812.

Strauss, C.J., Van Wyk, P.W.J., Lodolo, E.J., Botes, P.J., Pohl, C.H., Nigam, S. & Kock, J.L.F. 2007. Mitochondrial associated yeast flocculation – the effect of acetylsalicylic acid. *Journal of the Institute of Brewing* 113: 42-47.

Van As, L.L. & Van As, J.G. 2007. *Lamproglana hepseti* n. sp. (Copepoda, Lernaeidae) gill parasite of the African Pike, *Hepsetus odoe* (Bloch, 1794) from the Okavango River and Delta, Botswana. *Systematic Parasitology* 67: 19-24.

Van Heerden, A., Van Wyk, P.W.J., Botes, P.J., Pohl, C.H., Strauss, C.J., Nigam, S. & Kock, J.L.F. 2007. The release of elongated, sheathed ascospores from bottle-shaped asci in *Dipodascus geniculatus*. *FEMS Yeast Research* 7: 173-179.

Venter, H.J.T. & Verhoeven, R.L. 2007. A re-appraisal of *Cryptolepis sinensis* subsp. *africana* (Apocynaceae: Periplocoideae) and a



Prof. Pieter van Wyk, Director of the centre, and students from the Department of Genetics during a course on the functioning of the confocal laser scanning microscope.

description of the pollen apparatus. *South African Journal of Botany* 73(1): 40-42.

Venter, H.J.T., Winter, P.J.D., Verhoeven, R.L. & Archer, R.H. 2007. *Raphionacme villicorona* (Apocynaceae: Periplocoideae), a new species from the Sekhukhuneland Centre of plant endemism, South Africa. *South African Journal of Botany* 73(1): 97-101.

Conference contributions

Basson, L. & Van As, J.G. 2007. An enigmatic relationship between fish trichodinids (Ciliophora: Peritrichia) and other hosts. Proceedings of the 7th International Symposium on Fish Parasites (ISFP VII): Fish Parasitology in the 21st Century: From Biodiversity and Ecosystem to Global Warming, Viterbo, Italy. 24-28 September. Volume 49: 123.

Christie, J., Basson, L. & Van As, L.L. 2007. *Mantoscaphidia* (Ciliophora: Peritrichia) of gastropods in a marine environment. Paper presented at the 36th Annual Conference of the Parasitological Society of southern Africa, Pestana Kruger Lodge, Malelane, South Africa. 18-20 September.

Ells, R., Kock, J.L.F., Botes, P.J., Van Wyk, P.W.J. & Pohl, C.H. 2007. Effect of arachidonic acid on *Candida dubliniensis*. Poster presented at the Asian Mycology Congress and 10th International Marine and Fresh Water Mycology Symposium, Penang, Malaysia. 2-6 December.

Goldblatt, M.E., Van Wyk, P.W.J., Pohl, C.H. & Kock, J.L.F. 2007. Ascospore release and oxylipin production in the yeast *Dipodascopsis*. Poster presented at the Asian

Mycology Congress and 10th International Marine and Fresh Water Mycology Symposium, Penang, Malaysia. 2-6 December.

Groenewald, H., Basson, L. & Van As, J.G. 2007. Trichodinid ectoparasites of *Anuran* larvae. Paper presented at the 36th Annual Conference of the Parasitological Society of southern Africa, Pestana Kruger Lodge, Malelane, South Africa. 18-20 September.

Kock, J.L.F., Sebolai, O.M., Pohl, C.H., Van Wyk, A., Van Wyk, P.W.J. & Lodolo, E.J. 2007. Oxylipin production, inhibition and function in fermentative and other yeasts. Poster presented at the 26th International Specialised Symposium on Yeasts (ISSY26), Sorrento, Italy. 3-7 June.

Kock, J.L.F., Sebolai, O.M., Pohl, C.H., Van Wyk, P.W.J. & Lodolo, E.J. 2007. Oxylipins in yeast - a review. Poster presented at the Asian Mycology Congress and 10th International Marine and Fresh Water Mycology Symposium, Penang, Malaysia. 2-6 December.

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. 2007. Acetylsalicylic acid as antifungal in *Eremothecium* and other yeasts. Poster presented at the Asian Mycology Congress and 10th International Marine and Fresh Water Mycology Symposium, Penang, Malaysia. 2-6 December.

Ncango, D.M., Kock, J.L.F., Swart, C.W., Pohl, C.H., Strauss, C.J., Van Wyk, P.W.J. & Botes, P.J. 2007. Oxylipin and mitochondrion probes to track asci of Ascoidea. Poster presented at the Asian Mycology Congress and 10th International Marine and Fresh Water Mycology Symposium, Penang, Malaysia. 2-6 December.

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Sebolai, O.M., Pohl, C.H., Botes, P.J., Strauss, C.J., Van Wyk, P.W.J. & Kock, J.L.F. 2007. Oxylipin release in *Cryptococcus neoformans*. Poster presented at the Asian Mycology Congress and 10th International Marine and Fresh Water Mycology Symposium, Penang, Malaysia. 2-6 December.

Swart, C.W., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F. 2007. Oxylipin accumulation in fermentative and non-fermentative yeasts. Poster presented at the Asian Mycology Congress and 10th International Marine and Fresh Water Mycology Symposium, Penang, Malaysia. 2-6 December.

Terry, S., Jordaan, A.J. & Horak, I.G. 2007. The geographic distribution and a taxonomic description of ticks in the Free State Province. Poster presented at the 36th Annual Conference of the Parasitological Society of southern Africa, Pestana Kruger Lodge, Malelane, South Africa. 18-20 September.

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Mr Andries Jordaan

Disaster Management Training and Education Centre for Africa (DiMTEC)

Overview

The Disaster Management Training and Education Centre for Africa (DiMTEC) has experienced rapid growth in its intake for the master's degree programme in Disaster Management over the last couple of years. In 2007 the centre had a record intake of 70 first-year students compared to 60 students in 2006.

Because of the multi-disciplinary focus of the master's programme and the relevance of the course in the developing African continent, it is expected that interest in the course will remain high. The main challenge however for the UFS is to provide the necessary institutional support to DiMTEC to maintain current intakes and to support the large number of students in their research.

DiMTEC secured a bursary programme for the master's degree programme in Disaster Management which will run until 2008. The programme is funded by the Department of Science and Technology (DST), the Department of Water Affairs and Forestry (DWAF) and the National Disaster Management Centre (NDMC). Bursaries to the value of R2.3 million were received for the 2006 intake and another R3 million for the 2007 intake. The programme enables students to gain experience in disaster management in different government departments while completing their master's degree studies in Disaster Management.

During 2007 staff from DiMTEC presented short courses on various aspects of Disaster Management to government departments and non-governmental and private organisations. These courses were presented on demand and tailored to suit the organisations. Some of the courses were: the Sphere Project and Minimum Standards in Disaster Response course, presented to 19 members of the Adventist Development and Relief Agency (ADRA) in Bloemfontein and 30 participants in Bulawayo, Zimbabwe; the Introduction to Disaster Risk Management course, presented to 170 officials of the Cape Winelands District Municipality; the Introduction to Disaster Management and the Creation of the Free State Disaster Management Framework, presented to 25 Free State Disaster Management officials in Bloemfontein; and the Political Strategic Planning course, which was presented to local government political officials in Bloemfontein.

DiMTEC staff also played an active role in agricultural development in South Africa. Mr Andries Jordaan, Director of DiMTEC, acted as the agricultural advisor to the Richtersveld community during the court case in the battle for their land. He

also supported the community during the transfer phase of the land from government to the community.

Eight unpublished reports on projects from as far as the Sudan and the Richtersveld were produced by DiMTEC staff. Mr Jordaan is the only South African specialist, together with specialists from Germany, Finland, France, Italy and China, contracted to the US\$5.5 billion Sudan project. He produced five research reports for the Sudanese government and is contracted to support them for the next five years. This project entails the building of a dam on the Nile River (which is nearly completed) and the development of one million hectares of new irrigation land. Four students from the Sudan enrolled for the DiMTEC programme as a result of Mr Jordaan's activities.

Asia is well-known for its disasters and Mr Jordaan used the opportunity during the International Disaster Reduction Conference in China to link up with Chinese universities and scientists working in the field of disaster management.

DiMTEC staff were also involved as specialist advisors in two environmental impact assessments for Ninham Shand/ESKOM, the development of the Free State disaster management framework, external evaluation of disaster risk assessments and several small scale agricultural development projects.

Mr Jordaan presented papers at the National Conference for Risk Assessment and the conference on community vulnerability. He also presented papers at the International Interdisciplinary Social Sciences Conference in Spain and at the International Disaster Risk Reduction Conference in China. Messrs Theuns van der Linde and Pios Ncube presented papers at the annual conference of the Disaster Management Institute for Southern Africa (DMISA), presented in Jeffrey's Bay, Eastern Cape.

DiMTEC staff are well represented on provincial and national bodies. This includes the South African Qualifications Authority's (SAQA) Scoping Committee for Disaster Management Training in South Africa, the Free State Disaster Management Advisory Forum, ICSU Regional Consultative Forum for Africa, and the National Disaster Management Technical Advisory Forum on Disaster Risk Assessment.

Probably the biggest challenge at DiMTEC is to publish the results of the research completed by students and staff. A



The centre secured a bursary programme from the Department of Science and Technology (DST), the Department of Water Affairs and Forestry (DWAF) and the National Disaster Management Centre (NDMC) for the master's programme in Disaster Management. The programme, which runs until 2008, is administered by the Council for Scientific and Industrial Research (CSIR). Attending the launch of the bursary programme are, from the left: Mr Chris Swiegers, DWAF, Mr Lance Williams, Head: NDMC, Prof. Magda Fourie, Vice-Rector: Academic Planning at the UFS, Ms Ramadolela Lindelani, M.Sc. student, and Mr Andries Jordaan, Director: DiMTEC.



Students who graduated during the September 2007 graduation ceremony are, from the left: Mss Joan Mute, Regina Gapa, Messrs Mc Donald Kadzatsa, Gift Chatora, Ms Sibusiwe Ndlovu, and Mr Andries Jordaan, Director: DiMTEC.

number of research papers are in the pipeline. Although students only complete a mini dissertation as part of the requirements for the master's degree, most of the research is publishable. The challenge is to motivate students to prepare scientific papers for publication after completion of their studies.

Some of the research topics completed during 2007 were:

- Analysis of a food aid programme in Murehwa district and its contribution to community resilience.
- Adapting to the negative effects of drought: A study of the coping strategies of the Marange community of Manicaland Province in Zimbabwe.
- Living with flood risk: A case study of the Dambakurima area of Muzarabani district in Zimbabwe.
- Effectiveness of disaster contingency planning in Southern Africa.
- Traditional cultural practices contributing to vulnerability of food insecurity in Gwembe district of Zambia.

Staff

Director: Mr Andries Jordaan
Junior Lecturers: Messrs Theuns van der Linde (contract appointment), Pios Ncube (contract appointment)
External Lecturers: Messrs Schalk Carstens, Anthony Keston
Secretary: Ms Annelene Schröder-Groenewald
Research Assistants: Mss Olivia Kunguma, Alice Ncube, Messrs Derrick Sissons, Regardt Ferreira
Lecturer: Units: Dr Dusan Sakulski

Contact details

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Research outputs

Research articles

Jordaan, A.J. 2007. Disaster risk assessment: Thumb sucking or scientific risk quantification? *International Journal of Interdisciplinary Social Sciences*. [Electronic].

Report

Jordaan, A.J. & Breytenbach, T. 2007. *Richtersveld sosio ekonomiese opname*. Report to the University of the Free State, Bloemfontein, South Africa.

Conference contributions

Jordaan, A.J. 2007. *Disaster risk assessment at municipal level in South Africa: The need for a multi-disciplinary approach*. Paper presented at the International Disaster Reduction Conference (IDRC), Harbin, China. 21-25 August.

Jordaan, A.J. 2007. *Disaster risk assessment in informal settlements*. Paper presented at the Conference on Disaster Management in Informal Settlements, Sandton, Johannesburg, South Africa. January 2007.

Jordaan, A.J. 2007. *Disaster risk assessment: Thumb sucking or scientific risk quantification?* Paper presented at the 2nd International Conference on Interdisciplinary Social Sciences, University of Granada, Granada, Spain. 10-13 July.

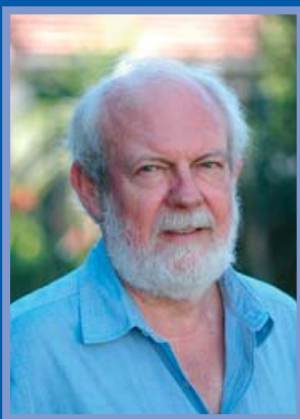
Jordaan, A.J. 2007. *Participatory disaster risk assessment: The only true risk assessment.* Paper presented at the Disaster Risk Assessment Conference, Randburg, Johannesburg, South Africa. February 2007.

Ncube, P. & Jordaan, A.J. 2007. *Taking the 'naturalness' out of 'natural disasters': A focus on flood risk and gender.* Paper presented at the International Disaster Reduction Conference (IDRC), Harbin, China. 21-25 August.

Van der Linde, T. & Jordaan, A.J. 2007. *Disaster management at South African academic institutions and the development of a complex disaster management system.* Paper presented at the Disaster Management Institute of Southern Africa (DMISA) Annual Conference, Jeffreys Bay, South Africa. 17-18 October.



Participants who attended the Sphere Project and Minimum Standards in Disaster Response course in Bloemfontein.



Prof. Maitland Seaman

Centre for Environmental Management

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.

The master's programme developed gradually and 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 2007. The intake increases in diversity every year. In 2007 about 30% of the students were from the Southern African Development Community (SADC), and a few were from the rest of Africa, making this a truly continental programme. The programme is based on 37 full days of contact time at the Main Campus 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. Graduates are in demand by large companies, government and nature conservation bodies.

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 2007 seven students were registered for their Ph.D. degrees. During the April 2007 graduation ceremony, Ms Simoné Schroeder received the BloemWater Prize for the Best Master's Student in Environmental Management.

The centre has a co-operation agreement with the Katholieke Universiteit Leuven, Belgium, to conduct research on temporary water ecology. Under this agreement, a Ph.D. and two M.Sc. students from Leuven spent time working at the centre in 2007, 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 co-ordinator of the cluster. Bursaries for postgraduate students form part of this grant from the NRF.

Staff of the centre attended a range of conferences in 2007. Prof. Seaman attended the World Water Week in Stockholm, Sweden, while Dr Jan Roos presented a paper entitled: *Nitrogen assimilation capacity of the Vaal River, South Africa* at the 2nd conference of the International Association of Science and Technology for Development (IASTED) on Water Resources Management, Honolulu, Hawaii, United States of America (USA). The paper was included in the conference proceedings.

The World Limnology Congress (SIL, 30th Congress of the International Association of Theoretical and Applied Limnology) was held in Montreal, Canada, and was attended by Dr Roos. The congress was attended by almost 1 500 delegates from all over the world. The 31st SIL Congress will be presented in 2010 in Cape Town, South Africa.

Mss Marilie Carstens, Eloise Lamprecht and Mr Jurie du Plessis attended the National Arid Zone Ecology Forum in Sutherland. The theme of the forum was: "Drought as a driver: physical, ecological and socio-economic effects, interactions and responses".

Ms Marie Watson attended and presented two posters at the 10th International River Symposium and Environmental Flows Conference in Brisbane, Australia. The conference covered aspects from environmental flows implementation, methods, models and monitoring to urban river management. Environmental economics and the involvement of social issues in E-flows received much attention in plenary and other sessions.

The 8th WaterNet/WARFSA/GWP-SA Symposium, held in Lusaka, Zambia, was attended by Mss Marinda Avenant, Tascha

Vos and Limpho Letsela. The theme of this year's conference was: "From Concept to Practice". Ms Avenant presented a paper in the session on Water and Environment entitled: *Investigations into the methodology for setting environmental water requirements in non-perennial rivers*.

Several projects and 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 has 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 Council for Scientific and Industrial Research (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 also 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 Mayoral Reception in the Blue Room of the City of Stockholm, Sweden, during the World Water Week. Here are, from the left: Mss Helga Seaman and Tumi Makgetla, Rhodes Scholar from South Africa and daughter of Mr Makgetla, Prof. Maitland Seaman, Director of the centre, Mr Zeph Makgetla, South African Ambassador to Sweden, Mr Jaco Schoeman, Technical Director, Western Utilities Corporation, and Ms Marina Schoeman.



Mss Tascha Vos and Marinda Avenant with a taxi driver in Lusaka, Zambia during the 8th WaterNet/WARFSA/GWP-SA Symposium.

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

Course Co-ordinator: Ms
Marthie Kemp

Senior Professional Officer: Ms
Marie Watson (Macro-
Invertebrates)

Professional Officers: Mss Marilie
Carstens (GIS), Eloise Lambrecht
(Macro-Invertebrates), Limpho
Letsela (Sociology), Ms Bettie
Phillips (Finance), Tascha Vos
(Water Quality and Algae), Louise
Zietsman (Macro-Invertebrates),
Messrs Jurie du Plessis (Fish), Juan
Potgieter (Fish)

Messenger: Ms Evodia Khalata

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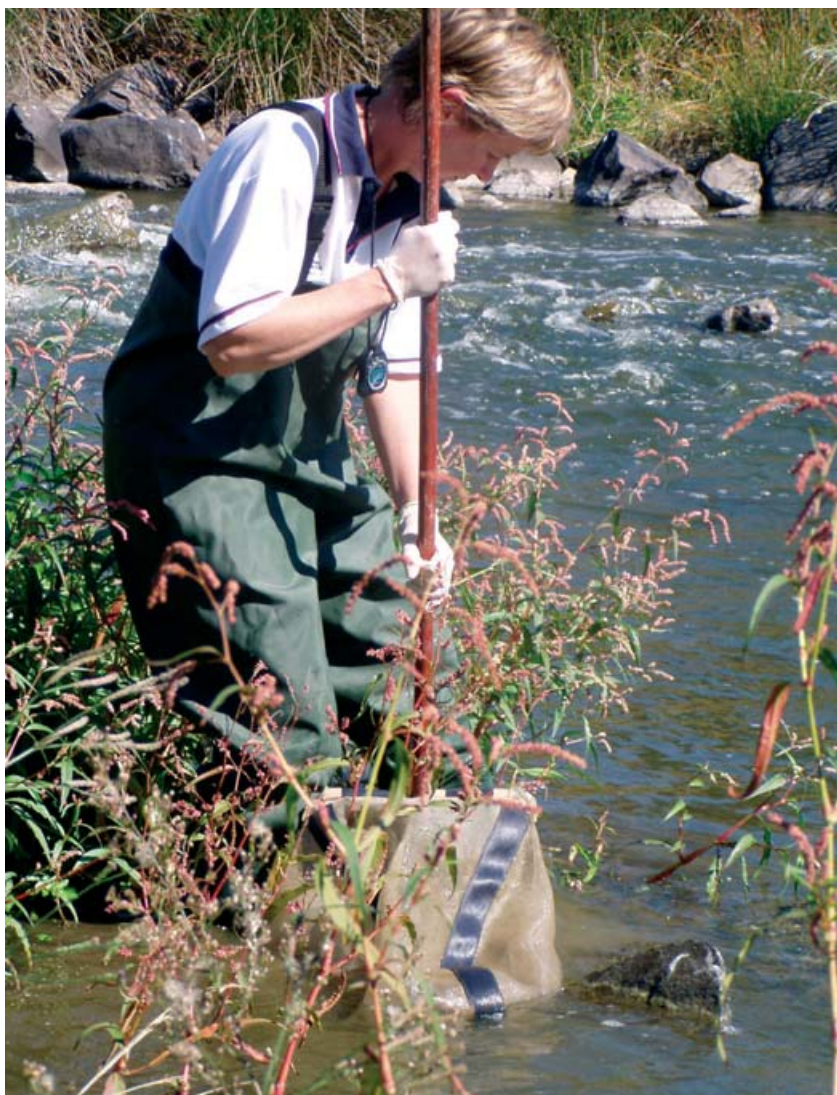
9300

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Ms Louise Zietsman sampling gravel for the South African Scoring System (SASS) at Bishop's Weir on the Renoster Spruit.

Research outputs

Research articles

Avenant, N.L. & Cavallini, P. 2007. Correlating rodent community structure with ecological integrity: Tussen-die-Riviere Nature Reserve, Free State Province, South Africa. *Integrative Zoology* 2: 212-219.

Vanschoenwinkel, B., De Vries, C., Seaman, M.T. & Brendonck, L. 2007. The role of metacommunity processes in shaping invertebrate rock pool communities along a dispersal gradient. *Oikos* 116: 1255-1266.

Du Plessis, J.J., Avenant, M.F. & Potgieter, J. 2007. Freshwater fish specialist study (Appendix B). In *Environmental Impact Assessment: Mining Right Application. Alluvial Diamond Mining at Rooipoort Private Nature Reserve (Sol Plaatje Municipality: Frances Baard District Municipality)*. Report compiled by B. Benade on behalf of De Beers Consolidated Mines for the Institute of Natural Resources, Scottsville, South Africa. Appendix B: p.1-26.

Seaman, M.T., Roos, J.C., Watson, M. & Vos, A.T. 2007. *State of the Modder River, first term 2007 – A biomonitoring report*. Report to BloemWater, Bloemfontein, South Africa.

Seaman, M.T., Roos, J.C., Watson, M. & Vos, A.T. 2007. *State of the Modder River, second term*

Reports

Avenant, N.L. 2007. *Mammals and the Senqu Sources Biosphere Reserve*. Report for Strategic Environmental Focus, Pretoria, South Africa.

2007 – A biomonitoring report. Report to BloemWater, Bloemfontein, South Africa.

Seaman, M.T., Roos, J.C., Watson, M., Avenant, M.F., Vos, A.T. & Du Plessis, J.J. 2007. *State of the Modder River, third term 2007 – A biomonitoring report.* Report to BloemWater, Bloemfontein, South Africa.

Seaman, M.T., Roos, J.C., Watson, M., Avenant, M.F., Vos, A.T. & Du Plessis, J.J. 2007. *State of the Modder River, fourth term 2007 – A biomonitoring report.* Report to BloemWater, Bloemfontein, South Africa.

Watson, M. 2007. Aquatic macro-invertebrate specialist study (Appendix A). In *Environmental Impact Assessment: Mining Right Application. Alluvial Diamond Mining at Rooipoort Private Nature Reserve (Sol Plaatje Municipality: Frances Baard District Municipality).* Report compiled by B. Benade on behalf of De Beers Consolidated Mines for the Institute of Natural Resources, Scottsville, South Africa. Appendix A: p.1-32.

Watson, M., Avenant, M.F., Du Plessis, J.J. & Vos, A.T. 2007. Ecological character of the Sepane and Koranna Spruit. In *The Free State River Ecosystem Project – the Koranna and Sepane Spruit in the Modder River Catchment Area*, edited by G.J. Hoon, M. Watson, J. Armour & L. Letsela for the National Grasslands Biodiversity Programme – Free State Rivers Ecosystem Project. A report by H2ON Environmental Specialists, the Centre for Environmental Management, Laughing Waters & Netgroup for SANBI, Pretoria, South Africa. Appendix C: p.1-47.

Conference contributions

Avenant, M.F., Seaman, M.T., Armour, J., Barker, C.H., Dollar, E.J., Du Preez, P.J., Hughes, D., King, J.M., Rossouw, L., Van Tonder, G.J. & Watson, M. 2007. *Investigations into the methodology for setting environmental water requirements in non-perennial rivers.* Paper presented at the 8th WaterNet / WARFSA / GWP-SA Symposium: Integrated Water Resource Management, Livingston, Zambia. 30 October – 3 November.

Avenant, N.L. 2007. *Incorporating caracal feeding and ranging behaviour in the management of this damage-causing carnivore.* Poster presented at the Felid Biology and Conservation Conference, Oxford, UK. 17-21 September.



Ms Marie Watson, Louise Zietsman, and Eloise Lamprecht identifying macro-invertebrates for the South African Scoring System (SASS) version 5 at Bishop's Weir on the Renosterspruit.

Avenant, N.L. 2007. *Sustainable small stock farming and ecosystem conservation in southern Africa: A role for small mammals.* Poster presented at the 10th African Small Mammal Symposium, Cotonou, Benin. 20-25 August.

Avenant, N.L., Watson, J.P. & Schulze, E. 2007. *Correlating small mammal community characteristics with habitat integrity in the Caledon Nature Reserve, South Africa.* Paper presented at the 10th African Small Mammal Symposium, Cotonou, Benin. 20-25 August.

Roos, J.C. 2007. *Nitrogen assimilation capacity of the Vaal River, South Africa.* Paper presented at the Second IASTED (International Association of Science and Technology for Development) International Conference on Water Resources Management, Honolulu, Hawaii, USA. 20-22 August.

Seaman, M.T. 2007. *The registration of Environmental Assessment Practitioners - Assuring the future, with some benefits for geohydrologists.* Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Seaman, M.T., Avenant, M.F., Armour, R. J., Barker, C.H., Dollar, E., Du Plessis, J.J., Du Preez, P.J., Hughes, D., King, J., Rossouw, L., Van Tonder, G., Vos, A.T. & Watson, M. 2007. *Environmental water requirements (EWRs) of a non-perennial river: The Seekoei River example.* Poster presented at the 10th International River Symposium and International Conference on Environmental Flows, Brisbane, Australia. 3-6 September.

Vanschoenwinkel, B., Seaman, M.T. & Brendonck, L. 2007. *Local vs regional factors in a rock pool metacommunity: The role of dispersal limitation and priority effects in explaining small-scale spatial patterns.* Paper presented at the ASLO 2007 Aquatic Sciences Meeting, American Society of Limnology and Oceanography, Santa Fe, New Mexico, USA. 4-9 February.

Watson, M. 2007. *Invertebrates in a non-perennial river: The Seekoei River example.* Poster presented at the 10th International River Symposium and International Conference on Environmental Flows, Brisbane, Australia. 3-6 September.



Lengau Agricultural Development Centre

Dr Léan van der Westhuizen

Overview

The Lengau Agricultural Development Centre's Agricultural Skills Development, Training and Mentorship Programme is an initiative aimed at being an engaged faculty of the UFS by utilising academic capacity and facilities to make a significant difference in sustainable agriculture to the region, country and continent.

The UFS owns three experimental farms to the south of Bloemfontein. These farms are used for training, research and community service. Some of the farms are earmarked for agricultural skills development and training of emerging farmers, farm workers and entrepreneurs in agricultural business.

The facilities are also earmarked for alternative natural and agricultural skills development opportunities in brick-making, construction, value-adding and compost production. The buildings, facilities and a portion of the land of the Sydenham Experimental Farm are allocated to the centre.

These facilities 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 and primary herding. The centre also serves as a centre for the education of under- and postgraduates, mentors, farmers and black entrepreneurs in many aspects of livestock, crop farming and agri business.

The UFS, the Mangaung Local Municipality, the Free State Provincial Department of Agriculture and the National African Farmers Union (NAFU) have embraced the programme as partners in agricultural transformation.

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 projects undertaken at the centre include the training of community members of the Mangaung Local Municipality, particularly the residents of the informal settlement within the immediate vicinity of the experimental farms, and the training of emerging farmers who were recently allocated land under the land reform programme, but who are unable to make a success of their farming operations due to inexperience and lack of technical support.

Other projects are the developing and presenting of short courses in practical agriculture in line with dominant conditions encountered by the target groups; farm demonstrations; research to identify factors that enhance the competitiveness; strengthening of the practical aspects of the curriculum for on-going community service learning of the students on the three campuses of the UFS; an outreach programme through partnerships to extend the clientele through a "hub-and-spokes" framework to different parts of the country; providing a support facility to emerging commercial farmers where training and implementation assistance can be supplied to livestock and crop farmers; participating and assisting in Agri BEE initiatives, establishing of HIV and Aids prevention, care and support initiatives amongst farmers, farm workers and associated communities.

During 2007 the centre, in collaboration with several partners, achieved a number of outcomes. In conjunction with the ECIAfrica, the Free State Provincial Department of Agriculture, the Mangaung Local Municipality, the Mantsopa Local Municipality



Ms Doretha Jacobs from the Department of Microbial, Biochemical and Food Biotechnology is responsible for the skills development of the Mamello sewing project at the centre.

and Total Transformation Agribusiness, eight farmers' days were held in the Motheo District where project managers, project beneficiaries, farmers and farm workers were skilled in feedlot management, animal feeding, vaccination, branding, dehorning, castration and tick control. They also received training in animal breeding and bull selection for the improvement of their livestock.

Fifteen people were trained in broiler production skills at Thaba Nchu and at the centre. Approximately 1 200 head of cattle were handled and 68 people attended the sessions. Ms Doretha Jacobs of the Department of Microbial, Biochemical and Food Biotechnology at the UFS, in conjunction with the Department of Labour, trained 12 beneficiaries in sewing skills. The Mangaung Local Municipality funded the equipment. A variety of products were produced and marketed during 2007.

One self-employed black lady managed five cycles of the 250-bird broiler house. Sixteen emerging poultry farmers of Bloemfontein and the eastern Free State were trained in broiler and layer management. The five pig farmers, utilising the piggery facilities at the centre, and two commercial pig farmers from Tweespruit, were trained in piggery construction and management skills.

The four hydroponics units at the centre are functional and vegetable production skills were offered to 62 people in the Free State Province. The centre was contacted by the Free State Provincial Department of Agriculture to conduct a feasibility study on six hydroponics projects and if favourable, to revitalise all or some of them.

CMW and BKB Louwid offered monthly livestock auctions for commercial and emerging farmers at the centre. BKB Louwid achieved a record turnover per auction of more than one million rand.

The centre, in conjunction with the Central University of Technology (CUT) and the national Department of Agriculture, trained 22 agricultural extension officers from the provincial Departments of Agriculture of the Eastern Cape, Free State and Northern Cape Provinces theoretically and practically in Integrated Project Management skills. The candidates implemented these skills afterwards in projects in their communities.

Three of the four black cattle owners who housed approximately 240 head of cattle overnight in the feedlot pen and who



Beneficiaries of the Maluti A Phofung hydroponics project in Qwaqwa. The tunnels are equipped with heating systems and thus make tomato and green pepper production possible during the cold winter months in the eastern Free State.



CMW and BKB Louwid are responsible for livestock auctions at the Lengau Agricultural Development Centre.

Staff

The following staff of the UFS are involved in the management and implementation of the project on a permanent or temporary basis.

Permanent:

Senior Lecturer: Dr Léan van der Westhuizen

Community Development Officer: Ms Lolly Mogoere

Temporary:

HIV/Aids Prevention, Care and Support Co-ordinator: Ms Estelle Heideman

Administrative Manager: Mr Mogale Mphahlele

Farm Assistants: Messrs Raymond Melusi, William Mosoeu

Farm Guards: Messrs Solomon Masikila, Peter Makiti, Esau Selepe

Project Co-ordinator, Agricultural Business Unit: Mr Challa Moahloli

Contact details

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were skilled at the centre in various aspects of cattle management, were successful in obtaining their own farms through the Land Reform Programme. Afterwards another two emerging farmers and their cattle entered the cattle incubator system for training. The veterinary services of the Free State Provincial Department of Agriculture used these cattle to demonstrate cattle health and vaccination, branding, dehorning and castration activities to emerging farmers of Bloemfontein.

The Lengau HIV and Aids Prevention, Care and Support Programme was officially launched in 2007. Information sessions were held regularly 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 centre presented a farmers day to emerging farmers in co-operation with the Free State Department of Agriculture and the Mangaung Local Municipality. The topics that were discussed were cattle breeding, cattle health and vaccination of cattle, and castration. Demonstrations on branding and dehorning were also done. Attending the farmers day are, from the left: Mss Angelina Nkoqa, farmer, Ms Jeany Motlogelwa, Veterinary Services Division, Department of Agriculture, Dr Léan van der Westhuizen, Head of the centre, and Mr Emanuel Mhlauli, farmer.



Prof. Izak Groenewald

Centre for Sustainable Agriculture and Rural Development

Overview

The Centre for Sustainable Agriculture and Rural Development was established in 1994, in order to offer postgraduate training at master's degree level with a multi-disciplinary approach by means of distance education, and to undertake research with a view to the development and maintenance of sustainable agricultural production systems.

The international status of this programme was confirmed in 2007 when great interest was shown from all of the countries of the Southern African Development Community (SADC), and students from Ireland, England, the Netherlands, Denmark, Kenya, Texas and Ethiopia. The international student component is approximately 50%.

Students come from all sectors of the agricultural milieu, including, amongst others, commercial and small farmers, as well as employees of the Department of Agriculture, the Agricultural Research Council (ARC), agricultural co-operatives and industrial institutions such as mining firms involved in the re-establishment of agricultural activities on their over-utilised land.

Students leave this 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.

In 2007, 54 students were selected from more than 100 enquiries for the programme. Our experience has shown that quality of tuition declines when larger numbers of students are enrolled per year.

During 2007, Ph.D. degrees were awarded to Drs Hendrik Smit and David Nthakheni. Dr Smit's research focused on: *Development of a systems model facilitating action research with resource-poor farmers for sustainable management of natural resources*, whilst Dr Nthakheni researched: *A livestock production systems study amongst resource-poor livestock owners in the Vhembe District of Limpopo Province*. Prof. Edward Nesamuvuni, Extraordinary Professor of this centre and General Manager of Research, Provincial Department of Agriculture, Limpopo Province played a pivotal role in these studies.

The congress of the European Association for Animal Production (EAAP) was held in 2007 at Dublin, Ireland. During the congress, Prof. Izak Groenewald, Director of the centre, delivered

a poster presentation on recent advances in lick supplementation for livestock in rural areas. At the same congress, a master's graduate and current Ph.D. candidate of this centre, Mr Douglas Nkosi, presented a poster presentation.

A visit was paid to the Royal Agricultural College for Science and Technology in the United Kingdom (UK). This institution offers similar learning programmes to the one at the UFS, and existing course contents and new ideas were exchanged.



The centre presented a summer school during the first two weeks of October on the Main Campus in Bloemfontein. The purpose of the summer school was to provide subject guidance to the centre's distance-learning students and to summarise the year's assignments. The highlight of the summer school was a lecture by Prof. Edward Nesamuvuni, Extraordinary Professor at the centre and General Manager of Research, Provincial Department of Agriculture, Limpopo Province, on the role of agricultural research in the progress of rural communities. From the left are, front: Prof. Nesamuvuni and Prof. Izak Groenewald, Director of the centre; back: Mr Khathu Tshikolomo, Senior Manager: Crop Production, Limpopo, Ms Jane Tshovhote, Manager of the Giyani Municipality, Limpopo, and Mr Maanda Dagada, Manager of Land and Agrarian Reform, Limpopo. All three are registered as Ph.D. students at the centre.

Collaborations

Collaboration with the following institutions has been established and maintained in various ways:

- University of Namibia,
- University of Virginia, United States of America (USA)
- University of Cornell, USA
- Royal Agricultural College, UK
- Dronten Professional Agricultural University – Netherlands
- University of Wageningen – Netherlands



A group of 52 emerging farmers from Gobabis in the Omaheke region of Namibia visited the centre. The group, which comprised several ladies and young people, consisted mostly of small and large scale cattle farmers. They were addressed by several lecturers from the centre. Visits were also paid to a large goat farm in Upington and Beefmaster's feeding paddock in Christiana, amongst others. The farmers wanted to acquaint themselves with animal production practices and possible food value chains and establish future business partners for their businesses. From the left, are: Prof. Izak Groenewald, Director of the centre, Sir Lesley Kaundara, member of the group, Ms Inge Kangootui, member of the group, Prof. Kobus Laubscher, Associate Professor at the centre as well as the Department of Agricultural Economics, and Mr Joel Tjaondjo, member of the group.

Staff

Professor: Prof. Izak Groenewald

Professors Extraordinary: Profs Frans Swanepoel, Edward Nesamuvuni, Alice Pell

Senior Researchers: Drs Aldo Stroebe, Florence Nherera

Associate Lecturer: Prof. Kobus Laubscher

Programme Co-ordinator: Ms Mia Kirsten

Officers: Mss Reneé Heyns, Suzette Seymore

Messenger: Ms Evodia Khalata

Contact details

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Research outputs

Reports

Swanepoel, F.J.C., Lombard, C. & Stroebe, A. 2007. *United in our diversity: Working together towards the total emancipation of rural women from poverty and hunger. Executive summary and analysis.* Position paper to Cabinet for the 4th World Conference on Rural Women.

Conference contributions

Groenewald, I.B. & Katjiteo, Z.K. 2007. *Efficacy of homemade lick supplements for cattle in rural areas of Namibia.* Poster presented at the 58th Annual Meeting of the European Association for Animal Production (EAAP), Dublin, Ireland. 26-29 September.

Langa, T., Nkosi, D., Meeske, R., Palic, D. & Groenewald, I.B. 2007. *The effect of ensiling Bonsilage Mai on the fermentation quality of whole maize crop: A laboratory study.* Paper presented at the XII International Feed Technology Congress, Novi Sad, Yugoslavia. 13-15 November.

Nkosi, D., Groenewald, I.B., Palic, D., Meeske, R., Leeuw, K., Ratsaka, M. & Langa, T. 2007. *The effect of dietary inclusion of potato hash silage on the growth performance*

of sheep. Paper presented at the XII International Feed Technology Congress, Novi Sad, Yugoslavia. 13-15 November.

Nkosi, D., Ratsaka, M., Leeuw, K., Palic, D. & Groenewald, I.B. 2007. *Laboratory evaluation of vegetable wastes as alternative feed sources for livestock farmers in South Africa.* Poster presented at the 58th Annual Meeting of the European Association for Animal Production (EAAP), Dublin, Ireland. 26-29 September.

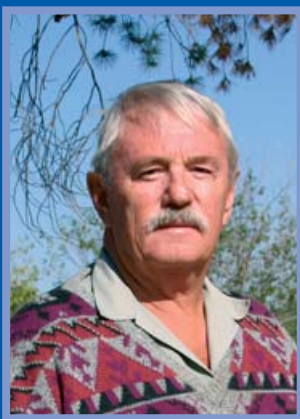
Stroebe, A. 2007. *Research and innovation management: Key to prosperity.* Convenor of the 6th Southern African Research and Innovation Management Association (SARIMA) Conference, Potchefstroom, South Africa. 9-11 May.

Stroebe, A., Swanepoel, F.J.C. & Van Niekerk, J.A. 2007. *Agricultural research for development: Facilitating leadership roles in South African Higher Education.* Paper presented at the 5th Conference of the Global Consortium of Higher Education and Research for Agriculture (GCHERA), San José, Costa Rica. 5-8 March.

Swanepoel, F.J.C. & Stroebe, A. 2007. *Positioning agricultural research institutions to be fully effective.* Paper presented at the 4th FARA Annual General Meeting, Sandton, Johannesburg, South Africa. 10-16 June.



Experimental Farm



Mr Cobus van Dyk

Paradys Experimental Farm

Overview

The Paradys Experimental Farm, situated outside Bloemfontein on the Reddersburg road, underwent substantial upgrading in 2007. The upgrades included an office in the milking-shed, palisade fencing around the feed stores, a new thatched roof for the lapa, deeper silage furrows to enable the storage of larger quantities of silage, and a security fence around the weather station used by the Department of Soil, Crop and Climate Sciences.

Numerous compliments on the upgrades were received from institutions and farmers who visit the farm regularly. In addition, a system to supply water to all the grazing camps has also been installed. The water supply on the farm was previously generated by windmills.

The experimental farm achieved exceptional success recently when the Afrikaner stud was recently identified by the Afrikaner Cattle Breeders' Society as being above breed average.

The Afrikaner core herd, established on the farm in 2006, has in general shown excellent progress. The herd includes 60 stud cows with 14 herd-replacement heifers, 24 young heifers, 31 young bulls, and 40 grade cows used for crossing with Angus bulls.

An important focus area for the farm is student training. Several departments in the faculty use the farm for research purposes and for the practical training of undergraduate and postgraduate students. For instance, Mr Strauss Boshoff conducted a highly successful nutrition and digestion programme during the year as part of his studies.

Several agricultural organisations have made use of the farm for their experiments. Meadows, for example, successfully tested their latest nutrition programme for dairy cows on the farm.

The farm has grown in popularity, and it is especially used for farmers' days, training, and the introduction of farming equipment. Various school groups in the area have also paid visits to the farm.

Dairy Belle hosted a farmers' day at which the Dairy Farmer of the Year was announced and Coopers, a pest-control company that assists with pest control on the experimental farm, held an information day to introduce its latest products.

The experimental farm has been supplying milk to Dairy Belle for the past few years. This agreement has succeeded in

boosting the farm's income considerably. In 2006 the farm's income stood at approximately R27,000 per month – and in 2007 it grew to approximately R100,000 per month. This exceptional growth was achieved with a herd of only 53 cows in milk.

The cultivation of crops on the farm has been tremendously successful. Of the 160 hectares of maize, 70 hectares of silage was produced and stored in the silage furrows. The remaining hectares were harvested, yielding an estimated 3 to 3.5 tons per hectare. In addition, 14 hectares have been planted with teff and 40 hectares with feed sorghum. Of the 160 hectares of maize, 50 hectares are used for the infield rainwater harvesting project of the Department of Soil, Crop and Climate Sciences. Pannar donated R35 000 worth of yellow-maize seed.



Mr E.J. King, student assistant on the farm, shown here stamping down silage in silage furrows with the McCormick tractor.



Information sessions on a wide range of topics are presented during farmers' days held on the farm.

Staff

Farm Manager: Mr Cobus van Dyk

Administrative Manager: Ms Amanda Smith

Student Assistants: Messrs Jannie Myburgh, E.J. King

Farm Workers: Mss Anna Seboniyane, Elizabeth Seboniyane, Messrs Thabo Khubeka, Vinie Khubeka, Piet Lekaje, Jeremia Lelaka, Isaac Nkotchana, Christiaan Olivier, Daniel Somi, Paulus Somi, Hendrick Tsabo, Ismael Tukula, Abram Tsolo

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Mr Jannie Myburgh, student assistant, with one of the newborn calves.



The annual conference of the South African Agricultural Teachers Association (SAATA) was held on the experimental farm and was attended by the principals and deputy principals of agricultural schools across the country. Here are, from the left: Messrs Gerrit Viljoen, chairperson of SAATA, Jannie van den Heever, representative from Limpopo, Bennie Trollip, Department of Education, Free State, and prof. Herman van Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS. The faculty also held talks with SAATA.

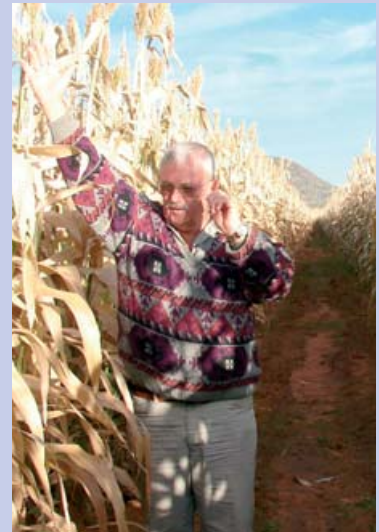


One of the farm workers, Mr Abram Tsolo, using the hammer-mill to grind maize for silage.



A farm worker, Mr Hendrik Tsabo, shredding maize for silage.

Activities on the farm





Institute



Dr Ingrid Dennis

Institute for Groundwater Studies

Review

The Institute for Groundwater Studies (IGS) has seen many changes over the past year. The most significant of these has been the retirement of the former Head of Department, Prof. Frank Hodgson, after more than 30 years of service in this position.

Prof. Hodgson founded the IGS in 1974 and became its first Director. In 1988, the Groundwater Division of the Geological Society of South Africa rewarded him with the Ground Water medal for his significant contributions to the advancement of groundwater in South Africa. Prof. Hodgson negotiated a 6-year contract [1995 – 2000] with the German Government to sponsor 12 students per year from Africa to obtain their honours degrees from the IGS. In 2004, the UFS rewarded him with a centenary medal for his entrepreneurial management of the IGS. The nine indigenous trees that Prof. Hodgson planted in front of the IGS building will always bear witness to the fact that he was not only a brilliant scientist, but also deeply involved in environmental concerns.

After Prof. Hodgson's retirement, two members of the Institute, Prof. Gerrit van Tonder and Dr Danie Vermeulen took over the director's duties until 1 August 2007, when the final decision was taken to appoint Dr Ingrid Dennis as the Director of the IGS on a permanent basis.

Dr Dennis has an impressive academic and professional record and has received numerous awards for excellence in both her studies and her professional career. She is a member of the International Hydrogeological Association and the South African Council for Natural Scientific Professions.

During 2007, 17 honours, 20 M.Sc. and 13 Ph.D. students were registered at the Institute.

Five affiliated researchers at the IGS, namely Ms Adrie van Wyk, Messrs Danie Vermeulen, Rainier Dennis, and Robel Gebrekristos, obtained their Ph.D. degrees during 2007. Ms Van Wyk and Mr Gebrekristos have since left the IGS to pursue careers with private firms. The remaining three were appointed as full-time researchers at the Institute.

The institute was privileged to have visits and collaboration from two international experts, namely Dr Allen Shapiro, a research hydrologist from the United States Geological Survey

(USGS), and Prof. Dave Kremer from the University of Nevada, Las Vegas (UNLV), United States of America (USA).

About 254 delegates from across South Africa and the world registered for the three-day South African Groundwater Conference from 8-10 October 2007 in Bloemfontein. This was the biannual conference of the Groundwater Division of the Geological Society of South Africa and drew groundwater practitioners, researchers, regulators and other interested parties from across South Africa, Africa, Europe, Asia and North America. A wide variety of papers were delivered on topics including groundwater regulation and governance, aquifer characterisation, surface/ groundwater interaction and groundwater pollution and quality. The IGS presented 16 papers at the conference and received the "Best Poster" award. Staff members of the IGS served on the organising committee of the conference.

The opening address was made by the Minister of Water Affairs and Forestry, Ms Lindiwe Hendriks. Discussions were held between the Minister and Dr Dennis on how the IGS, as part of the UFS cluster for "Water management in water-scarce areas", can promote the integration of water resources and build capacity within the government and private sectors by means of research projects and the training of students.

A pre-conference course was held by Dr Allen Shapiro (USGS) and Prof. Van Tonder at the IGS. Dr Shapiro is a research hydrologist with the U.S. Geological Survey in Reston, Virginia, USA. His research has focused on characterising groundwater flow and chemical transport in fractured rock. He is a collaborating researcher on the Water Research Commission's (WRC) "Bulk Flow" project.

At the conference dinner, the Ground Water Division bestowed an Honorary Membership on, and awarded the Ground Water medal to, Prof. Jopie Botha, a retired professor from the IGS. He was nominated by Dr K Pietersen, and the decision of the Executive Committee was unanimous. The award is given to members of the groundwater community of South Africa who have made a significant contribution to the advancement of groundwater. This award aims at recognising the scientific contribution to the field of groundwater studies in South Africa, especially in developing the theoretical understanding of ground-



Attending the South African Groundwater Conference held in Bloemfontein are, from the left: Mr Trevor Balzer, Department of Water Affairs and Forestry, Minister's office, Dr Jennifer Pretorius, IGS, Mr Guy Preston, Department of Water Affairs and Forestry, Working for Water; front: Mr Chris Moseki, Department of Water Affairs and Forestry, Water Resource Planning Systems, Ms Lindiwe Hendriks, Minister of Water Affairs and Forestry, Dr Ingrid Dennis, Director: IGS.

water flow in fractured rock aquifers. Prof. Botha has played a significant role in mentoring a number of groundwater professionals.

During the GWD conference, the IGS arranged (and partly financed) the visit of Dr H.A. Dharmagunawardhane, Senior Lecturer in Hydrogeology and Applied Geophysics, Department of Geology, University of Peradeniya, Sri Lanka, to attend the conference. Dr Dharmagunawardhane was instrumental in arranging the workshops presented by Prof. Van Tonder, Drs Vermeulen and Dennis in Sri Lanka in 2006 and 2007.

A Memorandum of Understanding (MOU) between the University of D'Abomey-Calavi, Benin and the UFS was signed. The MOU will provide a platform for the IGS to assist in the development of the curriculum and training for both staff and students at the University of D'Abomey-Calavi.

A three-year project on the impacts of irrigation of mine water on groundwater resources was completed in 2007. This research, co-sponsored by the WRC and Coaltech 2020, provided a quantification of the impacts from four different irrigation sites, with suggested guidelines for the implementation of this practice.

During 2007, a two-year WRC contract was also awarded to the IGS, with

the title, *Scoping level assessment of how water quality and quantity will be affected by mining method and mining of the Waterberg coal reserves.*

The three-year WRC project on *Field investigations to study the fate and transport of dense non-aqueous phase liquids (DNAPLs) in groundwater* was completed early in 2007. For this project, the IGS collaborated with the University of Johannesburg and the Council for Geoscience. Six research products in the form of research reports and guidelines were produced as a result. A follow-up four-year research project on *Light Non-Aqueous Phase Liquids* was initiated in 2007. Collaborating organisations are: the Universities of KwaZulu-Natal and Pretoria, and Golder and Associates Consultants.

Another four-year project from the WRC, *Measurement of the bulk flow and transport characteristics of selected fractured rock aquifer systems in South Africa*, was awarded to the IGS. Collaborating organisations are USGS and the Universities of Venda, Fort Hare, and the Western Cape.

In 2007 the IGS, together with the Department of Water Affairs and Forestry (DWAF) and Fetwater, presented short courses in Groundwater Resource Directed Measures Port Elizabeth and Cape Town. These courses focused on training groundwater professionals in assessment, as dictated by the Water Act of 1998.

These training courses will continue into 2008.

The IGS was awarded with Phase 2 of the project Geohydrological Software Development for Decision Support, and two Reserve Determinations by the DWAF.

A number of contracts have been obtained from SASOL Mining, SASOL Synfuels and ESKOM. These are used as projects for M.Sc. and honours students.

In addition, numerous contracts for geohydrological investigations at mining and industrial sites were awarded to the IGS.

Staff members attended and presented papers at four international conferences in the USA, Canada and Ghana.

On 30-31 October 2007, Prof. Marc Kpodekon (Dean of Natural Sciences) and Dr Codo Francois de Paule from the University of D'Abomey-Calavi in Benin paid a visit the Institute for Groundwater Studies. They were accompanied by Mr Wouter van den Wall Bake, the Programme Officer for international projects from Vanhall-Larenstein in the Netherlands. The aim of the visit was to sign an MOU between the University of D'Abomey-Calavi and the UFS. The MOU will provide a platform enabling the IGS to assist in the development of the curriculum and training for both staff and

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, Dr Francois Fourie, Messrs Michael du Preez, Robel Gebrekristos, Sechaba Lenong, Mehari Menghistu, Richard Akoachere, Michael Bester, Modreck Gomo, Ms Michelle Pienaar

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Prof. Frank Hodgson, former head of the IGS, retired after more than 30 years of service in this position. The photo was taken during his farewell function.

and another formed the basis of a presentation by Prof. Kreamer at the GSA conference in Denver.

In 2007 the contract with the DWAF entitled: *Geohydrological Software Development For Decision Support: Phase 1* ended. However, the IGS was also awarded with Phase 2 of the above-mentioned contract. The focus of the contract will be training in the following software packages: South African Groundwater Decision Tool, Groundwater Dictionary and Groundwater Resource Directed Measures. The Department of Water Affairs and Forestry also awarded the IGS with two Reserve Determinations for the Thukela and Mhlatuze Water Management Areas. These projects include both research and training components.

Two researchers, Drs Jennifer Pretorius and Brent Usher, visited the USA for a fortnight in October 2007. Two papers were presented at a special session on "Groundwater in the Developing World" at the Annual Geological Society of America Meeting in Denver, Colorado. As part of this session, interested researchers, academics and Non-Governmental Organisations (NGOs) held a specially convened meeting to establish a multi-organisational, university-driven consortium to further groundwater research and development in the developing world under the leadership of Prof. Kreamer of UNLV and Dr Michael

Campana. The Geosciences School at the University of Nevada was also paid a visit to explore collaboration possibilities, and a meeting was held with the Dean of the College of Sciences at UNLV to establish a formal collaboration agreement. As a final leg, the National Ground Water Association's Conference on Light Non-Aqueous Phase Liquids was attended in Houston, Texas, in support of the Institute's research activities in this field.

During July 2007, Dr Vermeulen attended a conference in Accra, Ghana and delivered a paper entitled *Quantification of the impact of irrigating with coalmine waters on the underlying aquifers*. This paper was subsequently selected to be published in a book by Springer, entitled *Appropriate Technologies for Environmental Protection in the Developing World*. Dr Vermeulen also chaired a number of the sessions at the conference.

As member of the International Mine Water Association, Dr Vermeulen also attended the 14th Annual BC/MEND (Mine Environment Neutral Drainage) Metal Leaching / Acid Rock Drainage Workshop on Challenges in Collection and Treatment of Mine Drainage (28-30 November 2007), at the Simon Fraser University Harbour Centre, Vancouver, BC. This is an annual workshop attended by researchers and professionals from the mining industry from all over the world.

students at the University of D'Abomey-Calavi. Vanhall-Larenstein will assist with finances for this exchange.

Prof. David Kreamer of the University of Nevada (UNLV) in Las Vegas, USA visited the IGS on two occasions as part of his extended sabbatical, which included three other African countries. During his first visit, in May 2007, Prof. Kreamer reviewed some of the research projects underway at the IGS. He also lectured the postgraduate students on the practical application of geophysics for groundwater contamination problems. He returned to the IGS in June 2007. In this period, the possibility of collaboration was discussed, and the basis of several joint papers on groundwater issues was outlined. One paper has subsequently been submitted to a special edition of the journal *Groundwater* for consideration,

Research outputs

Research articles

Dennis, I. & Wentzel, J. 2007. Groundwater resource-directed measures software. *Water SA* 33(1): 79-86.

Fourie, F. 2006. Aspects of the lateral and vertical resolution of surface electroseismic data with implications for groundwater exploration in fractured Karoo rocks. *South African Journal of Geology* 109(4): 571-584.

Van Tonder, G.J., Usher, B.H., Dennis, I. & Vermeulen, P.D. 2007. Predicting rebound in a deep colliery in South Africa. *Mine Water and the Environment* 26(2): 79-87.

Conferences contributions

Akoachere, R. & Van Tonder, G.J. 2007. *Three methods for the determination of mechanical and hydraulic fracture apertures in fractured rock aquifers.* Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Akoachere, R.A., Itie, T.M., Yaya, O.O. & Oteze, G.E. 2007. *Using morphometric analysis to evaluate groundwater hydraulic characteristics in the piedmont regions of Mount Cameroon, West Africa.* Paper presented at the 19th Annual Conference of the Nigerian Association of Hydrogeologists (NAH), Port Harcourt, Nigeria. 18-23 November.

Akoachere, R.A., Van Tonder, G.J., Yaya, O.O. & Menghistu, M.M. 2007. *The partial hydraulic conductivity theory of bulk flow in aquifers: (Isotropy to anisotropy).* Paper presented at the 19th Annual Conference of the Nigerian Association of Hydrogeologists (NAH), Port Harcourt, Nigeria. 18-23 November.

De Sousa, E.R., Usher, B.H. & Bernardes, C. 2007. *Evaluation of the hydraulic effectiveness of a Phytoremediation System from South-eastern Brazil.* Paper presented at the XXXV International Association of Hydrogeologists (IAH) Congress: Groundwater and Ecosystems, Lisbon, Portugal. 17-21 September.

De Sousa, E.R., Usher, B.H. & Bernardes, C.J. 2007. *Evaluation of the hydraulic effectiveness of a phytoremediation system from south-eastern Brazil.* Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Demmer, T., Barnes, J., Van Rensburg, H.J., Hubert, G.L.H., Meyer, M. & Vermeulen, P.D. 2007. *Development of a conceptual aquifer model for the Tenke-Fungurume area, southern DRC.* Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.



The Ground Water Division (GWD) bestowed an Honorary Membership on, and awarded the Ground Water medal to, Prof. Jopie Botha at the conference dinner of the GWD's biannual conference.

Dennis, I. & Moseki, M.C. 2007. *Investigation of the applicability of various groundwater / surface water interaction methodologies in South African fractured rock environment.* Paper presented at the XXIV General Assembly of the International Union of Geodesy and Geophysics (IUGG), Perugia, Italy. 2-13 July.

Dennis, I., Veltman, S., Dennis, S.R. & Watson, M. 2007. *Geohydrological software for decision support.* Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Fourie, F. 2007. *Geotechnical application of a 2-D resistivity survey: Mapping bedrock elevation for bridge construction.* Paper presented to the 10th SAGA Biennial Technical Meeting and Exhibition, Wild Coast Sun, South Africa. 15-18 October.

Fourie, F. 2007. *Limitations of the Helmholtz-Smoluchowski Equation in Electrostatics.*

Paper presented to the 10th SAGA Biennial Technical Meeting and Exhibition, Wild Coast Sun, South Africa. 15-18 October.

Fourie, P.J. & Usher, B.H. 2007. *Geochemical numerical modelling of acid mine drainage from an open-cast coal mine.* Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Gebrekrstos, R.A. & Usher, B.H. 2007. *A column experiment to characterise DNAPL Saturation using Partitioning Interwell Tracer Test (PITT).* Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Gebrekrstos, R.A., Shapiro, A.M. & Usher, B.H. 2007. *In situ estimation of the effective chemical diffusion coefficient of the rock matrix in a fractured aquifer.* Paper presented at the Biennial South African Groundwater

Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Gebrekrstos, R.A., Usher, B.H., Lenong, S.E. & Pretorius, J.A. 2007. *Innovative methods to characterize fractured rock aquifers and comparison to established methods*. Poster presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Hodgson, F.D.I. 2007. *Water management in South African collieries*. Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Jovanovic, N., Saayman, I., Beekman, H., Adams, S., Campbell, R., Conrad, J., Fey, M. & Usher, B.H. 2007. *Improved tools and protocols for aquifer vulnerability assessment in South Africa*. Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Le Roux, P.A.L., Hensley, M., Van Huyssteen, C.W.J., Van Tol, J., Vermeulen, P.D. & Lorentz, S.A. 2007. *Hydrosequences of wetland soils in selected catchments*. Paper presented to the National Wetlands Indaba: Wetlands for tomorrow, Gauteng Department of Agriculture, Conservation and Environment (GDACE), Kempton Park, South Africa. 22-26 October.

Pretorius, J.A., Usher, B.H. & Gebrekrstos, R.A. 2007. *Characterising DNAPL fracture flow in the field using a surrogate DNAPL*. Paper presented to the Geological Society of America Annual Meeting, Denver, Colorado, USA. 28-31 October.

Pretorius, J.A., Usher, B.H. & Gebrekrstos, R.A. 2007. *Fate and transport of dense non-aqueous phase liquids (DNAPLs) in South African aquifer systems*. Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Reynolds, K., Nel, J., Pretorius, C., Petrik, L., Buckley, C., Usher, B.H., Gericke, G. & Roux, D.T. 2007. *Sustainability of inland ash disposal facilities as salt sinks*. Poster presented at the 11th International Conference on Diffuse Pollution and the 1st Joint Meeting of the IWA Diffuse Pollution and Urban Drainage Specialist Groups, Sao Paulo, Brazil. 26-31 August.

Reynolds, K., Pretorius, C., Petrik, L., Buckley, C., Usher, B.H., Gericke, G. & Roux, D.T. 2007. *Sustainability of inland ash disposal facilities as salt sinks*. Poster presented at the World of Coal Ash (WOCA) 2007 Science, Application and Sustainability Conference, Lexington, Kentucky, USA. 7-10 May.

Usher, B.H. 2007. *Appraisal of multi-country groundwater assessment and protection projects in Africa*. Paper presented to the Geological Society of America Annual Meeting, Denver, Colorado, USA. 28-31 October.

Van Tonder, G.J., Usher, B.H. & Hughes, D. 2007. *Groundwater / surface water interaction: A new perspective*. Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Van Wyk, A. & Usher, B.H. 2007. *Field scale application of biobarriers for hydraulic control in fractured aquifers*. Paper presented at the Biennial South African Groundwater

Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Veltman, S. & Dennis, S.R. 2007. *Using neural networks for simulating groundwater / surface water interaction in hydrological yield modelling*. Poster presented at the XXIV General Assembly of the International Union of Geodesy and Geophysics (IUGG), Perugia, Italy. 2-13 July.

Veltman, S. & Dennis, S.R. 2007. *Using neural networks for simulating groundwater / surface water interaction in hydrological yield modelling*. Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Vermeulen, P.D. & Usher, B.H. 2007. *Determination of the impact of mine water irrigation on groundwater resources*. Paper presented at the ERTEP 2007 - First International Conference on Environmental Research, Technology and Policy: Building Tools and Capacity for Sustainable Production, La Palm Royal Beach Hotel, Accra, Ghana. 17-19 July.

Vermeulen, P.D., Van Tonder, G.J. & Usher, B.H. 2007. *Detailed quantification of coalmine water irrigation impacts on the underlying aquifers*. Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

Xu, Y. & Usher, B.H. 2007. *Groundwater quality issues in Africa and some suggested solutions*. Paper presented at the Biennial South African Groundwater Conference, University of the Free State, Bloemfontein, South Africa. 8-10 October.

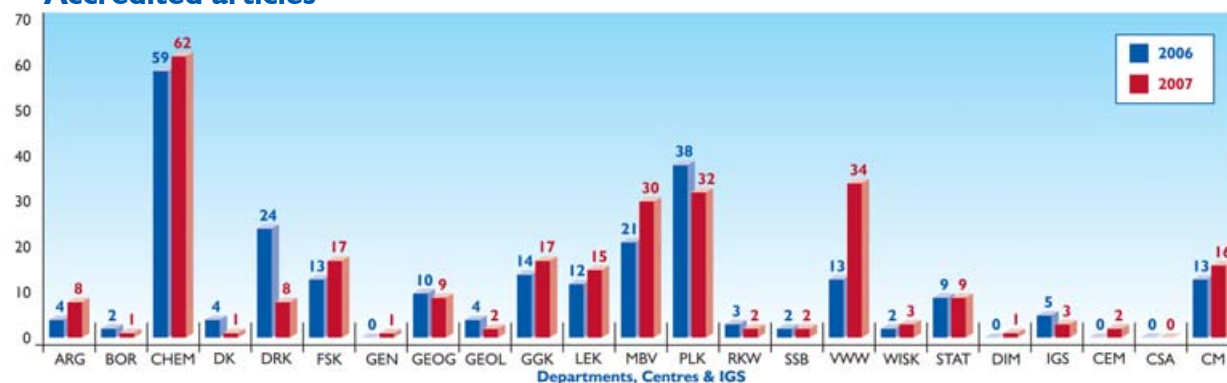


Statistical data

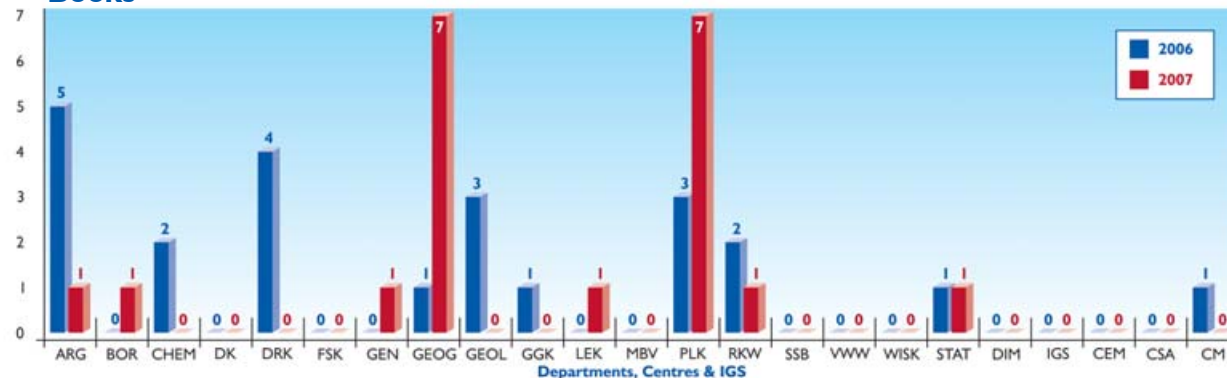
List of abbreviations

Abbreviation	Description	Abbreviation	Description
ARG	- Department of Architecture	GEOL	- Department of Geology
BOR	- Department of Quantity Surveying and Construction Management	GGK	- Department of Soil, Crop and Climate Sciences
CEM	- Centre for Environmental Management	IGS	- Institute for Groundwater Studies
CHEM	- Department of Chemistry	LEK	- Department of Agricultural Economics
CM	- Centre for Confocal and Electron Microscopy	MBV	- Department of Microbial, Biochemical and Food Biotechnology
CSA	- Centre for Sustainable Agriculture and Rural Development	PLK	- Department of Plant Sciences
DIM	- Disaster Management Training and Education Centre for Africa (DiMTEC)	RKW	- Department of Computer Science and Informatics
DK	- Dean's Office	SSB	- Department of Urban and Regional Planning
DRK	- Department of Zoology and Entomology	STAT	- Department of Mathematical Statistics
FSK	- Department of Physics	VWW	- Department of Animal, Wildlife and Grassland Sciences
GEN	- Department of Genetics	WISK	- Department of Mathematics and Applied Mathematics
GEOG	- Department of Geography		

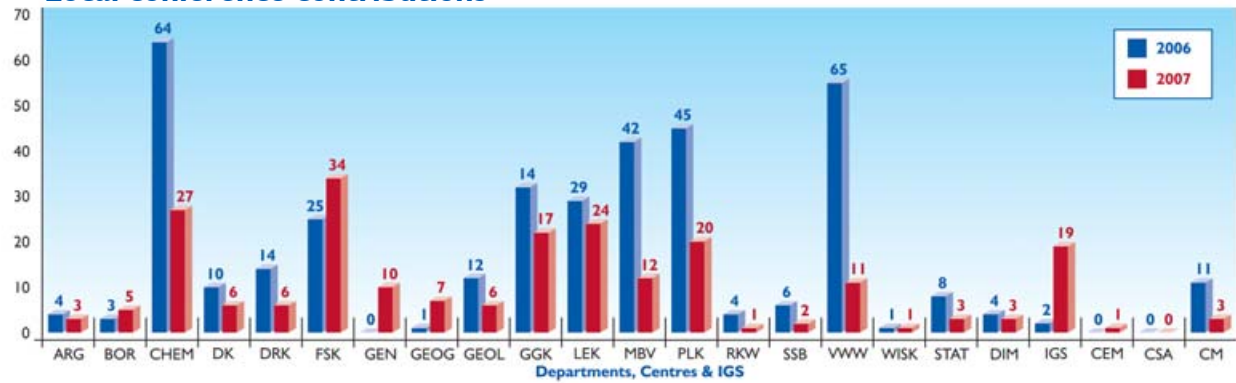
Accredited articles



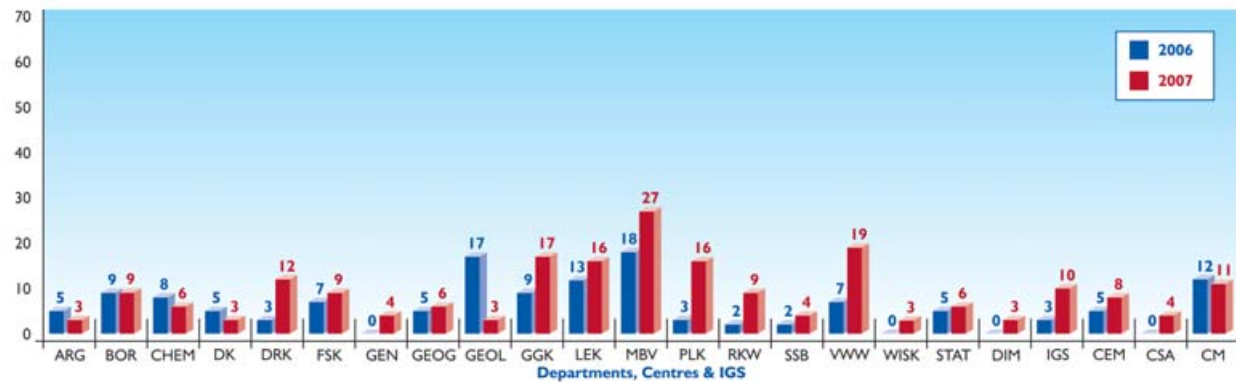
Books



Local conference contributions



Overseas conference contributions

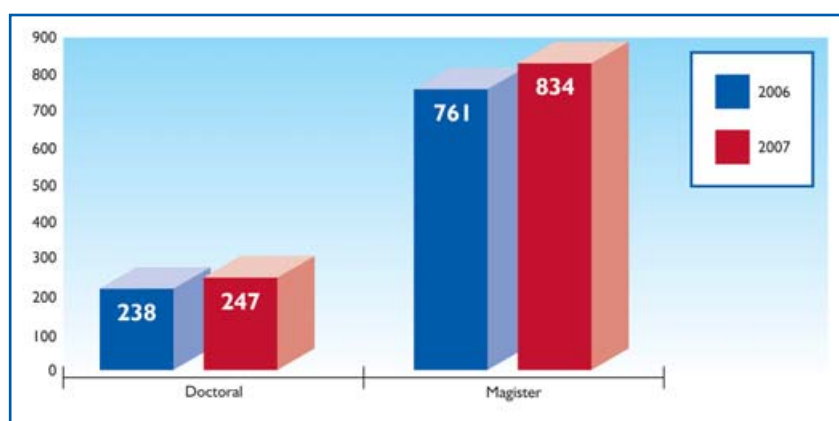
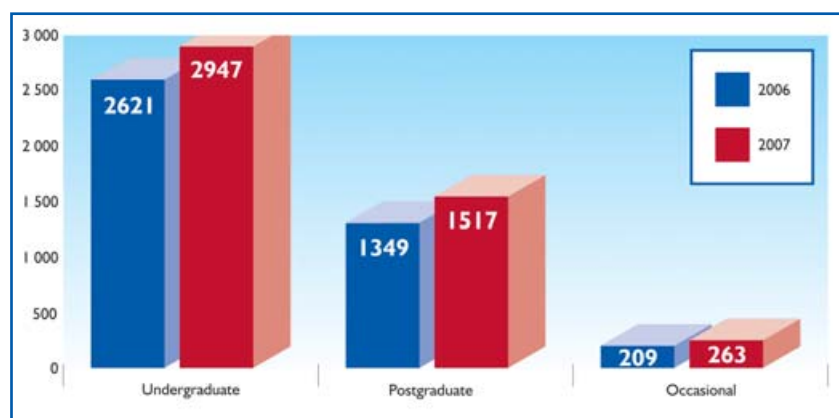


Students figures: 2006-2007

Student figures

Year	Description	Total				Total
		Black	Coloured	Asian	White	
2006	Undergraduate	1358	62	39	1162	2621
	Postgraduate	619	35	33	662	1349
	Occasional	164	4	4	37	209
Total		2141	101	76	1861	4179
2007	Undergraduate	1555	69	41	1282	2947
	Postgraduate	727	43	41	706	1517
	Occasional	238	6	1	18	263
*Total		2520	118	83	2006	4727

Comparison for the Faculty of Natural and Agricultural Sciences: 2006-2007



International students

Nationality	Year	
	2006	*2007
Asian countries	18	21
Botswana	19	16
European countries	6	8
Lesotho	141	123
Malawi	1	3
Mauritius	2	2
Mozambique	7	4
Namibia	40	58
North America	4	15
Other African countries	48	51
South Africa	3853	4325
South America	1	2
Swaziland	13	6
Zambia	6	8
Zimbabwe	20	48
Unknown		37
*Total	4179	4727

*2007 Final HEMIS figures not available



Glossary

A

AACC	American Association for Cereal Chemists
ADF	Amsterdam Density Functional Programme
ADRA	Adventist Development and Relief Agency
AEASA	Agricultural Economics Association of South Africa
ALPRU	African Large Predator Research Unit
AMI	Advanced Metals Initiative
ARC	Agricultural Research Council
ARMSCOR	Armaments Corporation of South Africa
ASAQS	Association of South African Quantity Surveyors
ASOCSA	Association of Schools of Construction of Southern Africa
ASREML	Arthur's Restricted Maximum Likelihood
ASSA	Actuarial Society of South Africa

B

BMF	Black Management Forum
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C

CANSA	Cancer Association of South Africa
CCEM	Centre for Confocal and Electron Microscopy
CePHMa	Centre for Plant Health Management
CfPB - SA	Centre for People and Buildings - South Africa
CIDB	Construction Industry Development Board
CIOB	Chartered Institute of Building
CIOB	Chartered Institute of Building
CMW	Cape Mohair and Wool
CPU	Central Processing Unit
CSIR	Council for Scientific and Industrial Research Organisation
CUT	Central University of Technology

D

DiMTEC	Disaster Management Training and Education Centre for Africa
DMISA	Disaster Management Institute of Southern Africa
DST	- Department of Science and Technology
DWAF	Department of Water Affairs and Forestry

E

EAAP	European Association for Animal Production
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EBS	Electron Backscatter Diffraction
ECA	European Crystallographic Association
ECAP	Equal Channel Angular Pressing
EGIC	Economic Growth and International Competitiveness
EMS	Economics and Management Sciences
EPWP	Expanded Public Works Programme
ESR	Educational Standards and Research Committee
EU	European Union
EUG	European Union of Geologists
FET	Further Education and Training

F

FM	Facility Management
FMP	Facilities Management Programme
FNBG	Free State National Botanical Gardens
FOTIM	Foundation of Tertiary Institutions of the Northern Metropolis
FSRDPP	Free State Rural Development Partnership Project

G

GET	General Education and Training
GIS	Geographical Information Systems
GMBA	Gauteng Master Builders Association
GSSA	Grassland Science Society of Southern Africa
GPS	Global Positioning System
GWD	Ground Water Division

H

HCI	Human-computer Interaction
HEQC	Higher Education Quality Committee
HESS	High Energy Stereoscopic System
HIV	Human Immunodeficiency Virus
HOORC	Harry Oppenheimer Okavango Research Centre

I

IATED	International Association of Science and Technology for Development
ICEC	International Cost Engineering Council
ICMR	International Centre for Material Research

IDC	Industrial Development Corporation
IEEE	Institute of Electrical and Electronics Engineers
IFAC	International Federation of Automatic Control
IFMA	International Farm Management Association
IGS	Institute for Groundwater Studies
INCRoP	Insects on New Crops Programme
INTSORMIL	International Sorghum and Millet Research Support Programme
IOFOS	International Organisation for Forensic Odonto-Stomatology
IPMP	Intensive Project Management Programme
IRDP	Institutional Research and Development Programme
IRWH	In-field Rainwater Harvesting
IUCr	International Union of Crystallography

M

MEC	Member of the Executive Council
MOU	Memorandum of Understanding
MUCPP	Mangaung University Community Partnership Programme

N

NAFU	National African Farmers Union
NAMC	National Agricultural Marketing Council
NASSP	National Astrophysics and Space Science Programme
NCEE	National Council for Economic Education
NDMC	National Disaster Management Centre
NECSA	South African Nuclear Energy Corporation
NELSAM	Natural Earthquake Laboratory in South African Mines
NGO	Non-Governmental Organisation
NLC	National Laser Centre
NMR	Nuclear Magnetic Resonance
NRF	National Research Foundation
NUFU	Norwegian Council of Universities Committee for Development, Research and Education
NWGA	National Wool Growers' Association

P

PAMO	Pan African Mathematics Olympiad
PAQS	Pacific Association of Quantity Surveyors
PARSA	Parasitological Association of Southern Africa
PEC	Power electronic converter
POE	Post-occupancy evaluation
PPRI	Plant Protection Research Institute
PRF	Protein Research Fund
PRINT	Promotion of Regional Integration
PRT	Protein Research Trust

R

REDIBA	Research Development Initiative for Black Academics
RICS	Royal Institute of Chartered Surveyors
RIEP	Research Institute of Education Planning
RNA	Research Niche Area
RPO	Red Meat Producers' Organisation
RTPI	Royal Town Planning Institute

S

SA	South Africa
SAAB	South African Association of Botanists
SAACE	South African Association of Consulting Engineers
SAAO	South African Astronomical Observatory
SAATA	South African Agricultural Teachers Association
SAB	The South African Breweries Limited
SABI	South African Biosystematics Initiative
SACAP	South African Council for the Architectural Professions

SACPLAN	South African Council of Planners
SACPVP	South African Council for the Property Valuation Profession
SACQSP	South African Council for the Quantity Surveying Profession
SADC	Southern African Development Community
SAFEFE	South African Foundation for Economic and Financial Education
SAFOI	South African Fryer Oil Initiative
SAIA	South African Institute of Architects
SAICE	South African Institute for Civil Engineers
SAIP	South African Institute of Physics
SAISC	Southern African Institute of Steel Construction
SANBI	South African National Biodiversity Institute
SANI	South African Nanotechnology Initiative
SANPAD	South Africa-Netherlands Research Programme on Alternatives in Development
SAPI	South African Planning Institution
SAPOA	South African Property Owners' Association
SAPS	South African Police Services
SAQA	South African Qualifications Authority
SASAS	South African Society for Animal Science
SASPP	Southern African Society for Plant Pathology
SASQUA	Southern African Society for Quaternary Research
SASS	South African Scoring System
SAWMA	South African Wildlife Management Association
SCB	Society for Conservation Biology

SEM	Scanning Electron Microscope
SFS	Sustainable Fibre Solutions
SGA	Society of Geology applied to Ore Deposits
SIDA	Swedish International Development and Cooperation Programme
SMME	Small, Medium and Micro Enterprises
SPALHE	Short Programme on Assessment of Learning in Higher Education
SPDG	Sustainable Projects Development Group

T

TEM	Transmission Electron Microscope
THRIP	South African National Research Foundation Thrust for Industry-Related Projects

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
UNLV	University of Nevada, Las Vegas
UP	University of Pretoria
USA	United States of America
USAID	United States Agency for International Development
USGS	United States Geological Survey
UWC	University of the Western Cape

W

WITS	University of the Witwatersrand
WPSA	World's Poultry Science Association
WRC	Water Research Commission

