ANNUAL REPORT

Faculty of Natural and Agricultural Sciences





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



ANNUAL REPORT Faculty of Natural and Agricultural Sciences

Contact Details

Dear

Prof. Neil Heideman +27 (0)51 401 2322 heidemannj@ufs.ac.za

Office of the Dean Ms René Bloem +27 (0)51 401 2322 bloemr@ufs.ac.za

Faculty Manager Mr Johan Kruger +27 (0)51 401 2409 krugerjf.sci@ufs.ac.z

Marketing Manager Ms Elfrieda Lötter +27 (0)51 401 2531 lottere@ufs.ac.za

Physical Address Room 9A, Biology Building, Main Campus Bloemfontein

Postal Address University of the Free Sta PO Box 339 Bloemfontein South Africa 9300

ix: ·mail:

-27 (0)51 401 3728 hatagri.sci@ufs.ac.za vww.ufs.ac.za/natag

Issued By

Faculty of Natural and Agricultural Sciences University of the Free State

Editorial Compilation

Language Revision

Revision of Bibliographical Data Mercia Coetzee

Design Layout & Printing SUN MeDIA Bloemfontein

Photography (Chairpersons) Stephen Collett

table of **CONTENTS**

Preface	7
Darwin 200 – The story of life and survival	9
Agricultural Sciences	19
Agricultural Economics	21
Animal, Wildlife and Grassland Sciences	29
Plant Sciences	41
Soil, Crop and Climate Sciences	51
Building Sciences	63
Architecture	65
Quantity Surveying and Construction Management	73
Urban and Regional Planning	81
Natural Sciences	87
Chemistry	89
Computer Science and Informatics	113
Consumer Science	123
Genetics	129
Geography	139
Geology	145
Mathematical Statistics and Actuarial Science	155
Mathematics and Applied Mathematics	163
Microbial, Biochemical and Food Biotechnology	167

Physics	185
Plant Sciences	41
Zoology and Entomology	197
Centres	211
Disaster Management Training and Education Centre for Africa (DiMTEC)	213
Environmental Management	219
Lengau Agricultural Development Centre	231
Microscopy	237
Sustainable Agriculture, Rural Development and Extension	243
Experimental Farm	251
Paradys	253
Institute	259
Groundwater Studies	261
Workshops	271
Electronics	273
Instrumentation	279
Statistical Data	283
Students	284
Research	286
Glossary	289



Preface From the Dean's Office

In 2010, the Faculty of Natural and Agricultural Sciences continued its upward trajectory of outstanding achievements in research, driven by staff and postgraduate student commitment to excellence and leadership. This is reflected in its sustained level of scholarly outputs in leading international journals (close to 180 units, most of them in ISI-listed journals), numerous conference presentations, including keynote addresses, the hosting of international conferences, prestigious awards for the advancement of science, noteworthy contributions to the welfare of society and further expansions to its infrastructural capacity. Much was indeed achieved again and what follows here are but a few highlights of yet another remarkable year.

In the **Agricultural Sciences**, important breakthroughs were made by Prof. HO de Waal (Animal, Wildlife & Grassland Sciences) with the utilisation of cactus pear (*Opuntia ficus-indica*) in animal diets for application in the arid parts of South Africa. Prof. Seef Pretorius and his team (Soil, Crop & Climate Sciences) completed the screening of more than 3 500 crude plant extracts for antibacterial, antifungal, herbicidal and biostimulatory potential, while Dr Pieter le Roux and his group (Soil, Crop & Climate Sciences) showed that hydrological classification of soils and hill slopes are possible and can improve the modelling of catchment hydrology. In terms of disaster risk reduction, Andries Jordaan (Disaster Management Training and Education Centre for Africa) continued to expand the footprint of his centre in Africa. Finally, the

honour of being named Free State Agriculturist for 2010, the fourth staff member in the past 10 years to receive this award, went to Prof. Frikkie Neser (Animal, Wildlife & Grassland Sciences).

In the Building Sciences, our Unit for Earth Construction, a partner of the UNESCO Chair Earthen Architecture, was applauded for its SANPAD project addressing the acceptability of earth construction in South Africa. Merit awards went to Professor Emeritus Bannie Britz, Affiliate Professor, Prof. Ora Joubert, and Henry Pretorius for outstanding contributions to the built environment. The Department of Quantity Surveying and Construction Management produced an average of more than 2,5 research output units per permanent lecturer in 2010, which are 1,7 research output units more than the requirement of the Royal Institute of Chartered Surveyors (RICS) for a South African university to maintain its accreditation. Dr Maléne Campbell (Urban and Regional Planning) was an invited participant in the Knowledge Week of the Development Bank of Southern Africa during October 2010, where the focus was on South African human settlements 2030 - rethinking the spatial development trajectory.

In the **Natural Sciences**, the Chemistry Department has seen the virtual completion of the upgrading of its facilities, doubling its capacity for postgraduates to more than 100, while providing modern and safe working conditions. The total investment over the past five years in the building and equipment each totals > R60 million, resulting in a world-class facility. Research on the genetic variation in African blue monkeys by Prof. Paul Grobler (Genetics) led to invitations by the University of California (Los Angeles) and the University of Wisconson - Milwaukee for collaboration in a genome project, which will use these animals as a model system for integrated genetic and genomic research. Collaborative research between Prof. Lodewyk Kock (Microbial, Biochemical & Food Biotechnology), Prof. Hendrik Swart (Physics) and Prof. Pieter van Wyk (Centre for Microscopy) resulted in an important breakthrough in the use of nanotechnology in medical and biological research. In addition, the Extreme Biochemistry group, of which the Metagenomics Platform forms part, acquired a fully automated robotic colony picker to complement the high-throughput screening research facility that includes a robotics liquid handling system. Two provisional patents that were registered by the Biocatalysis research group of Prof. Martie Smit, in collaboration with Prof. Koos Albertyn (both from Microbial, Biochemical & Food Biotechnology), are aimed at developing microbial hosts for the heterologous expression of genes encoding hydroxylation enzymes. The Department of Physics was nominated for the Bloemfontein Institution of the Year award, and one of its staff members, Prof. Martin Ntwaeaborwa, was awarded the Paul Holloway Young Investigator Award

for 2010 by the Thin Film Division of the American Vacuum Society (AVS). Prof. Thomas Acho (Mathematics and Applied Mathematics) acted as reviewer for the American Mathematical Society MR Database, while Prof. Jo Schröder from the Department of Mathematics at the Qwaqwa Campus continued as Editor of the Scientiae Mathematicae Japonicae. The Parasitological Society of Southern Africa (PARSA) awarded the 24th Elsdon-Dew medal of merit for contributions to parasitology in Africa to Prof. Jo van As (Zoology and Entomology). This award is named after Ronald Elsdon-Dew, who was one of the founders of the society. Dr Anthony Turton, Affiliate Professor in the Centre for Environmental Management, was named SAB Environmentalist of the Year and received the Nick Steele Memorial Award for his inspiring work. Dr Danie Vermeulen (Institute for Groundwater Studies) gave several invited lectures at SASOL Secunda mines, one of which addressed the question of mines decanting.

2010 was therefore yet another good year for the faculty and with this brief introductory overview I wish to thank all staff and students for their outstanding efforts and commitment to academic excellence and to express my gratitude for the privilege of having been part of it.

Prof. NJL Heideman

DARWIN 200

1953

"It is not the strongest of the species that survives, nor the most intelligent, but the one most responsive to change"

Charles Darwin

Darwin 200 The story of life and survival

Collage of paper clippings of the Darwin 200 Lecture Series.

Charles Robert Darwin was born in Shrewsbury, England on 12 February 1809. Although trained as a medical doctor, he became known as a naturalist, geologist and scientist. He established that all species of life have descended over time from common ancestry, and proposed the scientific theory of evolution. In his 50th year, he published his theory, which he called natural selection, in his now famous book, *On the origin of species*. This book transformed human understanding of the living world and challenged the medieval perception that life and all the biodiversity came about by omnipotent individual design. The theory of evolution is recognised today as one of the greatest intellectual revolutions in the history of science, and is accepted by most scientists as the process responsible for the diversity of life on our planet.

Scientists all over the world celebrated the 200th anniversary of Charles Darwin's birthday and the 150th anniversary since the publication of his book. In Bloemfontein, the University of the Free State (UFS), under the leadership of Profs. Jo and Liesl van As, initiated a programme, *The story of life and survival*, to participate in the world-wide celebrations. The series of 26 lectures were presented during ten meetings that took place over a year, starting on Charles Darwin's 200th birthday on 12 February 2009 and concluding on 11 February 2010. The programme was presented in collaboration with the Bloemfontein National Museum and The Central University of Technology (CUT).



The programme (in chronological order) included:

12 February 2009:

Darwin 200: The story of life and survival (Prof. Jo van As, Department of Zoology and Entomology, UFS). The lecture explained the importance and significance of Charles Darwin's work and how it resulted in a paradigm shift with regard to the way we view the world and its biodiversity.

The life of Charles Darwin. A short play where Mr Darwin (played by Prof. Schalk Louw from the Department of

11

DARWIN 200 | THE STORY OF LIFE AND SURVIVAL



Mr Darwin (played by Prof. Schalk Louw from the Department of Zoology and Entomology, UFS) interviewed by a 'reporter' from the 21st century (Prof. Maitland Seaman from the Centre for Environmental Management, UFS).

Zoology and Entomology, UFS) was interviewed by a 'reporter' from the 21st century (Prof. Maitland Seaman from the Centre for Environmental Management, UFS). The play presented a brief history of Charles Darwin, his family and the people who influenced his life and work.

The evolution of the Universe: What nature tells us about the cosmic history (Prof. Matie Hoffman, Department of Physics, UFS). This lecture dealt with the Big Bang theory and examples of observational support for this theory, which occur in time and space, as proposed by Albert Einstein. The lecture also addressed various scientific worldviews, the Goldilocks enigma, the design and purpose of natural selection, and the laws of nature and physics.

26 February 2009:

The origin of our solar system (Prof. Marian Tredoux, Department of Geology, UFS). A short overview of how it all started, existing evidence of the nebula theory, and how elements formed to produce the Earth were presented. The lecture also dealt with myths about the age of our planet. The geological evolution of our planet: The first billion years (Dr Johan Loock, Department of Geology, UFS). This lecture explained the geological history of the first billion years of our planet when mountains were formed and the seafloor moved, as well as the influence of solar energy in the development of our planet before the first life forms evolved. It concluded with the final synthesis: what was needed for early life to develop 3,6 billion years ago?

13 March 2009:

The origin of life: Exactly how did life begin? (Prof. Doug Rawlings, Microbiology, Stellenbosch University). The essential characteristics of life, reproduction, the code for life, the ability to adapt and the ability to obtain energy, as well as the potential sources of energy were explained. Evidence on how higher life forms such as plants and animals developed was illustrated. The lecture concluded with the importance of microbial biodiversity, the dominance of it in every ecological niche, and a summary of the earlier major evolutionary transitions.

This lecture coincided with the Department of Microbial, Biochemical and Food Biotechnology's 50th anniversary. The event was followed by a reunion dinner for current and former staff and postgraduate students where guests were entertained to a presentation on the origins and growth of the department.

24 March 2009:

Transitions and extinction (Dr Jennifer Botha-Brink, Bloemfontein National Museum). The five major mass extinctions that occurred during the evolutionary history of the world were described. The lecture presented an overview of the extinction events, the aspects of dinosaur diversity, the mammal ancestors and possible reasons for the extinctions.

30 April 2009:

Biodiversity (Prof. Linda Basson, Department of Zoology and Entomology, UFS). The lecture explained the history of taxonomy and systematics, as well as the terminology used in the study of animal biodiversity.

Animal biodiversity, Part I (Prof. Jo van As, Department of Zoology and Entomology, UFS). This presentation comprised an overview of the 38 phylums of the Animal Kingdom. It highlighted how animal diversity came about, starting with the origin of single-cell organisms to more complex multi-cellular animals, including humans. It also discussed the reasons why species became prematurely extinct, focusing specifically on human encroachment and the illegal wildlife trade. Lastly, the lecture explained the rediscovery of animals thought extinct, as well as how scientists find and describe new species today.

Animal biodiversity, Part 2 (Prof. Schalk Louw, Department of Zoology and Entomology, UFS). Part 2 on the topic of animal biodiversity concentrated on Darwin's interest in insects, the enormous diversity and interaction of insects found on our planet, and on the concept of coevolution between plants and insects.

The genetic basis of evolution (Prof. Johan Spies, Department of Genetics, UFS). This lecture explained the

role of heredity in evolution and genetic variations, and provided numerous examples of how gene mutations resulted in genetic variations.

Natural selection (Prof. Paul Grobler, Department of Genetics, UFS). In this presentation, the genetic basis of natural selection and the processes involved were explained. The lecture also explained how natural selection influences our daily activities and our daily lives. The concept, survival of the fittest, was clarified in this presentation.

14 May 2009:

Human origins and dispersals: A Southern African perspective (Dr James Brink, Bloemfontein National Museum). This lecture discussed the origin of humans from Africa, with reference to the Neanderthal, the famous Florisbad human skull, and other hominid discoveries during the 20th century in Southern Africa. The presentation also dealt with the dispersal of the genus *Homo* to the rest of the continents around 1,8 million years ago.

4 June 2009:

Environmental history as revealed by plant fossil records (Prof. Louis Scott, Department of Plant Sciences, UFS). This lecture gave an overview of paleobotany, information on different plant fossils and how these data were used in explorations as well as in modern plant biomes, longterm climate patterns and as global warming predictions.

Plants: Adaptations and strategies for survival (Prof. Johann du Preez, Department of Plant Sciences, UFS). An overview of plant biodiversity, with detailed information on anatomical and morphological adaptations of a wide spectrum of plants species, was provided and explained. 13

DARWIN 200 | THE STORY OF LIFE AND SURVIVAL



Prof Johann du Preez presenting a lecture on plant biodiversity.

Evolutionary perspectives of crop production (Prof. Wijnand Swart, Department of Plant Sciences, UFS). The origin of agriculture 11 000 years ago, up to the impact and consequences of modern crops, was discussed. The presentation also included information on agriecosystems and on pesticide and herbicide resistance in modern agricultural practices.

30 July 2009:

Misapplying Darwin: Social Darwinism, demography and South African history, Part I (Dr Shirley Brooks, Department of Geography, UFS). Dr Brooks explained how Darwin's key idea of evolution by natural selection has been misapplied and misinterpreted by human societies, for example imperialism and conquests, where the "'lower races" deserved to be conquered, Hitler's Germany and the Holocaust, as well as population control programmes, specifically in South Africa from 1910–1939.

Misapplying Darwin: Social Darwinism, demography and South African history, Part 2 (Prof. Gustav Visser, Department of Geography, UFS). Prof. Visser provided concrete examples of how social Darwinism was misapplied, specifically in South Africa. The history of South Africa over the last 300 years was explained, including the early Settlers, the discovery of diamonds and gold, the Second World War, urbanisation, the period between 1950-1970, and the Apartheid era. The presentation ended with the current situation concerning social Darwinism, namely birth control and HIV/AIDS.

Man's rise to civilisation? (Dr Leon Jacobson, McGregor Museum, Kimberley). Man's development from hunter to farmer, civilisation and domestication were addressed in this presentation. Different aspects of evolution were applied, concentrating on the situation in central and Southern Africa, with examples from Zimbabwe and Venda. The presentation concluded with a discussion of the rock paintings made by primitive hunter-gatherers that challenge the modern ideas of civilised people.

20 August 2009:

Communication between different operational units in a reconfigurable manufacturing environment (Prof. Jorrie Jordaan, CUT). This presentation dealt with different types of communication and focused on the situation in an industrial environment where communication between humans and machines was an increasingly common

DARWIN 200 | THE STORY OF LIFE AND SURVIVA

Ms Mercia Coetzee (phoned Darwin) during the exhibition of The evolution of technology.

occurrence. The use of robots in the workplace was demonstrated at the hand of some of the technological developments from CUT.

Knowledge explosions: From then till now till ... (Prof. Jannie Swarts, Department of Chemistry, UFS). Using a 24-hour clock, this presentation summarised the ontogeny of Gaia, human development and technologies in relation to our energy consumption, scientific outputs and mobility. The lecture also showed how the rate of future scientific development would be linked directly to the rate at which behavioural, psychological and spiritual evolution took place.

The broadband universe (Prof. Pieter Meintjes, Department of Physics, UFS). This lecture provided a detailed summary of the history of the Universe and of modern ways of detecting solar planets. Prof. Meinties also explained what we could expect over the next few years concerning the exploration of the Universe, namely 2009-2059.

10 September 2009:

Human impact on the environment, Part 1 (Prof. Maitland Seaman, Centre for Environmental Management, UFS). This presentation tried to answer three questions: Are humans separate from the ecosystems in which we live? Is development purely a moral issue? Should we as humans be ashamed of what we do to our environment? The lecture also dealt with some of the issues that affect our environment, with the current world population and with some future predictions.

Human impact on the environment, Part 2 (Ms Marinda Avenant, Centre for Environmental Management, UFS). How to measure environmental changes and why we



should do it, as well as the ecological footprint concept were discussed in this presentation. The listeners were each challenged to establish their individual ecological footprint.

8 October 2009:

Evolution of pathogen micro-organisms (Dr Loekie Badenhorst, Department of Medical Microbiology, UFS). This lecture provided information on modern-day microorganisms associated with humans (viruses, bacteria and algae) and on the resistant hospital bacteria. The lecture illustrated the importance of antibiotics, how fast bacteria become resistant to antibiotics, how we have

created our own super-bugs, and how we currently need new antibiotics to treat old diseases.

Evolutionary innovations of animal parasites (Prof. Dawie Kok, ClinVet International, Bloemfontein). In this presentation, four main topics were addressed: 1) parasitism, 2) the co-evolution of parasites and hosts, 3) the evasion strategies; and 4) human intervention. All of these were explained using examples such as malaria, *Trypanosoma*, tapeworms, bilharzias, lice, fleas and ticks.

22 October 2009:

From genes to memes – architecture, evolution and beyond? (Ms Nina Maritz, Nina Maritz Architects, Namibia). The presentation dealt with the gender issue in a lighthearted way and how this influences the different ways in which men and women design and construct buildings. Architectural examples were provided to illustrate how contemporary fashions in design become memes in our societies. The scientific works of Charles Darwin, Stephan Jay Gould and Richard Dawkins were used to explain architecture and the way we live. The lecture concluded with ideas concerning environmentally eco-friendly sustainability and the way forward.

11 February 2010:

Trends in evolution and their bearing on the future of humankind, Part 1 (Prof. Bruce Rubidge, Bernard Price Institute for Paleontological Research, Wits). The presentation focused on the fossil record as it is found in South Africa, specially the Karoo, and provided a summary of the most important discoveries.

Trends in evolution and their bearing on the future of humankind, Part 2 (Prof. Terence McCarthy, Mineral Geochemistry, Wits). The presentation dealt with life on our planet and with the future of humans. Prof. McCarthy illustrated how our increased dependence on technology makes us more specialised, but illustrated from the fossil record that the more specialised a species becomes, the more vulnerable it is to extinction. Prof. McCarthy illustrated how climate change, volcanic hazards, asteroids and cosmic impacts, tsunamis, and the change in the Earth's magnetic field can cause global disruption, resulting in human extinction.

Culmination of the series: 150 years later; still controversial? (Prof. Jo van As, Department of Zoology and Entomology, UFS). Prof. Van As provided an overview of all the events of the Darwin 200 commemoration year. He also discussed the persistent resistance of many people to accept evolution, and referred to international studies concerning the public's understanding and acceptance of evolution.

Drama

As part of the series, the Department of Drama and Theatre Arts of the UFS presented the play, Don't shoot the messenger, written by Prof. Nico Luwes and performed by some of the postgraduate Drama students. In this allegorical drama, Charles Darwin is being confronted by the classical Greek character, Ancienti Academicus. Representing Western religion, Rei-Goius comes into serious conflict with Darwin. Everything changes dramatically when Incense reveals her Eastern theories on reincarnation and the origin of Earth. The oldest isolated population Original Aboriginal comes on board and upsets everybody with its theory on Dreamtime. As if this is not enough, Africa Nus also has a lot to say. The Harlequin manipulates all the characters with the main question: Can a religious person accept Darwin's theories? The final verdict is left to the audience.

DARWIN 200 | THE STORY OF LIFE AND SURVIVAI



Exhibitions at Bloemfontein National Museum

As part of the bicentennial birthday celebrations of Charles Darwin, the National Museum presented a special temporary exhibition, *Transitions and Extinctions*, from 4 May to 31 July 2009. The aim of this exhibit was to dispel common misconceptions or confusion regarding evolution and provide insight on the concept of deep time, fossilisation processes and the techniques used to date the age of the Earth. The exhibit also demonstrated macro-evolution by displaying specimens representing two transitional sequences, viz. the evolution of mammals, and blue and black wildebeest speciation, thus demonstrating that small changes over long periods lead to large overall changes in the bodies of organisms.

Also on display was a particularly special and exciting 3-metres-long fossil skeleton of *Erythrosuchus africanus*, an extinct reptile that lived about 245 million years ago in A 3-metres-long fossil skeleton of Erythrosuchus africanus, an extinct reptile that lived about 245 million years ago in the South African Karoo as part of the special temporary exhibition, Transitions and Extinctions, presented by the National Museum from 4 May to 31 July 2009.

the South African Karoo. This animal belonged to a group called archosaurs from which the first dinosaurs evolved. It is the only complete, articulated skeleton of this species ever found and will provide important information for the understanding of the early ancestors of dinosaurs. This fossil is now on display in the Palaeontology Hall. The exhibition was opened with a cocktail function during which Prof. Bruce Rubidge, Director of the Bernard Price



Learners attending an open day as part of the Darwin 200 programme.



The Darwin lecture events attracted large numbers of guests.



Prof. Matie Hoffman explaining the Big Bang and the origin of the Universe.

Institute for Palaeontological Research, and Chairperson of the Council of the National Museum, presented a talk entitled Since Darwin – the four billion-year existence of life; Southern Africa's role in understanding this remarkable story.

On average, between 250 and 300 guests attended each of the lecture events.

At the end of the series, Prof. Matie Hoffman invited all participants in the series to a special evening at the Boyden Observatory on 12 February 2010, where he entertained guests to a DVD on the Universe and afterwards invited guests outside to watch the stars and look at the planets through the telescope. All these lectures are available on a series of 10 DVDs of which the production was coordinated by Prof. Liesl van As and sponsored by the Dean of the Faculty of Natural and Agricultural Sciences. The series is also available on the webpage of the UFS.

Departments in the AGRICULTURAL SCIENCES



"The Agri-Business Bursary Scheme, which was launched at the 50th anniversary dinner of the department in 2009, has grown from strength to strength."

Prof. Johan Willemse

Department of Agricultural Economics

Overview

01

The objective of the Department of Agricultural Economics is to provide students in Agricultural Economics with the theoretical training, linked to current agricultural economics and marketing issues in Southern Africa as well as the world. Emphasis is also placed on management, strategic planning and analysis of markets. This has forged a strong relationship with the industry.

Dr Bennie Grové obtained his National Research Foundation (NRF) rating at the end of 2010, establishing him as a researcher in the department. Research articles published during 2010 include 14 articles in accredited journals, ten conference contributions and 70 popular publications. A number of projects resulted in peerreviewed scientific publications.



From the Department of Agricultural Economics are, from the left: Profs. Johan Willemse, Jan Groenewald, Rector and Vice-Chancellor, Prof. Jonathan Jansen, Prof. Giel Viljoen and Dr Wimpie Nell.

but wished them well in all their future endeavours.



Mr Dirk Strydom, recipient of the Protein Research Foundation's Prestige Award for the best Master's dissertation in 2010.

Special achievements

The University of the Free State (UFS) launched a new programme in 2010, namely The Vice-Chancellor's Prestige Scholarship Programme. This programme will provide an accelerated pathway to 25 young scholars in their development to the professoriate through intensive local and international mentorship, research support and academic training. A junior lecturer in our department, Mr Abiodun Ogundeji, was selected for this programme in the field of econometrics, as well as international trade and marketing. He is currently completing his Ph.D. in Agricultural Economics.

Mr Dirk Strydom, a Ph.D. student and lecturer in the department, excelled in his Master's degree in Agricultural Economics. His dissertation, entitled *The economic impact* of maize based ethanol production on the South African animal feed industry, was elected the best dissertation at the Joint 3rd Annual Conference of the African Association of Agricultural Economists (AAAE) and the 48th Annual Conference of the Agricultural Economics Association of

Bursary holders of the Agri-Business Bursary Scheme for 2010 are, from the left: Mss Funzani Sundani, Sharon Mogamisi, Marie Engelbrecht (department official), Mandisa Thembani, Nomalanga Mdungela, Mr Papi Moseki, Prof. Johan Willemse, Chairperson of the Department of Agricultural Economics and Mr Frikkie Maré.



South Africa (AEASA) that was held in Cape Town from 19-23 September 2010. The conference was attended by 14 students and staff members of the department. The UFS delegation presented four papers and three posters.

Mr Strydom also received the Protein Research Foundation's Prestige Award for the best Master's dissertation in 2010.

The Agri-Business Bursary Scheme, which was launched by Prof. Johan Willemse at the 50th anniversary dinner of the department during 2009, has grown from strength to strength. The first bursary holders for 2010 comprised of a group of eight students, ranging from third-year and final-year students to Honours as well as Master's degree students. A donation of R168 000 was received from John Deere during 2010 to assist students in the department with their class fees. The agricultural businesses that sponsored bursaries were Pioneer Foods, Silostrat, Corporate Guarantee and VKB. These bursaries have enabled the department to build strong relationships with the agricultural business sector and students.



Activities and achievements

Messrs Walter van Niekerk and Janus Henning attended an international Ph.D. Winter School with the theme *An institutional approach to the analysis of systems, systems change and transition in natural resources,* presented by the Institute for Agricultural and Fisheries Research (ILVO), in conjunction with the University of Ghent and the Wageningen University, in Belgium, from 1–4 February 2010.

Prof. Johan Willemse attended a Scenario Training Programme at the Saïd Business School, Oxford University in the United Kingdom, from 6–10 September 2010.

A total of 14 scientific publications were published during 2010. Assistant researchers and members of staff are regular writers in almost all the larger South African agricultural publications and daily newspapers, such as Landbouweekblad, GrainSA, SenWes, The Afrikaner, Jersey SA, Brangus Joernaal, Veeplaas, Beeld and



The guest speaker at one of the quarterly Agricultural Market Outlook Workshops was ABSA CEO, Ms Maria Ramos. From the left are: Prof. Johan Willemse, Ms Maria Ramos and Prof. Driekie Hay.

Rapport which, in total, account for 70 popular scientific publications during 2010.

The quarterly Agricultural Market Outlook Workshops have grown over the past five years with distinguished guest speakers participating such as Ms Maria Ramos, CEO of ABSA. These workshops are attended by between 100 and 120 commercial farmers and agri-business managers from all the provinces.

Two Safex Workshops were organised by Mr Dirk Strydom and Dr Kit le Clus at the UFS. Approximately 50 delegates attended, ranging from agri-business representatives, traders and farmers. The Safex Workshops have become an annual event and the demand for these workshops is increasing steadily.

Every year a mini-symposium is held in the Department of Agricultural Economics, where final-year students have the opportunity to present a paper on a topic of their choice. The aim of this symposium is to equip students with the professional skills necessary to present their work to an audience of peers as well as practise their writing skills. During the 2010 symposium, 12 students participated, of which four were upgraded papers. Out of the upgraded paper session three prize-winners were selected based on their presentations. The prize-winners were Messrs Regardt Strauss, Thian Swanepoel and Willie Britz. Standard Bank was the main sponsor of the symposium.

The department is also involved in a number of research projects for agri-business, regular presentations on Agricultural Economics, as well as strategic planning sessions for agri-business and industry bodies.

Community service

The department is the founder and main driver of the South African Foundation of Economic and Financial Education (SAFEFE), which focuses on economic literacy training in schools, including the launch of an Economic Olympiad in schools. The number of school learners that took part in the olympiad was 2 459, while 104 405 school learners received economic/financial literacy training. Staff members are also involved in training the trainer programme, as well as an international training course with the United States-based Council for Economic Education.

The Centre of Excellence in the department focuses on micro-partnerships, with the objective of capacity building. Sustainability of projects on the one hand, and sustainability of districts on the other hand, cannot be achieved without proper partnerships. The services of Mama Africa were acquired, based on their skills and experience. Mama Africa was contracted by the Centre of Excellence for the Mashaeng Poultry Initiative to assist the members of Mashaeng to implement their action plans in order to improve their business. The contribution by the Dihlabeng Local Municipality in terms of a cash injection has to be acknowledged and commended, as well as the advisory services provided by the Department of Agriculture in Thabo Mofutsanyane. The partnership that was created for the Mashaeng Poultry Initiative is a model that can be used for other districts. It illustrated how the university, departments, municipalities and the private sector can achieve success when they collaborate and work together for the development of agriculture in the province.

At the Mashaeng Poultry Project the objectives are:

- Building the capacity of the members
- Development of the business as a whole
- Refining the following skills:
 - Financial skills
 - Technical skills
 - Slaughtering
 - Marketing
 - General and specific project management
 - Enterprise development
 - Other agri-business-related skills

All the discussions with the people of Mashaeng as well as the Mama Africa members were entirely in line with the principles of The South African Excellence Model of the Department of Agriculture, Forestry and Fisheries (DAFF). The 11 objectives of this model are:

- Leadership development
- Business planning
- Customer and market planning
- People management
- Resource management
- General processes

- Impact of society
- Customer satisfaction
- People satisfaction
- Suppliers and partnership development
- Results/profit

It is important to align the above objectives with the principles underpinning the government's Economic and Multi-purpose Development Scheme. Linking the First Economy with even the Fourth Economy is also in line with the principles underpinning the government's National Growth Programme and Action Research.

In view of the above, we will work with enterprises that will create more and meaningful green jobs in future. According to the International Labour Organisation, UN Environment Programme (ILO/UNEP), green jobs are "work in agricultural, manufacturing, research and development (R&D), administrative and service activities that contribute substantially to preserving or restoring environmental quality". According to the ILO/UNEP, green jobs have the potential to create decent work for large numbers of people in the sector.



researchOUTPUTS Agricultural Economics

Research articles

Alemu, Z.G. & Ogundeji, A.A. 2010. Price transmission in the South African food market. *Agrekon* 49(4): 433-445.

Grové, B. & Oosthuizen, L.K. 2010. Stochastic efficiency analysis of deficit irrigation with standard risk aversion. *Agricultural Water Management* 97(6): 792–800.

Jordaan, H. & Grové, B. 2010. Factors affecting forward pricing behaviour: Implications of alternative regression model specifications. South African Journal of Economic and Management Sciences (SAJEMS) 13(2): 113-129.

Maine, N., Lowenberg-De Boer, J., Nell, W.T. & Alemu, Z.G. 2010. Impact of variable-rate application of nitrogen on yield and profit: A case study from South Africa. *Precision Agriculture* 11(5): 448-463.

Matthews, N., Grové, B., Barnard, J.H. & Van Rensburg, L.D. 2010. Modelling the economic tradeoffs between allocating water for crop production or leaching for salinity management. *Water SA* 36(1): 37-44.

Mmbengwa, V.M., Groenewald, J.A. & Van Schalkwyk, H.D. 2010. Critical assessment of the performance and sustainability of Land Bank customers among emerging farmers in South Africa. African Journal of Business Management 4(13): 2753-2762.

Monk, M.J., Jordaan, H. & Grové, B. 2010. Factors affecting the price volatility of July futures contracts for white maize in South Africa. *Agrekon* 49(4): 446-458. Ogundeji, A.A., Uchezuba, D.I. & Jooste, A. 2010. Econometric estimation of Armington Elasticities for selected agricultural products in South Africa. South African Journal of Economic and Management Sciences (SAJEMS) 13(2): 123-134.

Strydom, D.B., Taljaard, P.R. & Willemse, B.J. 2010. Ethanol blending policies and the South African animal feed industry. *Agrekon* 49(2): 255-265.

Strydom, D.B., Meyer, F., Taljaard, P.R. & Willemse, B.J. 2010. The economic impact of maize-based ethanol production on the South African animal feed industry. *Agrekon* 49(2): 255-265.

Strydom, D.B., Taljaard, P.R. & Willemse, B.J. 2010. Ethanol blending policies and the South African animal feed industry. *Agrekon* 49(3): 267-292.

Tanko, L., Jirgi, A.J. & Ogundeji, A.A. 2010. Impact of Fadama II project on income of tomato farmers in Niger State, Nigeria. African Journal of Agricultural Research 5(15): 1937-1942.

Teweldemedhin, M.Y. & Van Schalkwyk, H.D. 2010. Regional trade agreements and its impact on trade flows for South African agricultural products. Journal of Development and Agricultural Economics 2(5): 157-165.

Teweldemedhin, M.Y. & Van Schalkwyk, H.D. 2010. The international trade prospective of agriculture sector in South African. Journal of Development and Agricultural Economics 2(8): 281-292.

Conference contributions

Hanekom, J.W. & Willemse, B.J. 2010. Structure, conduct and performance in the South African potato processing industry. Paper delivered at the Joint 3rd Annual Conference of the African Association of Agricultural Economists (AAAE) and the 48th International Annual Conference of the Agricultural Economics Association of South Africa (AEASA): Africa and the Global Food and Financial Crises, The Westin Grand Cape Town Arabella Quays, Cape Town, South Africa. 19-23 September.

Henning, J.I.F., Maré, F.A. & Willemse, B.J. 2010. Profitability analysis of different reproduction methods with Dohne Merinos. Poster presented at the Joint 3rd Annual Conference of the African Association of Agricultural Economists (AAAE) and the 48th International Annual Conference of the Agricultural Economics Association of South Africa (AEASA): Africa and the Global Food and Financial Crises, The Westin Grand Cape Town Arabella Quays, Cape Town, South Africa. 19-23 September.

Jirgi, A.J. & Viljoen, M.F. 2010. Resource use efficiency of millet/ cowpea intercropping in Niger state, Nigeria. Poster presented at the Joint 3rd Annual Conference of the African Association of Agricultural Economists (AAAE) and the 48th International Annual Conference of the Agricultural Economics Association of South Africa (AEASA): Africa and the Global Food and Financial Crises, The Westin Grand Cape Town Arabella Quays, Cape Town, South Africa. 19–23 September. Jordaan, H. & Grové, B. 2010. Analysis of the governance structure used by Eksteenskuil raisin producers: Is there a need for more vertical coordination? Paper delivered at the Joint 3rd Annual Conference of the African Association of Agricultural Economists (AAAE) and the 48th International Annual Conference of the Agricultural Economics Association of South Africa (AEASA): Africa and the Global Food and Financial Crises, The Westin Grand Cape Town Arabella Quays, Cape Town, South Africa. 19-23 September.

Khaile, P.M.E., Jordaan, H., Matthews, N. & Grové, B. 2010. Investigating factors causing inefficient use of resources: The case of emerging raisin producers at Eksteenskuil. Paper delivered at the International Commission on Irrigation and Drainage (ICID) Symposium: Efficient Water Use for Food Production, Desert Palace Hotel and Casino Resort, Upington, South Africa. 16-18 November.

Maré, F.A., Nell, W.T. & Willemse, B.J. 2010. Maize prices in South Africa: Can the producer increase his revenue by marketing grain through cattle? Paper delivered at the Joint 3rd Annual Conference of the African

Association of Agricultural Economists

(AAAE) and the 48th International Annual Conference of the Agricultural Economics Association of South Africa (AEASA): Africa and the Global Food and Financial Crises, The Westin Grand Cape Town Arabella Quays, Cape Town, South Africa. 19–23 September.

Matthews, N. & Grové, B. 2010. The environmental impact of risk efficient fertilisation rates. Paper delivered at the International Commission on Irrigation and Drainage (ICID) Symposium: Efficient Water Use for Food Production, Desert Palace Hotel and Casino Resort, Upington, South Africa. 16-18 November.

Mompati, B. & Viljoen, M.F. 2010. Enhancing food and livelihood security in the context of the food and financial crises: Challenges and opportunities for small scale rainwater harvesting and conservation. Paper delivered at the Joint 3rd Annual Conference of the African Association of Agricultural Economists (AAAE) and the 48th International Annual Conference of the Agricultural Economics Association of South Africa (AEASA): Africa and the Global Food and Financial Crises. The Westin Grand Cape Town Arabella Quays, Cape Town, South Africa. 19-23 September.

Strydom, D.B. & Grové, B. 2010. Stochastic efficiency analysis of alternative basic maize marketing strategies. Poster presented at the Joint 3rd Annual Conference of the African Association of Agricultural Economists (AAAE) and the 48th International Annual Conference of the Agricultural Economics Association of South Africa (AEASA): Africa and the Global Food and Financial Crises, The Westin Grand Cape Town Arabella Quays, Cape Town, South Africa. 19-23 September.

Shiimi, T., Taljaard, P.R. & Jordaan,

H. 2010. Transaction costs and cattle farmers' choice of marketing channels in North-Central Namibia. Paper delivered at the Joint 3rd Annual Conference of the African Association of Agricultural Economists (AAAE) and the 48th International Annual Conference of the Agricultural Economics Association of South Africa (AEASA): Africa and the Global Food and Financial Crises, The Westin Grand Cape Town Arabella Quays, Cape Town, South Africa. 19-23 September.

Academic staff

Professors:

Profs. Johan Willemse, Klopper Oosthuizen, Giel Viljoen

Professor Extraordinary: Dr Kit le Clus

Associate Professors: Profs. André Jooste, Zerihun Alemu Senior Lecturers: Drs Bennie Grové, Godfrey Kundhlande

Lecturers:

Messrs Henry Jordaan, Dirk Strydom, Frikkie Maré, Abiodun Ogundeji, Petso Mokhatla and Mss Lize Terblanche, Nicky Matthews

Contact details

Prof. Johan Willemse

Faculty of Natural and Agricultural Sciences Department of Agricultural Economics University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone: Fax: E-mail: Website: +27 (0)51 401 2824/3864 +27 (0)51 401 3473 willemsebj@ufs.ac.za www.ufs.ac.za/agri-econ 27

"Approximately 75% of the agricultural land in South Africa is not arable and can only be utilised efficiently by sustainable livestock and wildlife production."

Prof. Johan Greyling

02

Department of Animal, Wildlife and Grassland Sciences



Overview

The Department of Animal, Wildlife and Grassland Sciences is the largest and most specialised tertiary animal production unit serving the agricultural community in South Africa. During 2010, it once again contributed significantly to the agricultural industry in Southern Africa. By focusing on the different disciplines within the department, namely Animal Breeding, Animal Nutrition, Animal Physiology, Grassland Science and Wildlife Management, new knowledge was generated and technologies developed. Our quest is to optimise the production efficiency in production systems, ranging from intensive to extensive, and from communal to small-scale and large, commercial livestock enterprises.

The main objectives of the department are capacity building through the effective transfer of knowledge and skills, performing research into efficient and economical animal production in order to supply animal products of high quality, taking into account public health and the protection of our natural resources, while also rendering community service.

In 2010, nine B.Sc. Honours students, ten M.Sc. students and two Ph.D. students attained their postgraduate degrees in the different disciplines of the Department of Animal, Wildlife and Grassland Sciences. This is indicative of the research focus and orientation of the lecturers in the department. Limited time and funding remain our biggest challenge in our efforts to balance teaching, research and community service. Notwithstanding this, the Department of Animal, Wildlife and Grassland Sciences is the largest and most specialised animal production unit in Southern Africa, something the University of the Free State (UFS) is truly proud of. The department's products (undergraduate and postgraduate students) are our pride. The postgraduate students come from all over Africa and are therefore the department's export product, thus making excellence and quality non-negotiable.

Special achievements

Prof. Frikkie Neser was nominated as the Free State Agriculturist of the Year, certainly one of the highlights of the department in 2010. He is actively involved with the stud cattle breed societies in addressing breed value estimations (EBVs), while also evaluating the correlations between certain traits and the performance of animals. Together with Prof. Japie van Wyk, he is also involved with assessing genotype x environment interactions and the advantages of cross breeding in sheep and cattle. The Academy of Sciences for the Developing World, formerly known as the Third World Academy of Science (TWAS), awarded the TWAS Prize for Young Scientists to Ms Puleng Matebesi, Ph.D. student in Animal Breeding. This is a national award made annually to young scientists who have made outstanding contributions in scientific research within specific developing countries. This annual award is given to an outstanding researcher under the age of forty, living and working in South Africa, who is evaluated on the criteria of research excellence, the potential value of the research to society, the success of the candidate in the development of students and his or her success in contributing to the public understanding of science and technology.



Ms Puleng Matebesi (Ph.D. student in Animal Breeding) receiving the National Young Scientist Award of the Third World Academy for Science (TWAS) from the Minister of Science and Technology.

National and international collaboration

The contribution of the department towards increasingly efficient, sustainable and economical animal production and wildlife management in Southern Africa is reflected in the scientific contributions made locally and abroad, together with networking and collaboration with national and international institutions. This has also been complemented by interdisciplinary collaboration within the department, as well as between departments of the UFS and other governmental and private institutions.

From the 2010 research outputs of the Department of Animal, Wildlife and Grassland Sciences, it is evident that structured, focused research themes on various farm and wildlife species in the different disciplines were followed. With limited funds remaining a restricting factor, every new project is a challenge in terms of running costs, the acquisition of research facilities and the provision of postgraduate bursaries to students. Currently the National Research Foundation (NRF) is still the main institution supporting livestock research, if certain prerequisites are met. In terms of the private sector, additional funds and other contributions in the form of data, research facilities and products have been received from Supreme Chickens, Nutrifeeds, Meadow Feeds, the National Wool Growers' Association, Voermol Feeds, Pfizer Veterinary Supplies, Rhine Ruhr (Foss Instruments), Cape Mohair and Wool, the National Lucerne Organisation, Ramsem Artificial Insemination (AI) Station, Taurus AI Station, the Agricultural Research Council (ARC), SA Studbook and a number of livestock breed societies. This collaboration between the department and the industry is noteworthy as it underlines the department's focus on marketorientated research. Currently there are four Professors

Extraordinary (from locally and abroad) affiliated with the department, namely Profs. Amie Aucamp (Grassland Science), Gert Erasmus (Animal Breeding), James Hayes (Poultry Science) and Michiel Scholtz (Animal Breeding). This is indicative of the status that the department enjoys internationally.

During May 2010, four individuals, including Prof. HO de Waal, were invited to visit five states in the United States of America (USA) to gain firsthand information regarding predation management in the USA. The aim of the twoweek visit was to experience firsthand how the Wildlife Services and other role players cooperate and operate in the USA to manage the impact of predation. In the USA the coyotes (*Canis latrans*) cause huge damage to sheep, goats, cattle and wildlife. This corresponds with the damage caused by black-backed jackals (*Canis mesomelas*) in South Africa.



The South African contingent at the entrance to the Wildlife Services Predator Field Station outside Logan, Utah in the USA

The same basic non-lethal and lethal methods are used in both countries to reduce the impact of predation by coyote and black-backed jackals. There are, however, important differences in the approach followed in the USA. Farmers are allowed to control the coyotes, but are also officially supported by government agencies. These officials are specialists in the control of predators, but are still commonly referred to as "trappers" by the public. A process is underway in South Africa (with Prof. HO de Waal involved) to develop a system of coordinated predation management.

Research

Some of the research highlights of the Department of Animal, Wildlife and Grassland Sciences for 2010 include the following:

In the **Animal Nutrition** discipline, sundried cactus pear (*Opuntia ficus-indica*) cladodes in animal diets for broader application in the arid western parts of Southern Africa were researched. Here, the basic characteristics of the *Opuntia*, and establishing its potential use as an animal feed have been the field of study by three M.Sc. students. This study has been extended to Namibia, where progress is being made to commercialise *Opuntia* in balanced feedlot diets for sheep. There is wide interest and national recognition for the work done in this regard under the study leadership of Prof. HO de Waal.

Various research projects, in collaboration with the poultry and commercial feed manufacturing industry, were conducted during the past year. The department and, more specifically, Messrs Foch de Witt and Ockert Einkamerer, played an important role in the biological evaluation of nutritional supplementation on the performance of new poultry genotypes. The efficiency of supplementary enzymes such as phytase and xylanase, as well as different dietary energy densities has been evaluated.





A lamb fitted with a faeces collection bag in a nutrition trial.

Additionally, the department's Animal Nutrition discipline has assisted feed producers with the evaluation and improvement of certain standard broiler diets. Postgraduate research in respect of poultry nutrition at M.Sc. and Ph.D. levels currently focuses on production improvement and product development by utilising dietary lipid sources with omega-3, omega-6 and omega-9 characteristics. The effects of these different fatty acids on egg and broiler meat production, as well as product enrichment are being determined. These interactions between dietary lipid sources and the calcium metabolism in layers are being investigated in an attempt to decrease the number of cracked eggshells found in practice. Furthermore, the effect of maternal nutrient intake on semen cryopreservation and the hatchability of the eggs are also currently being investigated.

Also in the field of Animal Nutrition, two M.Sc. research projects on SA Mutton Merino lambs have been conducted, focusing on the improvement of the fat quality of the final product (lamb carcass) by means of



Grassland Science students participating in a veld evaluation practical session.



Grassland Science final-year students on tour to the Karoo.

dietary manipulation. Both studies contained treatments consisting of a basic diet, but differed in terms of the saturation rate (saturated and/or unsaturated) of the fat (oil) added to the diets. A natural antioxidant was added to the respective diets to see if it affected the unsaturated fatty acids in the adipose (fat) tissue of the carcasses. The final product should result in healthier red meat for the consumer, along with an increased shelf life due to the positive effects of the natural antioxidant. In a second study, increasing the concentration of the unsaturated fatty acid content in the adipose tissue of the lamb carcass was evaluated using an ionophore inclusion to try and manipulate the bio-hydrogenation (metabolic functions) in the rumen. Some of the results are very promising.

Much progress has been made by Prof. Hentie van der Merwe and Dr Gerrie Scholtz in the development of a lucerne grading system, whereby producers are rewarded based on the quality, especially protein content, of the SA Mediago Sativa hay (lucerne) produced. There is a direct correlation with this and, amongst others, the milk yield of dairy cows.

In the discipline of **Wildlife Management**, a Ph.D. study entitled A plant-based study of the feeding ecology of introduced herbivore game species in the central Free State, by Ms Beanelri Janecke and supervised by Prof. Nico Smit, was completed at the end of 2010. During this research project, the habitat preferences, seasonal movements and spatial utilisation of the vegetation by introduced herbivore game species on a game ranch in the central Free State were monitored. The complex interactions between these game species and a highly variable environment were successfully analysed. The results of this study provide recommendations regarding the correct approach to the introduction of herbivore game species on fenced game ranches with limited natural resources. The development of a GIS-based decision support system as one of the outcomes of the study not only resulted in a unique study of significant academic importance, but will also contribute to the practical application of a more scientific approach to game-ranch management in the central Free State.

The discipline of **Grassland Science**, under the guidance of Prof. Hennie Snyman, is conducting an in-depth study regarding "Slangbos" or "Bankrotbos" (*Seriphium Plumosum*), which is an aggressive, invasive plant in the grassland parts of the country with a rainfall of higher than 600 mm per annum. The bush is capable of decreasing the production potential of the grass component and thus the grazing capacity of the veld, which ultimately affects the number of animals the veld can maintain, with obvious economical implications. Apart from the fact that this problem has been identified, Prof. Snyman has done research to monitor the dynamics of this plant. Data generated have already led to the control and eradication of the plant.

Under the supervision of Prof. Hennie Snyman, Mr Paul Malan is conducting a study to evaluate the water use and production potential of certain Karoo shrubs – all in an effort to assess the grazing capacity of these shrubs for sheep.

Factors affecting the fertility in farm animals, e.g. nutrition, season, age, parity, breed, stage of lactation, etc., are the focus areas of **Animal Physiology** when investigating artificial reproduction techniques (ARTs)



and the quest for optimal reproduction efficiency in all farm species. For example, Mr Benedict Raito has made progress regarding in-vitro embryo production in sheep and cattle. The techniques of AI and controlled breeding (sheep and cattle) and factors contributing to the improvement of conception rates are being investigated by Prof. Johan Greyling and Dr Luis Schwalbach.

Mr Mike Fair is concluding a study for his Ph.D. thesis in which the genetic and environmental modelling of female ostriches is being investigated.

A new research focus area in the department is artificial breeding in poultry and the cryopreservation of semen.

Community service

The Department of Animal, Wildlife and Grassland Sciences has again made its mark as far as community service is concerned. This was done in the form of lectures at farmers' days, providing animal production advice, involvement in government projects and projects from the industry and serving on editorial boards of scientific journals. All staff members were involved.

An in-depth research project was undertaken in Lesotho, in collaboration with the Centre for Environmental Management and the Departments of Plant Sciences and Soil, Crop and Climate Sciences. From our department, Prof. Nico Smit and Mr Gideon Janse van Rensburg were involved. The results of this project were presented at two national congresses. This multi-million rand wetlands restoration and conservation project was initiated with the intention to help Lesotho address the widespread overgrazing and degradation of the alpine wetlands and the neighbouring areas. The aim of the project is to support the Government of Lesotho's National Poverty Reduction Strategy, by identifying means of enhancing rural livelihoods through improved watershed management.

The Nguni Project in the Northern Cape under the supervision of Prof. HO de Waal, assisted by Dr Luis Schwalbach and Mr Willie Combrinck, is still one of the community service flagships of the department. More than 100 individuals in the Northern Cape are currently benefitting from this project. This project, funded by the Industrial Development Corporation (IDC), received national recognition in terms of the rural upliftment of the rural poor communities. Approximately 400 Nguni cattle are involved in the project. However, the expansion of this project to the Free State Province has not progressed as fast as the project leader had hoped. With this project, the UFS, the Department of Agriculture and the IDC have formed a strong bond and have succeeded in empowering several selected black livestock farmers.

Cattle and sheep AI courses were presented to students and farmers in conjunction with the Glen Agricultural Development Institute. Here Prof. Johan Greyling, Dr Luis Schwalbach and Mr Thapelo Makae were involved. These courses received national recognition and we continue to receive enquiries regarding the courses. Similarly, Prof. Hentie van der Merwe and Dr Gerrie Scholtz (postdoctoral) have also presented courses in Cradock regarding the grading of lucerne.



Participants of a sheep AI course performing a practical exercise.

Staff actively involved in a sheep AI course.

The Animal Breeding section again held an annual workshop to discuss and assess this discipline. Here Profs. Japie van Wyk, Frikkie Neser and Mr Mike Fair, as part of the department's postgraduate school for Animal Breeding, played a leading role. This meeting is attended by people from the industry, other tertiary institutions and the Department of Agriculture.

Furthermore, members of the department were involved in the judging of national competitions, e.g. the National Black and White Stud Farmer of the Year (Prof. Frikkie Neser), the Voermol Sheep and Cattle Farmer of the Year (Profs. Johan Greyling and Hennie Snyman) and the National Commercial Black Farmer of the Year (Prof. Hentie van der Merwe), a New Harvest Project. This is a reflection of the recognition by industry of the quality of the department's staff, but also an advertisement for the department and the UFS. Several of our academic staff members are also serving on advisory boards for journals, besides serving on the editorial boards of national and international research journals, while being actively involved in the reviewing of manuscripts for these journals.

Staff matters

Prof. Hentie van der Merwe from Animal Nutrition retired at the end of 2010 after almost 30 years' service at the UFS. His departure leaves a vacuum, with regard to not only his expertise and knowledge, but also his experience and the capacity that he has generated over the years. His retirement is a loss, not only to the department, but also to the university.



Members of the department acting as judges during the 2010 Voermol National Sheep Farmer of the Year competition.

research OUTPUTS

Research articles

Crook, B., Neser, F.W.C. & Bradfield, M. 2010. Genetic parameters for cow weight at calving and at calf weaning in South African Simmental cattle. *South African Journal of Animal Science* 40(2): 140-144.

Foster, L., Fourie, P. & Neser, F.W.C. 2010. Differences in physical traits such as coat score and hide thickness together with tick burdens and body condition score in four beef breeds in the Southern Free State. *South African Journal of Animal Science* (Submitted).

Greyling, J.P.C. & Schwalbach, L.M.J. 2010. Liggaamskondisietelling as 'n hulpmiddel by vleisbeesboerdery (Body condition score as a resource in beef cattle farming). *Ons Eie* 45(4): 74-78.

Greyling, J.P.C. 2010. Reproduksiebestuur by vleisbeeste - 'n Presisiebestuursbenadering (Reproduction management in beef cattle - a precision management approach). Ons Eie 45(4): 62–65.

Kebede, S.A., Van Wyk, J.B. & Olivier,

J. 2010. Estimation of genetic and phenotypic parameters of growth curve and their relationship with early growth and productivity in Horro sheep. Archiv Fur Tierzucht-Archives of Animal Breeding 53(1): 85-94.

Lehloenya, K.C. & Greyling, J.P.C. 2010. Boer goat offspring born following transfer of cryopreserved embryos (Abstracts). *Reproduction Fertility and Development* 22(1): 207–208.

Lehloenya, K.C. & Greyling, J.P.C. 2010. Embryo transfer using cryopreserved Boer goat blastocysts. South African Journal of Animal Science 40(5): 446.

Lehloenya, K.C. & Greyling, J.P.C. 2010. The effect of embryo donor age and parity on the superovulatory response in Boer goat does. *South African Journal of Animal Science* 40(1): 65-69.

Lehloenya, K.C. & Greyling, J.P.C. 2010. The ovarian response and embryo recovery rate in Boer goat does following different superovulation protocols, during the breeding season. *Small Ruminant Research* 88: 38-43.

Menezes, C., Schwalbach, L.M.J., Combrinck, W.J., Fair, M.D. & De Waal, H.O. 2010. Effects of sun-dried Opuntia ficus-indica on feed and water intake and excretion of urine and faeces by Dorper sheep. *South African Journal of Animal Science* 40(5): 491-491.

Nkosi, B., Meeske, R., Van der Merwe, H.J. & Groenewald, I.B. 2010. Effects of homofermentative and heterofermentative bacterial silage inoculants on potato hash silage fermentation and digestibility in rams. *Animal Feed Science and Technology* 157: 195-200.

Nkosi, B., Meeske, R., Van der Merwe, H.J., Acheampong-Boateng, O. & Langa, T. 2010. Effects of dietary replacement of maize grain with popcorn waste products on nutrient digestibility and performance by lambs. South African Journal of Animal Science 40(2): 133-139.

Scholtz, A., Cloete, S., Van Wyk, J.B. & Van der Linde, T.C.D.K. 2010. The assessment of crystals derived from Aloe spp. for potential use as an herbal anthelmintic thereby indirectly controlling blowfly strike. *South African Journal of Animal Science* 40(1): 476-476.

Scholtz, A., Cloete, S., Van Wyk, J.B., Kruger, A. & Van der Linde, T.C.D.K. 2010. Influence of divergent selection for reproduction on the occurrence of breech strike in mature Merino ewes. *Animal Production Science* 50(3): 203–209.

Scholtz, A., Cloete, S., Van Wyk, J.B., Misztal, I., Du Toit, E. & Van der Linde, T.C.D.K. 2010. Genetic (co) variances between wrinkle score and absence of breech strike in mulesed and unmulesed Merino sheep, using a threshold model. *Animal Production Science* 50(3): 210–218.

Snyman, H.A. 2010. Allelopathic potential, seed ecology and germination of the encroacher shrub Seriphium plumosum. *African Journal of Range and Forage Science* 27(1): 29–37.

Snyman, H.A. 2010. Slangbosbeheer: Begin by kennis oor saadontkieming en saailingvestiging. *Ons Eie* 45(1): 53–57.

Snyman, H.A. 2010. Suksesvolle rooigrasvestiging om natuurlike weiveld te verbeter. *Ons Eie* 45(2): 58-59.

Snyman, H.A. 2010. Weiveldagteruitgang belemmer saadbank in die grond. *Afgriland* 54(2): 12-14.

Van Niekerk, M. & Neser, F.W.C. 2010. Belangrike faktore om in gedagte te hou tydens seleksie (Important factors
to keep in mind during selection). Simbra Journal: 34-44.

Van Niekerk, M. & Neser, F.W.C. 2010. Doeltreffende seleksie vir meer produktiewe (doeltreffende) beeste (Effective selection for more productive (effective) cattle). *Nguni Journal*: 31-39.

Van Niekerk, M. & Neser, F.W.C. 2010. Gebruik van teelwaardes tydens seleksie (Use of breeding values during selection). *Simbra Journal:* 46-55.

Van Pletzen, H. & Greyling, J.P.C. 2010. Reproduksie bepaal doeltreffendheid van voerverbruik (Reproduction determines the efficiency of feed usage). *Hereford Journal*: 38-40.

Chapters in books

Greyling, J.P.C. 2010. Applied reproductive physiology. In: Goat Science and Production, edited by S. Solaiman. New Jersey, USA: Wiley-Blackwell. pp. 139-155.

Jeltsch, F., Blaum, N. & Smit, G.N. 2010. Impacts of landuse and climate change on the dynamics and biodiversity in the Thornbush Savanna Biome. In: *Biodiversity in southern Africa (Volume 3: Implications for landuse and management)*, edited by M. Hoffman, U. Schmiedel & N. Jürgens. Namibia, Windhoek: Klaus Hess Publishers. pp. 34–74.

Smit, G.N. & Zimmerman, I. 2010. Impact of landuse at landscape scale, using fenceline contrasts and a bestpractice case study. In: *Biodiversity in southern Africa (Volume 2: Patterns and processes at regional scale)*, edited by M. Hoffman, U. Schmiedel & N. Jürgens. Namibia, Windhoek: Klaus Hess Publishers. pp. 214–221.

Reports

Smit, G.N. & Janse van Rensburg,
G. 2010. Baseline rangeland survey of the catchments in the Lets'en-la-Letsie, Khalong-la-lithunya and Koti-Sephola areas of Lesotho. Report

to the Department of Agriculture, Lesotho.

Smit, G.N., Janse van Rensburg, G. & Deacon, F. 2010. Ecological planning of the Mushavi Game Ranch, district Douglas. Report to Mushavi Game Ranch, Douglas, Northern Cape, South Africa.

Conference contributions

Banga, C., Neser, F.W.C., Van der Westhuizen, J. & Garrick, D. 2010. Economic value of live weight in South African dairy cattle. Proceedings of the 9th World Congress on Genetics Applied to Livestock Production (WCGULP2010), Leipzig, Germany. 1-6 August. pp. 203.

De Waal, H.O., Schwalbach, L.M.J., Combrinck, W.J. & Shiningavamwe, K.L. 2010. Commercialisation of sun-dried cactus pear (Opuntia ficusindica) cladodes in feedlot diets for Dorper wether lambs. Paper delivered at the VIIth International Congress on Cactus Pear and Cochineal and the VIIth General Meeting of the FAOICARDA International Technical Cooperation Network on Cactus Pear and Cochineal, Agadir, Morocco. 17-22 October.

Deacon, F., Avenant, N.L. & Barker,

C.H. 2010. Spatial ecology of damage causing by black-backed (Canis mesomelas) in the southern Free State. Poster presented at the Southern African Wildlife Management Association (SAWMA) 40th Anniversary Symposium: Biodiversity Conservation in a Changing World, Buffelspoort, South Africa. 19-22 September.

Fair, M.D., Van Wyk, J.B., Cloete, S. & Gilmour, A. 2010. Modelling egg production of ostrich females over years using random regression models. Proceedings of the 9th World Congress on Genetics Applied to Livestock Production (WCGULP2010), Leipzig, Germany. 1–6 August. pp. 215. Hugo, A., Ferreira, J., Liebenberg, B., Bothma, C., Els, S., De Witt, F. & Van der Merwe, H.J. 2010. Effect of dietary lipid source on fatty acid profile, lipid oxidation and sensory acceptability of broiler breast meat. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22–26 August.

Janecke, B.B., Smit, G.N. & Barker,

C.H. 2010. Spatial and temporal variation in habitat use of some herbivore game species in a small fenced property, central Free State. Paper delivered at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19–23 July.

Joubert, D.F. & Smit, G.N. 2010. The respective roles of competition, browsing and fire in Acacia mellifera establishment events in Namibia. Paper delivered at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19–23 July.

Joubert, D.F., Smit, G.N. & Luck-

Vogel, M. 2010. Patterns of bush encroachment over half a century in Namibia (1958 to 2007): A preliminary study based on aerial photography analysis. Poster presented at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19-23 July.

Lehloenya, K.C. & Greyling, J.P.C. 2010. Boer goat embryos born following transfer of cryopreserved embryos. Paper delivered at the 36th Annual Conference of the International Embryo Transfer Society (IETS) and the 23th Annual Meeting of the Brazilian AGRICULTURAL SCIENCES | DEPARTMENT OF ANIMAL, WILDLIFE AND GRASSLAND SCIENCES

Embryo Technology Society (SBTE), Cordoba, Argentina. 9-12 January.

Malan, P.J. & Snyman, H.A. 2010. Seed production and germination of Pentzia incana following water stress. Poster presented at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19–23 July.

Menezes, C., Schwalbach, L.M.J., De Waal, H.O. & Combrinck, W.J. 2010.

Effects of sun-dried cactus pear (Opuntia ficus-indica) cladodes on feed and water intake and excretion of urine and faeces by Dorper wethers. Paper delivered at the VIIth International Congress on Cactus Pear and Cochineal and the VIIth General Meeting of the FAOICARDA International Technical Cooperation Network on Cactus Pear and Cochineal, Agadir, Morocco. 17-22 October.

Neser, F.W.C., Van Wyk, J.B., Fair, M.D., Lubout, P. & Crook, B. 2010. Estimation of genetic parameters for growth traits in Brangus cattle. Proceedings of the 9th World Congress on Genetics Applied to Livestock Production (WCGULP2010), Leipzig, Germany. 1-6 August.

Nkosi, B., Meeske, R., Van der Merwe, H.J. & Groenewald, I.B.

2010. The effect of Lalsil Fresh LB on the fermentation quality and digestibility of a potato hash silage diet in rams. Paper delivered at the XVth International Silage Conference, Madison, Wisconsin, USA. 27-29 July.

Pienaar, F.C. & Smit, G.N. 2010. An evaluation of the effectiveness of mechanical bush thinning in Marakele Park, Limpopo Province. Paper delivered at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19-23 July.

Pienaar, F.C. & Smit, G.N. 2010. The influence of tree thinning on grass dry matter yield, with and without grazing by herbivore game species in the Marele e Park, South Africa. Poster presented at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19–23 July.

Smit, G.N. & Cloete, J.P. 2010. *Re*encroachment of woody plants on plots thinned to different tree densities in Mixed Bushveld. Paper delivered at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19-23 July.

Smit, G.N. & Janse van Rensburg, G. 2010. Phytomass and ecological significance of Chrysocoma ciliata within Highland Basalt Grassland of Lesotho. Paper delivered at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19-23 July.

Smit, G.N. 2010. Expansion of the BECVOL-model to a complete aboveground biomass quantification technique for trees and shrubs. Paper delivered at the Southern African Wildlife Management Association (SAWMA) 40th Anniversary Symposium: Biodiversity Conservation in a Changing World, Buffelspoort, South Africa. 19-22 September.

Smit, G.N. 2010. Re-encroachment of Colophospermum mopane on plots thinned to different tree densities in Mopane Bushveld. Paper delivered at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19-23 July.

Smit, G.N. 2010. Re-encroachment of Colophospermum mopane on plots thinned to different tree densities in Mopane Bushveld. Paper delivered at the Southern African Wildlife Management Association (SAWMA) 40th Anniversary Symposium: Biodiversity Conservation in a Changing World, Buffelspoort, South Africa. 19-22 September.

Snyman, H.A. 2010. Root studies along a degradation gradient in a semi-arid grassland. Poster presented at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19-23 July.

Snyman, H.A. 2010. Slangbos die aggressiewe indringer (slangbos the aggressive encroacher). Paper delivered at the Seriphium Plumosum National Workshop, Bloemfontein, South Africa. 25 March - 25 July.

Snyman, H.A. 2010. Soil seed bank evaluation following grassland degradation in a semi-arid area. Poster presented at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19-23 July.

Vos, M., Smit, G.N. & Pienaar, F.C. 2010. An assessment to quantify the impacts of Acacia mellifera subsp. detinens on the natural habitat of Rolfontein Nature reserve. Paper delivered at the Kimberley Biodiversity Research Symposium, Kimberley, South Africa. 12 October.



Academic staff

Professors:

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

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

Associate Professor: Prof. HO de Waal

Senior Lecturers: Dr Luis Schwalbach, Mr Wikus Vorster (contract) **Lecturers:** Messrs Foch de Witt, Mike Fair, Paul Malan, Ockert Einkamerer

Junior Lecturers: Messrs Thapelo Makae, Benedict Raito

Researcher: Dr Gerrie Scholtz

Contact details

Prof. Johan Greyling

Faculty of Natural and Agricultural Sciences Department of Animal, Wildlife and Grassland Sciences University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone: Fax: E-mail: Website: +27 (0)51 401 2211 +27 (0)51 401 2608 greylijp@ufs.ac.za www.ufs.ac.za/animal "The Department of Plant Sciences had a very productive year. This can be attributed to the dedication and hard work of the department's staff."

[·] Prof. Johann du P<mark>r</mark>eez



Department of Plant Sciences

Overview

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

In 2010, the department served a total of 393 undergraduate students, 12 Honours students, 34 students at M.Sc. level and 30 Ph.D. students, ten of whom were from other African countries.

Special achievements

Prof. Johan Grobbelaar was elected as Bloemfonteiner of the Year for 2010, an honour that reflects his contribution and service to Science as well as to the Bloemfontein community in general. He was also the organiser of the 31st Congress of the International Society of Limnology (SIL) that was held in Cape Town and attended by more than 400 delegates from 44 countries during August 2010. This was a first for Africa and South Africa. He also attended and presented a paper at the Fourth Human Resources Management Network Conference of the Association of Commonwealth Universities in Melbourne, Australia during November 2010. Prof. Grobbelaar served his eleventh year on the editorial board of the *Journal of Applied Phychology*.

Prof. Koos van Rensburg, one of our Affiliate Associate Professors, received the award as Scientist of the Year from Grain South Africa.



Dr Marieka Gryzenhout made us really proud. She was the first runner-up as Young Women Scientist of the Year of the Department of Science and Technology. Furthermore, Dr Gryzenhout received the prize for the best Ph.D. thesis in the Physiology and Genetics Division of the International Union of Forest Research Organisations (IUFRO) at their meeting held in Korea during 2010.

Activities and achievements

The Department of Plant Sciences had a very productive year. This can be attributed to the dedication and hard work of the department's staff.

Profs. Liezel Herselman and Sakkie Pretorius attended the 2nd Borlaug Global Rust Initiative (BGRI) Technical Workshop in St. Petersburg, Russia, from 30–31 May 2010. Here they presented papers on their recent research on wheat resistance genes and wheat rusts, respectively. They also attended the 8th International Wheat Conference in St. Petersburg, Russia, from 1–4 June 2010. 41

AGRICULTURAL SCIENCES | DEPARTMENT OF PLANT SCIENCES



In October 2010, Prof. Maryke Labuschagne attended the AACC International Annual Meeting that was held in Savannah, Georgia in the United States of America. Prof. Labuschagne also visited Colombia to inspect a Centre for the Improvement of Tropical Crops (CIAT) project, funded by the Gates Foundation. She was also in Uganda for a Gates Foundation symposium for postgraduates.

Prof. Sakkie Pretorius continued his research on wheat rusts.

During the National Museum in Bloemfontein's Biodiversity Series to celebrate the International Year of Biodiversity, Prof. Johann du Preez presented a lecture on ornithophily and biodiversity. He also gave several popular lectures to amongst others the Honorary Wardens Club on Golden Gate's vegetation, to BirdLife Free State on bird pollination and to the Botanical Society of the Free State on plant evolution.

Prof. Wijnand Swart, Chairperson of the Centre for Plant Health Management (CePHMa) in the Department of Plant Sciences, is also the Cluster Director of Cluster 4 of the University of the Free State (UFS), namely Technologies for Sustainable Crop Industries in Semi-Arid Regions.

Our students made us proud. Mr Oscar Elago received the prize for the best poster at the International Grains

Ms Gloudi Agenbag (Ph.D. student) and her promoter, Dr Renée Prins (CenGen and Affiliate Associate Professor, UFS) during field work. Gloudi works on the mapping of resistance genes to the stripe-rust disease of wheat.

Symposium organised by Cereal Science and Technology-SA (CST-SA) under the auspices of the International Association for Cereal Science and Technology (ICC) that was held at the University of Pretoria in February 2010. Mr Roean Wessels received the award for the best B.Sc. Honours presentation at the Annual Postgraduate Symposium between our department and the Department of Plant Biotechnology of the University of Johannesburg.

National and international collaboration

Profs. Johann du Preez and Wijnand Swart joined a delegation of lecturers and researchers, chaired by the Dean of the Faculty of Natural and Agricultural Sciences of the UFS, to meet with a number of delegates from the Polytechnic of Namibia. During this visit a memorandum of understanding between these two institutions was drawn up and signed.

As part of the SA/Germany Science, Research and Technology Cooperative Agreement, Dr Joyce Moloi from the

Qwaqwa Campus and Prof. Amie van der Westhuizen paid a short visit to the Department of Plant Biochemistry and Biotechnology of the Muenster University (WWU), Germany. Here, Dr Moloi presented an invited lecture on her research *Nitric oxide, an early signal molecule in the resistance response of wheat against the Russian wheat aphid.*

Dr Renée Prins, Dr Lesley Boyd (John Innes Centre, United Kingdom) and Prof. Sakkie Pretorius met to discuss progress of a joint project funded by the United Kingdom (UK) Biotechnology and Biological Sciences Research Council and the Department for International Development (BBSRC/DfID). One of the project's objectives is the genetic characterisation of stem rust resistance in African wheat germplasm.

Ms Lize Joubert joined Prof. Peter Bruyns's research facility at the University of Cape Town for two months to work on her Ph.D. project. This part of her project dealt with the phylogenetic analysis of molecular data of the genus *Cryptolepis* (*Apocynaceae*). Ms Joubert, Ms Magdil Pienaar and Dr Mariëtte Jackson also attended an advanced phylogenetics course hosted by the Forestry and Agricultural Biotechnology Institute (FABI) at the University of Pretoria during November 2010.

Staff matters

The year saw a number of staff changes. After a long and fruitful academic career, Prof. Charl van Deventer retired at the end of 2010. The department was fortunate to appoint four new staff members. Two of them have strong links with FABI based at the University of Pretoria. They are Prof. Gert Marais and Dr Marieka Gryzenhout. Dr Mariëtte Jackson was also appointed on the Main Campus, while Dr Tom Ashafa was appointed as new Head of the Botany Section of the Qwaqwa Campus.

We also experienced a tragedy in our department. One of our M.Sc. students, Mr Jaco Buys, sadly lost his life on 28 August 2010.



Mr Scott Sydenham (Ph.D. student), Profs. Liezel Herselman and Sakkie Pretorius attended the 2nd BGRI Technical Workshop and the 8th International Wheat Conference in St. Petersburg, Russia. Prof. Pretorius was an invited speaker.



Dr Renée Prins (CenGen and Affiliate Associate Professor, UFS), Dr Lesley Boyd (John Innes Centre, UK) and Prof. Sakkie Pretorius met to discuss progress of a joint project funded by the BBSRC/DfID.

researchOUTPUTS Plant Sciences

Research articles

Ajith, A., Labuschagne, M.T., Malan, A.F., Van Biljon, A. & Wentzel, B. 2010. Relationship between malting quality traits and hordeins as affected by timing of nitrogen fertilizer application. *Cereal Chemistry* 87(5): 393-397.

Akinbo, O., Labuschagne, M.T. & Fregene, M. 2010. Embryo rescue as a method to develop and multiply a backcross population of cassava (*Manihot esculenta* Crantz) from an interspecific cross of *Manihot esculenta* ssp. flabellifolia. African Journal of Biotechnology 9(42): 7059-7062.

Benesi, I.R.M., Labuschagne, M.T., Herselman, L. & Mahunga, N. 2010. Ethnobotany, morphology and genotyping of cassava germplasm in Malawi. Journal of Biological Sciences 10(7): 616-623.

Berner, J.M. & Van der Westhuizen, A.J. 2010. Inhibition of xanthine oxidase activity results in the inhibition of Russian wheat aphid-induced defence enzymes. *Journal of Chemical Ecology* 36(12): 1375-1380.

Berner, J.M. & Van der Westhuizen,

A.J. 2010. The selective induction of the phenylalanine ammonia-lyase pathway in the resistance response of wheat to the Russian wheat aphid. *Cereal Research Communications* 38(4): 506-513.

Brand, R.F., Brown, L.R. & Du Preez,

P.J. 2010. A florostic analysis of the vegetation of Plantberg, Eastern Free State, South Africa. *Koedoe* 52(1): 1-11.

Cawood, M.E., Pretorius, J.C., Van der Westhuizen, A.J. & Pretorius, Z.A. 2010. Disease development and RPprotein activity in wheat (*Triticum aestivum*) seedlings treated with plant extracts prior to leaf rust (*Puccinia triticina*) infection. *Crop Protection* 29(11): 1311–1319.

De Wit, M., Nel, P., Osthoff, G. & Labuschagne, M.T. 2010. The effect of variety and location on cactus pear (*Opuntia ficus-indica*) fruit quality. *Plant Foods and Human Nutrition* 65(2): 136-145.

Fehser, S., Beike, U., Stoveken, J., Pretorius, Z.A., Van der Westhuizen, A. & Moersbacher, B. 2010. Histological and initial molecular analysis of Ug99, the new Sr31-breaking race of the wheat stem rust fungus threatening global wheat production. *Journal of Plant Pathology* 92(3): 709-720.

Grobbelaar, J.U. 2010. Microalgal biomass production: Challenges and realities. *Photosynthesis Research* 106(1-2): 135-144.

Klopper, R.R., Zietsman, P.C., Du Preez, P.J. & Smith, G.F. 2010. A first record of a South African aloe, *Aloe spectabilis*, becoming naturalized elsewhere in the country. *Bradleya* 28: 37-38.

Labuschagne, M.T. & Hugo, A. 2010. Oil content and fatty acid composition of cactus pear seed compared to cotton and grape seed. *Journal of Food Biochemistry* 34(1): 93-100.

Marais, G.F., Badenhorst, P.E., Eksteen, A. & Pretorius, Z.A. 2010. Reduction of *Aegilops sharonensis* chromatin associated with resistance genes *Lr56* and Yr38 in wheat. *Euphytica* 171(1): 15-22.

Marais, G.F., Marais, A.S., Eksteen, A. & Pretorius, Z.A. 2010. Modification of the *Aegilops neglecta* – common wheat *Lr62/Yr42* translocation through allosyndetic pairing induction. *South African Journal of Plant and Soil* 27(2): 142-151.

Morojele, M.E. & Labuschagne, M.T. 2010. Characterization of wheat (*Triricum aestivum* L.) cultivars grown in Lesotho by storage proteins. *Cereal Research Communications* 38(4): 560–568.

Mutegi, E., Sagnard, F., Muraya, M., Kanyenji, B., Rono, B., Mwongera, C., Marangu, C., Kamau, J., Parzies, H., De Villiers, S., Semagn, K., Traoréf, P.S. & Labuschagne, M. 2010. Ecogeographical distribution of wild, weedy and cultivated *Sorghum bicolor* (L.) Moench in Kenya: Implications for conservation and crop-to-wild gene flow. *Genetic Resources and Crop Evolution* 57(2): 243-253.

Mweta, D.E., Labuschagne, M.T., Bonnet, S. & Saka, J.D.K. 2010. Physicochemical properties of starches from Malawian sweetpotato (*Ipomoea batatas*) cultivars. *Trends in Carbohydrate Research* 2(1): 54-65.

Mweta, D.E., Labuschagne, M.T., Bonnet, S., Swarts, J. & Saka, J.D.K. 2010. Isolation and physicochemical characterization of starch from cocoyam (*Colocasia esculenta*) grown in Malawi. *Journal of Science, Food and Agriculture* 90(2): 1886-1896.

Oelofse, R.M., Labuschagne, M.T. & Van Deventer, C.S. 2010. Influencing

factors of sodium dodecyl sulfate sedimitation in bread wheat. *Journal of Cereal Science* 52(1): 96–99.

Ojulong, H.F., Labuschagne, M.T., Herselman, L. & Fregene, M. 2010. Yield traits as selection indices in seedling populations of cassava. *Crop Breeding and Applied Biotechnology* 10(3): 191-196.

Pretorius, Z.A. & Bender, C.M. 2010. First report of virulence for the wheat leaf rust (*Puccinia triticina*) resistance gene *Lr32* in South Africa. *Plant Disease* 94(3): 381.

Pretorius, Z.A., Bender, C.M. & Visser, B. 2010. First report of a *Puccinia* graminis f. sp. tritici race virulent to the *Sr24* and *Sr31* wheat stem rust resistance genes in South Africa. *Plant Disease* 96(6): 784.

Smit, H.A., Tolmay, V.L., Barnard, A., Jordaan, J.P., Koekemoer, F.P., Otto, W.M., Pretorius, Z.A., Purchase, J.L. & Tolmay, J.P.C. 2010. An overview of the context and scope of wheat (*Triticum aestivum*) research in South Africa from 1983 to 2008. South African Journal of Plant and Soil 27(1): 81-96.

Terefe, T., Pretorius, Z.A., Paul, I., Mebalo, J., Meyer, L. & Naicker, K. 2010. Occurrence and pathogenicity of *Puccinia graminis* f. sp. *tritici* on wheat in South Africa in 2007 and 2008. *South African Journal of Plant and Soil* 27(2): 163–167.

Van Biljon, A., Labuschagne, M. & Koen, E. 2010. Microsatellite-based assessment of five *Solanum nigrum* complex species and their progeny. *Acta Agriculturae Scandinavica Section B – Soil and Plant Sciences* 60(6): 494-499.

Visser, B., Herselman, L., Park, R.F., Karaoglu, H., Bender, C.M. & Pretorius, Z.A. 2010. Characterization of two new *Puccinia graminis* f. sp. *tritici* races within the Ug99 lineage in South Africa. *Euphytica* 179:119-127.

Zacarias, A.M. & Labuschagne, M.T. 2010. Diallel analysis of cassava brown streak disease, yield and yield related characteristics in Mozambique. *Euphytica* 176: 309–320.

Chapter in book

Liebenberg, M.M. & Pretorius, Z.A. 2010. Common bean rust: Pathology and control. In *Horticultural Reviews*, Volume 37, edited by J. Janik. Online: Wiley-Blackwell. pp. 1-99.

Conference contributions

Agenbag, G.M., Boyd, L.A., Pretorius, Z.A. & Prins, R. 2010. Fine mapping of durable resistance to stripe rust in the South African wheat cultivar, Kariega, using an expressed sequence tag (EST) marker strategy. Poster presented at the International Plant and Animal Genome XVIII Conference, Town and Country Convention Centre, San Diego, USA. 9–13 January.

Agenbag, G.M., Pretorius, Z.A., Boyd, L.A., Bender, C.M. & Prins, R. 2010. Identification of quantitative trait loci (QTL) associated with durable resistance to stripe rust derived from the wheat cultivar Cappelle Desprez. Paper delivered at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15-17 March.

Agenbag, G.M., Pretorius, Z.A., Boyd, L.A., Bender, C.M. & Prins, R. 2010. High resolution mapping of stripe rust resistance QTL in the wheat cultivar Kariega. Paper delivered at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9-10 April. Ajith, A., Labuschagne M.T. & Malan,

A.F. 2010. The influence of nitrogen fertilizer application on malting quality of irrigation barley. Poster presented at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15-17 March.

Ajith, A., Labuschagne, M.T. & Malan, A.F. 2010. The use of leaf nitrogen to determine kernel nitrogen of a doubled haploid population of malting barley under irrigation. Poster presented at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15-17 March.

Crouch, J.A., Sakthikumar, S., Cuomo, C. & Pretorius, Z. 2010. A panel of *SNP- based real-time PCR probes* for the rapid and accurate detection of Ug99. Poster presented at the 8th International Wheat Conference and Borlaug Global Rust Initiative (BGRI) Meeting, St. Petersburg, Russia. 1-4 June.

De Villiers, C., Kriel, W. & Pretorius, Z.A. 2010. Greenhouse screening

of CIMMYT wheat germplasm for FHB response. Paper delivered at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15-17 March.

Elago, O., Labuschagne, M.T. & Van Biljon, A. 2010. The influence of low nitrogen on starch and minerals in quality protein maize. Proceedings of the CST-SA (Cereal Science and Technology Southern Africa) – ICC (International Association for Cereal Science and Technology) International Grains Symposium: Quality and Safety of Grain Crops and Foods, University of Pretoria, Pretoria, South Africa. 3-5

Elago, O., Labuschagne, M.T. & Van Biljon, A. 2010. The influence of

February. pp. 45-49.

low nitrogen conditions on quality and nutritional values in quality protein maize. Poster presented at the American Association of Cereal Chemists (AACC) International Annual Meeting, Savannah, Georgia, USA. 24-27 October.

Flett, B.C. & McLaren, N.W. 2010. Analysis of non-linear G X E interactions in disease evaluation. Paper delivered at the Scientific Workshop of the Free State Branch of the Southern African Society for Plant Pathology (SASPP), Stonehenge, Parys, South Africa. 28 January.

Herselman, L. 2010. Application of molecular markers for pathogen characterisation. Paper delivered at the Scientific Workshop of the Free State Branch of the Southern African Society for Plant Pathology (SASPP), Stonehenge, Parys, South Africa. 28 January.

Herselman, L., Sydenham, S.L., Senoko, K.J., Prins, R. & Pretorius, Z.A. 2010. Combining wheat rust and Fusarium head blight resistance genes and QTL using marker-assisted selection. Poster presented at the 8th International Wheat Conference and Borlaug Global Rust Initiative (BGRI) Meeting, St. Petersburg, Russia. 1-4 June.

Jackson, B.C., Spies, J.J., Herselman, L. & Maleka, M.F. 2010. Differential gene expression in the floral tepals of Clivia miniata using cDNA-AFLP. Poster presented at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9-10 April.

Janse van Rensburg, B., Flett, B.C. Viljoen, A. & Mc Laren, N.W. 2010. Modelling the incidence of Fusarium verticillioides and Aspergillus spp. and their mycotoxins in maize in South Africa taking all related factors into consideration. Paper delivered at

the Scientific Workshop of the Free State Branch of the Southern African Society for Plant Pathology (SASPP), Stonehenge, Parys, South Africa. 28 January.

Janse van Rensburg, B., Flett, B.C., Mc Laren, N.W. & Mc Donald, A.H. 2010. Distribution and quantification of Fusarium verticillioides in South African maize and its effect on grain *quality and toxicity*. Paper delivered at the Combined Congress 2010: Combined Congress of the South African Society of Crop Production (SASCP), the Soil Science Society of South Africa (SSSSA), the Southern African Society for Horticultural Sciences (SASHS) and the Southern African Weed Science Society (SAWSS), University of the Free State, Bloemfontein, South Africa. 19-21 January.

Janse van Rensburg, B., Flett, B.C., Viljoen, A. & Mc Laren, N.W.

2010. Genotype x environment interactions associated with fumonisin contamination of commercial maize. Paper delivered at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa, 15-17 March.

Janse van Rensburg, B., Flett, B.C., Viljoen, A. & Mc Laren, N.W.

2010. Incidence of fumonisin and fumonisin producing Fusarium spp. in commercial maize. Paper delivered at the Scientific Workshop of the Free State Branch of the Southern African Society for Plant Pathology (SASPP), Stonehenge, Parys, South Africa. 28 January.

Labuschagne, M.T. & Akinbo, O. 2010. Increasing cassava root protein content by introgressing high protein genes from a wild relative (Manihot esculenta spp flabellifolia). Paper delivered at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an

Evolving World, Cape Town, South Africa. 22-26 August.

Labuschagne, M.T. & Van Biljon,

A. 2010. The genetic relationship between glutenin and gliadin protein subunits in a double haploid population of wheat. Paper delivered at the 8th South African Plant Breeders Association (SAPBA) Symposium. Spier, Stellenbosch, South Africa. 15-17 March.

Labuschagne, M.T. & Van Biljon, A.

2010. The relationship between RP and SE-HPLC peaks and some quality characteristics in a double haploid wheat population varying in LMW *Glutenin subunits*. Paper delivered at the American Association of Cereal Chemists (AACC) International Annual Meeting, Savannah, Georgia, USA. 24-270ctober.

Labuschagne, M.T., Van Biljon, A. & Elago, O. 2010. Polymeric and monomeric proteins in South African wheat: How they are influenced by environmental conditions. Proceedings of the CST-SA (Cereal Science and Technology Southern Africa) – ICC (International Association for Cereal Science and Technology) International Grains Symposium: Quality and Safety of Grain Crops and Foods, University of Pretoria, Pretoria, South Africa. 3-5 February. pp. 22-26.

Laurie, S.M., Booyse, M., Van Jaarsveld, P.J., Faber, M. & Labuschagne, M.T. 2010. Characterization of new cream-fleshed sweet potato varieties based on agronomic traits, taste acceptability and nutrient content. Paper delivered at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15-17 March.

Laurie, S.M., Van Jaarsveld, P., Faber, M. & Labuschagne, M.T. 2010. Selected micronutrient content of

orange- fleshed sweet potato from South Africa. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22–26 August.

Lindeque, R.C., Tolmay, V.L.

& Labuschagne, M.T. 2010. Identification and utilization of new resistance donors with host plant resistance to Russian Wheat Aphid; biotype SA2. Poster presented at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15-17 March.

Lindeque, R.C., Tolmay, V.L. & Labuschagne, M.T. 2010. New resistance donors to biotype RWASA2 exist in CIMMYT (Mexico), Iran and South African germplasm collections. Paper delivered at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15-17 March.

McLaren, N.W. 2010. Optimal use of disease progress curve data. Paper delivered at the Scientific Workshop of the Free State Branch of the Southern African Society for Plant Pathology (SASPP), Stonehenge, Parys, South Africa. 28 January.

Miles, C.W., Labuschagne, M.T. & Otto, W.M. 2010. The mixogram as a selection tool for desirable rheological characteristics and loaf volumes in South African wheat cultivars, 2010. Poster presented at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15-17 March.

Mohase, L. & Taiwe, B.M. 2010. Elucidation of defence responses induced by aphid saliva. Poster presented at the 36th Annual Conference of the South African Association of Botanists (SAAB), North West University, Potchefstroom, South Africa. 11-14 January.

Moloi, M.J. & Van der Westhuizen,

A.J. 2010. Nitric oxide, an early signal molecule in the resistance response of wheat against the Russian wheat aphid. Invited paper delivered at the Department of Plant Biochemistry and Biotechnology, Münster University (WWU), Münster, Germany. 30 September.

Muedi, H.T.H., Fourie, D. & McLaren,

N.W. 2010. Reaction of common bean cultivars and lines to bacterial brown spot in South Africa. Poster presented at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15–17 March.

Oelofse, R.M., Labuschagne, M.T. & Van Deventer, C.S. 2010. Sodium Dodecyl Sulfate Sedimentation – Discrimination ability in a dryland wheat breeding programme in South Africa. Poster presented at the 8th International Wheat Conference and Borlaug Global Rust Initiative (BGRI) Meeting, St. Petersburg, Russia. 1–4 June.

Olivera, P.D., Pretorius, Z.A. & Jin, Y. 2010. Resistance to race TTKSK of P. graminis f. sp. tritici in Triticale (X Triticosecale). Poster presented at the Borlaug Global Rust Initiative (BGRI) Technical Workshop, St. Petersburg, Russia. 30–31 May.

Park, R., Fetch, T., Hodson, D., Jin, Y., Nazari, K., Prashar, M. & Pretorius, Z. 2010. International surveillance of wheat rust pathogens - progress and challenges. Paper delivered at the Borlaug Global Rust Initiative (BGRI) Technical Workshop, St. Petersburg, Russia. 30-31 May.

Phalafala, T., Labuschagne, M.T. & Van Biljon, A. 2010. The mineral and protein value of South African quality protein maize (QPM). Proceedings of the CST-SA (Cereal Science and Technology Southern Africa) – ICC (International Association for Cereal Science and Technology) International Grains Symposium: Quality and Safety of Grain Crops and Foods, University of Pretoria, Pretoria, South Africa. 3-5 February. pp. 210-214.

Rouse, M.N., Steffenson, B.J., Pretorius, Z.A., Carson, M. & Jin, Y. 2010. *Races* of *Puccinia graminis f. sp. tritici identified from the 2009 Njoro stem rust nursery*. Poster presented at the Borlaug Global Rust Initiative (BGRI) Technical Workshop, St. Petersburg, Russia. 30–31 May.

Shegro, A.G., Labuschagne, M.t. & Shargie, N.G. 2010. Protein and mineral content of sorghum [Sorghum bicolor (L.) Moench] accessions from Ethiopia and South Africa. Proceedings of the CST-SA (Cereal Science and Technology Southern Africa) – ICC (International Association for Cereal Science and Technology) International Grains Symposium: Quality and Safety of Grain Crops and Foods, University of Pretoria, Pretoria, South Africa. 3-5 February. pp. 39-44.

Sydenham, S.L., Herselman, L. & Kriel, W.M. 2010. Marker-assisted backcross breeding for Fusarium head blight resistance in South African wheat. Paper delivered at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15-17 March.

Sydenham, S.L., Herselman, L. & Kriel, W.M. 2010. Marker-assisted backcross breeding for Fusarium head blight resistance in South African wheat. Poster presented at the 8th International Wheat Conference and Borlaug Global Rust Initiative (BGRI) Meeting, St. Petersburg, Russia. 1–4 June.

Van Biljon, A., Phakela, K. & Laurie,

S. 2010. Total starch, amylose and

³

mineral content of South African sweet potato breeding lines. Poster presented at the 8th Triennial Conference of the African Potato Association: Potatoes and Sweet Potatoes - The Driving Force Behind Food Security in Africa, Protea Hotel Breakwater Lodge, Cape Town, South Africa. 5-9 December.

Van Biljon, A., Gissa, D. & Labuschagne,

M.T. 2010. Protein quality of quality protein maize grown under low and optimal nitrogen conditions. Proceedings of the CST-SA (Cereal Science and Technology Southern Africa) – ICC (International Association for Cereal Science and Technology) International Grains Symposium: Quality and Safety of Grain Crops and Foods, University of Pretoria, Pretoria, South Africa. 3-5 February. pp. 176-181. Van der Merwe, R., Herselman, L., Hugo, A. & Labuschagne, M.T. 2010. Development of molecular markers linked to the high-oleic acid trait in sunflower (Helianthus annuus L). Paper delivered at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15-17 March.

Van der Westhuizen, A.J. 2010. Biochemistry of resistance in wheat to biotic stresses. Paper delivered at the Annual Meeting of the Winter Cereal Trust Technical Committee, Stellenbosch, South Africa. 29 September.

Van Eeden, E. & Labuschagne, M.T. 2010. Characterization of falling number and sprouting tolerance in South African Hybrid bread wheat. Poster presented at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15–17 March. Visser, B., Herselman, L., Park, R.F., Karaoglu, H., Bender, C.M. & Pretorius, Z.A. 2010. *Characterization of two new wheat stem rust races within the Ug99 lineage in South Africa*. Paper delivered at the **Borlaug Global Rust Initiative** (BGRI) Technical Workshop, St. Petersburg, Russia. 30-31 May.

Wentzel, B.S., Labuschagne, M.T. & Otto, W.M. 2010. *Relationship* between size-exclusion HPLC and flour quality in selected South African hard red winter wheat (Triticum aestivum L.) cultivars. Poster presented at the 8th South African Plant Breeders Association (SAPBA) Symposium, Spier, Stellenbosch, South Africa. 15-17 March.

Contact details

Prof. Johann du Preez

Faculty of Natural and Agricultural Sciences Department of Plant Sciences University of the Free State PO Box 339 Bloemfontein South Africa 9300

 Telephone:
 +27 (0)51 401 2514

 Fax:
 +27 (0)51 444 5945

 E-mail:
 dpreezpj@ufs.ac.za

 Website:
 www.ufs.ac.za/plantsci

Academic staff

MAIN CAMPUS

Professors:

Profs. Sakkie Pretorius, Johan Grobbelaar, Maryke Labuschagne, Neal McLaren, Wijnand Swart, Amie van der Westhuizen, Charl van Deventer

Associate Professors: Profs. Johann du Preez, Lieze Herselman

Affiliate Associate Professors: Profs. Koos van Rensburg (ARC-GCI) Renée Prins (CenGen)

Senior Lecturer: Prof. Gert Marais

Lecturers:

Drs Lintle Mohase, Marieka Gryzenhout, Mariette Bezuidenhout, Gerhard Potgieter, Angie van Biljon, Botma Visser, Mss Lize Joubert, Adrie Minnaar-Ontong

QWAQWA CAMPUS

Lecturers:

Drs Tom Ashafa, Erwin Sieben, Mr Robert Lentsoane, Ms Joyce Moloi

Junior Lecturer: Mr Raymond Pitso



"Research in the department is aimed at various aspects of the soil-crop-atmosphere system."

Prof. Chris du Preez



Department of Soil, Crop and Climate Sciences

Overview

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

Over the past few years, the department has shown growth not only in the number of undergraduate students, but also in the number of postgraduate students. In 2010, 22 Master's and 16 doctoral students were enrolled. Approximately 40% of these students come from Botswana, Eritrea, Ethiopia, Germany, Kenya, Lesotho, Malawi, Mauritius, Swaziland, the United States of America, Zambia and Zimbabwe. Six Master's and five Ph.D. students graduated.

Research in the department is aimed at various aspects of the soil-crop-atmosphere system. Approximately R3,5 million was spent on research in 2010, of which only 10% came from the Central Research Fund of the UFS. The rest of the funding came from institutions such as



the National Research Foundation (NRF), Water Research Commission (WRC), German Research Foundation (GRF), Protein Research Trust (PRT), Montsanto, McCain Foods (SA) (Pty) Ltd., Omnia Fertilizer Ltd., Syngenta and Agraforum. Research findings were published in research articles, chapters in books and presented at conferences. These are outlined in the research outputs later on.

Activities and achievements

In terms of the department's activities and achievements during 2010, one has to note the extent of **national and international collaboration** that is being pursued by the department.

Staff members of the department were involved on the organising committee of a very successful combined congress of the Soil Science Society of South Africa (SSSSA), South African Society of Crop Production (SASCP), Southern African Society of Horticultural Sciences (SASHS) and Southern African Weed Science Society (SAWSS) that was held in Bloemfontein in January



A doctoral student, Mr Johan van Tol, and an assistant collecting soil samples in the Weatherley catchment near Maclear.

2010. One of our staff members, Dr James Allemann, received the SASCP Board Floating Trophy for the best paper delivered by a member of the society at the congress for his paper *Screening of some maize cultivars for acetochlor tolerance*. Two postgraduate students, Messrs Johan van Tol (*Predicting streamflow from the soil map in the Weatherley catchment*) and George van Zijl (*Soil erosion on a toposequence in Maputseng Lesotho*), shared the SSSA award for the best oral presentation by a researcher younger than 30 years. Drs James Allemann and Gert Ceronio were elected to the Executive of the SASCP and SAWSS, respectively.

The department was also instrumental in bringing Dr Stephen Duke from the University of Mississippi to Bloemfontein as a keynote speaker at the combined congress in January 2010. He also paid a visit to the department and presented a talk on the work being conducted in his laboratory on the development of natural products, which provided valuable insight into his research and the connection with the natural products research being conducted in the Agronomy discipline under the leadership of Prof. Seef Pretorius.

Prof. Seef Pretorius, project leader of the Crop and Stress Physiology team, was invited to attend the annual Plum Agrochemical Consulting and Service (Pty) Ltd. Conference on research-related matters in Beijing, China, in September 2010, where he presented the keynote address, New approaches in manipulating physiological processes in crops with plant growth regulators (PGRs) with the aim of improving yield. Dr Elmarie van der Watt spent three months in Japan on a research sabbatical where she studied the response of wheat treated with different PGRs to simulated drought stress, and confirmed that specific PGRs can induce resistance towards drought stress in wheat by using a resistant and susceptible cultivar in comparison.

In terms of mechanisms of action elucidation against drought stress, Arabidopsis thaliana has been chosen as test organism and is currently studied. It has been shown that treatment of the plant with different PGRs reduced the effect of drought stress significantly. In this study it is postulated that the overproduction of proline under drought conditions is only a marker and an early metabolic response trigger in the signal transduction pathway that links the perception of drought stress to the elicitation of physiological responses at the cellular metabolic level. Although numerous studies confirm the beneficial effects of proline accumulation in protecting plants under diverse stress conditions, it is also apparent that proline accumulation does not represent an exclusive condition for stress tolerance. Therefore it is still an open question as to how proline accumulation influences particular regulatory pathways in complex stress responses.

The crop and stress physiology team has completed the screening of more than 3 500 crude plant extracts for antibacterial, antifungal, herbicidal and bio-stimulatory



potential. A number of plants with high activities of this nature and the potential to be developed into natural products have been identified. Progress has been made in the development of a natural fungicide in terms of the economic preparation of a liquid product. It is envisaged that a natural product can be developed in three years' time. Furthermore, the plants identified with high insecticidal potential are currently being studied. Therefore research is now concentrated on the development of a natural fungicide and insecticide, elucidation of the agronomic requirements of donor plants with the objective to establish these plants as possible new crops, identification of the active insecticidal compounds, elucidation of mechanisms of action of the fungicide and insecticide and following the potential to manipulate systemic-induced resistance in crops towards both biotic and abiotic stress factors.

Herbicide research by Dr James Allemann continued elucidating damage caused to crops by the chloroacetamide herbicides. A great deal of work was conducted on the allelopathic effects of *Amaranthus*

Dr Gesine Engelbrecht supervising the preparation of plots for a field trial.

cruentus varieties. This included investigating the effect of the compounds on a number of common weed species, as well as attempting to identify the active compounds and elucidate their effect. Funding from the UFS Cluster on Technologies for Sustainable Crop Industries in Semi-Arid Regions has been obtained for a number of projects, and a number of contract research projects were also undertaken during the past year. Very promising results have been obtained in the research on the effect of soil temperature on sunflower emergence, and this will be investigated in further detail as well as in combination with previously identified herbicide effects.

In August 2010, Drs Gert Ceronio and Gesine Engelbrecht attended the 28th Congress of the International Society of Horticultural Science in Lisbon, Portugal, where they presented two posters on their research (*Influence of*



Ms Elmarie Kotzé calibrating an EM38 instrument for electrical conductivity measurements of soil in the Maria Moroka Nature Reserve near Thaba Nchu.

organic fertiliser on yield and quality of cabbage and Organic fertiliser use and the potential influence on cabbage plant and soil nutrient composition). Following the conference, a study tour was undertaken with visits to Dekker Chrysanthemums in The Netherlands and the Fruit Research Institute on the Canary Islands.

Agrometeorology hosted a training course of the Food and Agricultural Organisation (FAO) of the United Nations University (UNU) on capacity development for farm management strategies to improve crop-water productivity using AquaCrop. Participants from ten Southern African Development Community (SADC) countries and five other African countries attended the workshop and benefited from lectures and hands-on computer laboratory sessions using the AquaCrop model that was facilitated by Dr Dirk Raes from the Katholieke Universiteit in Leuven, Belgium, and Dr Gabriella Izzy from FAO, Rome.

This section also hosted the annual South African Society for Atmospheric Sciences (SASAS) conference at the Gariep Dam in the Free State in September 2010. The conference theme was SASAS 2010 – Not Just Any Dam Conference! About 70 people from a large array of atmospheric, science-related fields attended the conference. One of our undergraduate students, Ms Catherine Odendaal, received the prize for the best poster presentation. Dr Vesa Nietosvaara, one of the keynote presenters at the SASAS conference, visited our department after the conference and presented a faculty seminar about *Online learning in environmental sciences*. He is the Eumetcal Programme Manager at the Finnish Meteorological Institute in Helsinki and has designed and delivered numerous courses, remote sensing training events and online weather briefings for European meteorologists and researchers.

Prof. Kees Stigter of Agromet Vision in The Netherlands visited the Agrometeorology section for two months to arrange roving seminar training sessions in various SADC countries. During this period he presented a roving seminar course on *Agrometeorological services: Theory and practice* in Lesotho and in Swaziland, while the other countries will follow soon. Attendees felt honoured to have Prof. Stigter share his knowledge and experiences concerning Agromet services in different African countries and other parts of the world. He also taught the third-year undergraduate class about micrometeorological manipulations and the advantages that can be obtained by developing Agromet services for a variety of farming systems.

We are still excited about the joint research project funded by the joint research grant under the NRF/JSPS (South Africa/Japan) Scientific Cooperative Agreement. The project takes place in cooperation with Prof. Mitsuru Tsubo from the Arid Land Research Centre at Tottori University in Japan and has been addressing a drought early warning system for maize and grasslands in arid and semi-arid areas. Prof. Tsubo has visited the UFS several times for data collection and training workshops and Prof. Sue Walker and Mr Terry Newby of the Institute for Soil, Climate and Water of the Agricultural Research Council (ARC) also visited Japan during the year.

Agrometeorology continues to work with the University of KwaZulu-Natal (UKZN) on two WRC projects, namely *Applications of rainfall forecasts for agriculturally related decision making in selected catchments,* together with their Department of Bio-resources, Engineering and Environmental Hydrology, as well as *Water use of drought tolerant food crops,* in cooperation with the UKZN Department of Crop Sciences. Dr Sithabiso Gandure, Ms Caroline Kiringu, Mr Durton Nanja and Prof. Sue Walker, attended and presented papers at the African Climate Change Fellowship Programme (ACCFP) Culmination Conference funded by START in Dakar, Senegal, in December 2010. As ACCFP is viewed as fundamental to the development of leadership in climate change and adaptation in Africa, this provided many useful discussions on vulnerability and adaptation in African agriculture as well as the use of climate and weather information to reduce climate risk.

Agrometeorology had two postdoctoral fellows. The first is Dr Sithabiso Gandure, funded by the African Climate Change Fellowship Programme via START, who collected community perceptions and gave training on climate change and variability in Gladstone Village, Thaba Nchu. The other, Dr Mamokete Dingaan, is funded by the NRF and



Postgraduate students, Messrs Johan van Tol and Rian van der Merwe, collecting soil samples in Lesotho.



A doctoral student, Mr Gobeza Yada, inspecting maize ears in a field trial.

the UFS Water Cluster and works on relationships between drought and rainfall effects on biomass production and biodiversity of natural vegetation across the Free State. Ms Caroline Kirungu from Kenya, a START research fellow, wrote a seminar on *Modelling sugar cane growth and production* that was presented at the South African Sugarcane Research Institute (SASRI) at Mount Edgecombe.

In Soil Science, the WRC-funded project, Managing salinity associated with irrigation in selected areas of South Africa, comprised 27 on-farm case studies located in the Orange-Riet and Vaalharts Irrigation Schemes. The research outcome on best management practices will soon be communicated to farmers and extension officers. The staff members involved with this project are Profs. Chris du Preez, Leon van Rensburg, Alan Bennie, and Messrs Johan Barnard and Jason Sparrow. Mr Kevin Fourie, funded by Omnia Fertilizer Ltd., continued the salinity research on lucerne, using the lysimeter unit at the Kenilworth Experimental Site. Dr Imoh Haka completed his project funded by the UFS Water Cluster on transpiration efficiencies of wheat, canola and lucerne.

Dr Pieter le Roux and his team were involved in soil hydrology research, a field that has been neglected worldwide. Results show that an increase in soil data develops an improved understanding of the flow paths, residence times and storage mechanisms of water in hill slopes. Hydrological classification of soils and hill slopes is possible and can improve the modelling of catchment hydrology.

The second phase of the research project entitled *The fate* of organic matter in cultivated soils, reverted to perennial pasture, is almost completed under the leadership of Prof. Wulf Amelung of the University of Bonn in Germany. Prof. Du Preez is a member of this team that is financed



by the Research Foundation of Germany. The papers already published on this phase resulted in that Dr Johan Six from the University of California and Dr Sara Baer from Southern Illinois University started with research on microbial aspects of these soils. A third phase entitled the Vulnerability and resilience of soils under different rangeland use has already started under the leadership of Profs. Wulf Amelung and Chris du Preez, with Ms Elmarie Kotzé as a team member. This is a subproject of the umbrella project entitled Resilience, collapse and reorganisation in social-ecological systems of South Africa's savannahs.

The department was also successful in obtaining funding from the Inkaba yeAfrica programme for ten postgraduate students. Amongst others, these students focus on the change in soil carbon content after conversion from grass to forestry, the restoration of carbon under a variation of tillage practices, the influence of tillage practices on

A Master's student, Ms Margaret Nthejane, preparing soil samples in the laboratory.

activities of soil enzymes, and the evaluation of different environmental and agronomical phosphate analytical procedures. Four staff members and six postgraduate students were fortunate to attend the 7th Annual Inkaba yeAfrica Workshop in Potsdam, Germany, in November 2010, where they reported on their progress with the research.

Profs. Leon van Rensburg and Sue Walker with two of her doctoral students attended the International Commission on Irrigation and Drainage Conference in Yogyakarta, Indonesia, in October 2010, where they made useful contributions.

research OUTPUTS Soil, Crop and Climate Sciences

Research articles

Allemann, J. & Mphundi, P. 2010. Screening of some South African maize (Zea mays L.) cultivars for acetochlor tolerance. South African Journal of Plant and Soil 27(3): 235-241.

Baloyi, T., Kutu, F. & Du Preez, C.C. 2010. Assessment of variable application rates of biological amendment substances on establishment and growth characteristics of maize plants. *African Journal of Biotechnology* 9(46): 7847-7852.

Barnard, J.H., Van Rensburg, L.D. & Bennie, A.T.P. 2010. Leaching irrigated saline sandy to sandy loam apedal soils with water of a constant salinity. *Irrigation Science* 28(2): 191–201.

Cawood, M.E., Pretorius, J.C., Van Der Westhuizen, A.J. & Pretorius, Z.A. 2010. Disease development and PRprotein activity in wheat (*Triticum aestivum*) seedlings treated with plant extracts prior to leaf rust (*Puccinia triticana*) infection. *Crop Protection* 29(11): 1311–1319.

Elhag, M. & Walker, S. 2010. Impact of climate change and the human activities on land degradation in arid and semi-arid regions. *Nile Basin Water Engineering Scientific Magazine* 2: 31-38.

Engelbrecht, G.M., Ceronio, G.M. & Motseki, P.C. 2010. Effect of nitrogen levels and sources on production of Swiss Chard (*Beta vulgaris* var. *cicla*). *South African Journal of Plant and Soil* 27(3): 229–234. Engelbrecht, G.M., Du Preez, C.C. & Spies, J.J. 2010. Response of *Lachenalia* growing in soil to interactions between nitrogen and phosphorus fertilisation in the nursery phase. South African Journal of Plant and Soil 27(3): 221-228.

Le Roux, P.A.L., Hensley, M. & Van Huyssteen, C.W. 2010. Advances in pedology in South Africa. *South African Journal of Plant and Soil* 27(1): 1-8.

Mardamootoo, T., Ng Kee Kwong, K. & Du Preez, C.C. 2010. History of phosphorus fertilizer usage and its impact on the agronomic phosphorus status of sugarcane soils in Mauritius. *Sugar Technology* 12(2): 91–97.

Matthews, N., Grove, B., Barnard, J.H. & Van Rensburg, L.D. 2010. Modelling the economic tradeoffs between allocating water for crop production or leaching for salinity management. *Water SA* 36(1): 37–43.

Mzezewa, J., Misi, T. & Van Rensburg, L.D. 2010. Characterisation of rainfall at a semi-arid ecotope in the Limpopo Province (South Africa) and its implications for sustainable crop production. *Water SA* 36(1): 1–8.

Ng Cheong, L.R., Ng Kee Kwong, K., Ah Koon, P. & Du Preez, C.C. 2010. Influence of sugarcane cropping on the quality of an Oxisol and an Inceptisol in Mauritius. *Communications in Soil Science and Plant Analysis* 41(10): 1205-1219.

Otto, W. & Du Preez, C.C. 2010. Grain yield, nitrogen uptake and use efficiency components of South African irrigation wheat cultivars under different nitrogen management strategies. South African Journal of Plant and Soil 27(3): 199-206.

Preger, A., Kosters, R., Du Preez, C.C., Brodowski, S. & Amelung, W. 2010. Carbon sequestration in secondary pasture soils: a chronosequence study in the South Africa Highveld. *European Journal of Soil Science* 61(4): 551-562.

Singels, A., Annandale, J.G., De Jager, J.M., Schulze, R.E., Inman-Bamber, N.G., Durand, W., Van Rensburg, L.D., Van Heerden, P.S., Crosby, C.T., Green, G.C. & Steyn, J.M. 2010. Modelling crop growth and crop water relations in South Africa: Past achievements and lessons for the future. *South African Journal of Plant and Soil* 27(1): 49–65.

Steyn, A.S. & Walker, S. 2010. Die afskaling van globale sirkulasiemodelvoorspellings na daaglikse reënval oor die Bo-Olifantsrivieropvanggebied. *South African Journal of Science* 29: 163-164.

Van der Laan, M., Stirzaker, R.J., Annandale, J.G., Bristow, K.L. & Du Preez, C.C. 2010. Monitoring and modelling draining and resident soil water nitrate concentrations to estimate leaching losses. *Agricultural Water Management* 97(11): 1779–1786.

Van Huyssteen, C.W., Zere, T.B. & Hensley, M. 2010. Soil-water relationships in the Weatherley catchment, South Africa. *Water SA* 36(5): 521-530.

Van Rensburg, L.D. 2010. Advances in soil physics: Application in irrigation and dryland crop production. *South African Journal of Plant and Soil* 27(1): 9-18.

Chapters in books

Elhag, M. & Walker, S. 2010.

Environmental degradation of natural resources in Butana area of Sudan. In Land Degradation and Desertification: Assessment, Mitigation and Remediation, edited by P. Zdruli, M. Pagliau, S. Kapur & A. Cano. London: Springer. pp. 171-178.

Ramesh, K., Stigter, C.J. & Walker, S.

2010. Improving weather and climate related risk assessments in agricultural production: Multiple cropping. In *Applied Agrometeorology*, edited by C.J. Stigter. London: Springer. pp. 519-526.

Walker, S. & Stigter, C.J. 2010. Designing and selecting early warning strategies and increasing their efficiencies: Multiple cropping. In *Applied Agrometeorology*, edited by C.J. Stigter. London: Springer. pp. 485-492.

Walker, S., Stigter, C.J. & Ramesh, K. 2010. Developing scales and tools for weather and climate related risk quantifications: Multiple cropping. In *Applied Agrometeorology*, edited by C.J. Stigter. London: Springer. pp. 513–518.

Walker, S., Ofori, E., Kyei-Baffour, N. & Stigter, C.J. 2010. Problems and solutions in using of and coping with weather phenomena in need of tactical decision making and challenges remaining for the use of science to contribute to problem analyses and designing viable solutions in this context: Multiple cropping. In *Applied Agrometeorology*, edited by C.J. Stigter. London: Springer. pp. 493-498.

Walker, S., Ofori, E., Kyei-Baffour, N. & Stigter. C.J. 2010. The sustainable development and use of agroecosystems: Multiple cropping. In *Applied Agrometeorology*, edited by C.J. Stigter. London: Springer. pp. 461-466.

Conference contributions

Allemann, J. & Mphundi, P. 2010. Screening of some maize cultivars for acetochlor tolerance. Paper delivered at the Combined Congress 2010: Combined Congress of the South African Society of Crop Production (SASCP), the Soil Science Society of South Africa (SSSSA), the Southern African Society for Horticultural Sciences (SASHS) and the Southern African Weed Science Society (SAWSS), University of the Free State, Bloemfontein, South Africa. 19–21 January.

Baloyi, T.C., Kutu, F. & Du Preez,

C.C. 2010. Assessment of variable application rates of biological amendment substances on seedling establishment and growth characteristics of maize grown under glasshouse conditions. Paper delivered at the Combined Congress 2010: Combined Congress of the South African Society of Crop Production (SASCP), the Soil Science Society of South Africa (SSSSA), the Southern African Society for Horticultural Sciences (SASHS) and the Southern African Weed Science Society (SAWSS), University of the Free State, Bloemfontein, South Africa. 19-21 January.

Bello, Z.A., Walker. S. & Tfwala, C.M. 2010. Predicting pearl millet response to water under South African climatic conditions. Paper delivered at the 61st International Executive Council (IEC) Meeting and the 6th Asian Regional Conference of the International Committee on Irrigation & Drainage (ICID), Yogyakarta, Indonesia. 10-16 October.

Ceronio, G.M., Engelbrecht, G.M. & Mbatha, A.N. 2010. Organic fertiliser use and the potential influence on cabbage plant and soil nutrient composition. Paper delivered at the 28th International Horticultural Congress (IHC2010): Science and Horticulture for People, Lisbon, Portugal. 22-26 August.

De Wet, L. & Walker, S. 2010. Trends in rainfall patterns for Mpumalanga Highveld. Paper delivered at the 26th Annual Conference of the South African Society for Atmosphere Science (SASAS): SASAS 2010 – Not Just Any Dam Conference!, Gariep Dam, South Africa. 20-22 September.

Du Preez, C.C. & Amelung, W. 2010. Fate of soil organic matter in South African crop and pasture land. Paper delivered at the 7th Inkaba yeAfrica Workshop, GFZ Potsdam, Germany. 1-5 November.

Du Preez, C.C., Mnkeni, P. & Van Huyssteen, C.W. 2010. Knowledge review on land use and soil organic matter in South Africa. Paper delivered at the 19th World Congress of Soil Science: Soil Science for a Changing World, Brisbane Convention Centre, Brisbane, Australia. 1-6 August.

Engelbrecht, G.M., Ceronio, G.M. & Mbatha, A.N. 2010. Influence of organic fertiliser on yield and quality of cabbage (Brassica oleraceae var. capitata L.). Paper delivered at the 28th International Horticultural Congress (IHC2010): Science and Horticulture for People, Lisbon, Portugal. 22–26 August.

Engelbrecht, G.M., Fouche, H.J. &

Ntsane, S.M. 2010. Comparison of cactus pear (Opuntia spp.) cultivars for fruit yield and quality in the Central Free State, South Africa. Paper delivered at the VIIth International Congress on Cactus Pear and Cochineal and the VIIth General Meeting of the FAOICARDA International Technical Cooperation Network on Cactus Pear and Cochineal Agadir, Morocco. 17-22 October.

Fouche, H.J. & Engelbrecht, G.M. 2010. The potential of cactus pear (Opuntia ficus-indica) as animal feed. Paper delivered at the VIIth International Congress on Cactus Pear and Cochineal and the VIIth General Meeting of the FAOICARDA International Technical Cooperation Network on Cactus Pear and Cochineal Agadir, Morocco. 17-22 October.

Gandure, S., Walker, S. & Botha,

J. 2010. Farmers' perceptions of adaptation to climate change and water stress in a South African rural community. Paper delivered at the Culmination Conference for Round 1 of the African Climate Change Fellowship Program (ACCFP) - Dakar, Senegal. 8-10 December.

Hamandawana, H., Moeletsi, M.E., Walker, S. & Landman, W. 2010.

Water satisfaction analysis for dryland maize production in Frankfort. Paper delivered at 26th Annual Conference of the South African Society for Atmosphere Science (SASAS): SASAS 2010 – Not Just Any Dam Conference!, Gariep Dam, South Africa. 20-22 September.

Kemp, M.E., Van Rensburg, L.D. &

Sokolic, F. 2010. A methodology to estimate the minimum water requirements for shallow rooted plants in the riparian zone: A case study of the Mokolo River. Paper delivered at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19-23 July.

Kemp, M.E., Van Rensburg, L.D., Dennis, I. & Le Roux, P.A.L. 2010. A conceptual model for predicting the minimum water requirements for shallow-rooted plants in the riparian zone: A case study of the Mokolo River. Paper delivered at the Arid Zone Ecology Forum: Change and stasis in the Arid Zone, Gariep Dam, South Africa. 4-7 October.

Kotze, E. & Du Preez, C.C. 2010. Effect of long-term residue management on organic matter in a Plinthosol cropped annually with wheat. Paper delivered at the 7th Inkaba yeAfrica Workshop, GFZ Potsdam, Germany. 1-5 November.

Lebenya, R.M., Van Huyssteen, C.W. & Du Preez, C.C. 2010. Quantification of the soil-plant carbon stock in the Weatherley catchment eight years after conversion from grassland to forestry. Paper delivered at the 7th Inkaba yeAfrica Workshop, GFZ Potsdam, Germany. 1-5 November.

Loke, P.F., Kotze, E. & Du Preez, C.C. 2010. Influence of long-term wheat residue management on soil fertility indicators of an Avalon soil at Bethlehem. Paper delivered at the 7th Inkaba yeAfrica Workshop, GFZ Potsdam, Germany. 1-5 November.

Mathews, C. & Allemann, J. 2010. Cassava for food security: Evaluation of improved varieties for smallholder farmers in Mpumalanga. Paper delivered at the Combined Congress 2010: Combined Congress of the South African Society of Crop Production (SASCP), the Soil Science Society of South Africa (SSSSA), the Southern African Society for Horticultural Sciences (SASHS) and the Southern African Weed Science Society (SAWSS), University of the Free State, Bloemfontein, South Africa. 19–21 January.

Moeletsi, M.E., Walker, S. & Landman, W. 2010. A study of onset, cessation and duration characteristics of the rainy season in Bothaville, South Africa. Paper delivered at the 11th WaterNet/WARFSA/GWP-SA Symposium, Victoria Falls, Zimbabwe. 27-29 October.

Nanja, D.H. & Walker, S. 2010. Changes in farmer decision making under a variable Monze climate. Paper delivered at the Culmination Conference for Round 1 of the African Climate Change Fellowship Program (ACCFP) - Dakar, Senegal. 8-10 December.

Nape, K.M. & Steyn, A.S. 2010.

Economic benefits of varying maize production strategies under various seasonal rainfall scenarios in the Modder River catchment, South Africa. Paper delivered at the 7th Inkaba yeAfrica Workshop, GFZ Potsdam, Germany. 1-5 November.

Nthejane, M.M., Du Preez, C.C. & Van Huyssteen, C.W. 2010.

Correlation between agronomic and environmental phosphorus analyses of selected soils. Paper delivered at the 7th Inkaba yeAfrica Workshop, GFZ Potsdam, Germany. 1-5 November.

Odendaal, C. & Steyn, A.S. 2010. Accounting for Coriolis force in atmospheric motion on various planetary bodies. Paper delivered at the 26th Annual Conference of the South African Society for Atmosphere Science (SASAS): SASAS 2010 – Not Just Any Dam Conference!, Gariep Dam, South Africa. 20-22 September.

Sedibe, M. & Allemann, J. 2010. Effects of phosphate levels on rose geranium (Perlagonium graveolens) production. Paper delivered at the Combined Congress 2010: Combined Congress of the South African Society of Crop Production (SASCP), the Soil Science Society of South Africa (SSSSA), the Southern African Society for Horticultural Sciences (SASHS) and the Southern African Weed Science Society (SAWSS), University of the Free State, Bloemfontein, South Africa. 19-21 January.

Singels, A., Sithole, P. & Walker,

S. 2010. Influence of climate data quality on the accuracy of South African sugarcane yield estimates. Paper delivered at the 83rd Annual Congress of the South African Sugar Technologists' Association (SASTA), Durban, South Africa. 25-27 August.

Snyman, P. & Steyn, A.S. 2010. Monitoring the 2-D urban heat island for Bloemfontein, South Africa. Paper delivered at the 7th Inkaba yeAfrica Workshop, GFZ Potsdam, Germany, 1-5 November.

Steyn, A.S. 2010. Statistical downscaling of climate change projections to daily temperatures within the upper Olifants River catchment, South Africa. Paper delivered at the 7th Inkaba yeAfrica Workshop, GFZ Potsdam, Germany. 1-5 November.

Stigter, C.J., Walker, S., Das, H., Huda, S., Dawei, Z., Jing, L., Chunggiang, L., Dominguez-Hurtado, I., Mohammed, A., Abdalla, A., Bakheit, N., Al-Amin, N., Yurong, W., Kinama, J., Haasbroek, P. & Nanja, D.H. 2010. Meeting farmers' needs for agrometeorological services: An overview and case studies. Paper delivered at the World Meteorological Organisation's WMO/CAgM International Workshop - Addressing the Livelihood Crisis of Farmers: Weather and Climate Services, Belo Horizonte, Brazil. 12-14 July.

Tharaga, P.C. & Steyn, A.S. 2010. Downscaling climate change scenarios to daily maximum temperatures over Bloemfontein, South Africa. Paper delivered at the 7th Inkaba yeAfrica Workshop, GFZ Potsdam, Germany. 1-5 November.

Tshikolomo, K., Walker, S. & Nesamvuni, A.E. 2010. Rainfall influence on water gain and loss from Middle Letaba dam in Luvuvhu-Letaba water management area. Paper delivered at the 11th WaterNet/ WARFSA/GWP-SA Symposium, Victoria Falls, Zimbabwe. 27-29 October.

Van der Laan, M., Bristow, K., Stirzaker, R., Annandale, J. & Du Preez, C.C. 2010. Linking measurement and modelling more closely to improve estimates of solute leaching. Paper delivered at the International Commission on Irrigation and Drainage (ICID) Workshop: Nutrient Leaching from Agricultural Soils, Yogyarkarta, Indonesia, 10-16 October,

Van der Laan, M., Stirzaker, R.,

Annandale, J., Bristow, K. & Du Preez. C.C. 2010. Estimating leaching losses from mobile and immobile soil water nitrate concentrations. Paper delivered at the Combined Congress 2010: Combined Congress of the South African Society of Crop Production (SASCP), the Soil Science Society of South Africa (SSSSA), the Southern African Society for Horticultural Sciences (SASHS) and the Southern African Weed Science Society (SAWSS), University of the Free State, Bloemfontein, South Africa. 19-21 January.

Van der Laan, M., Stirzaker, R., Annandale, J., Bristow, K. & Du Preez. C.C. 2010. Estimating nitrate leaching losses through the monitoring and modelling of mobile and resident soil water concentrations. Paper delivered at the Australian Irrigation 2010 Conference and Exhibition, Darling Harbour, Sydney, Australia. 7-11 June.

Van Heerden, P.S. & Walker, S. 2010. Using year-on-year weather data to estimate crop irrigation water requirements at different probability levels. Paper delivered at the 26th Annual Conference of the South African Society for Atmosphere Science (SASAS): SASAS 2010 - Not Just Any Dam Conference!, Gariep Dam, South Africa. 20-22 September.

Walker, S. & Landman, W. 2010. Water satisfaction analysis for dryland maize production in Frankfort. Paper delivered at the 26th Annual Conference of the South African Society for Atmosphere Science (SASAS): SASAS 2010 – Not Just Any Dam Conference!, Gariep Dam, South Africa. 20-22 September.

Walker, S. & Stigter, C.J. 2010. Livelihood crises in Africa: Adaptations to uncertainty due to climate and other changes. Paper delivered at the World Meteorological Organisation's WMO/CAgM International Workshop

- Addressing the Livelihood Crisis of Farmers: Weather and Climate Services, Belo Horizonte, Brazil, 12-14 July.

Walker, S. & Van Heerden, P.S.

2010. Vegetables irrigated with stored rainwater for household food security. Paper delivered at the 61st International Executive Council (IEC) Meeting and the 6th Asian Regional Conference of the International Committee on Irrigation & Drainage (ICID), Yogyakarta, Indonesia. 10-16 October.

Walker, S., Kirungu, C.A. & Singels, A. 2010. Modeling sugarcane's response to climate change. Paper delivered at the Culmination Conference for Round 1 of the African Climate Change Fellowship Program (ACCFP) - Dakar. Senegal. 8-10 December.

Walker, S., Nanja, D.H. & Zuma-Netshiukhwi, G.N.C. 2010. Keys to help farmers cope with climate variability. Paper delivered at the Culmination Conference for Round 1 of the African Climate Change Fellowship Program (ACCFP) - Dakar, Senegal. 8-10 December.

Zuma-Netshiukhwi, G.N.C. & Walker, S. 2010. Improving water producitivity for the traditional vegetable Amaranthus arusha on a clay soil using Aqua Crop. Paper delivered at the 61st International Executive Council (IEC) Meeting and the 6th Asian Regional Conference of the International Committee on Irrigation & Drainage (ICID), Yogyakarta, Indonesia. 10-16 October.

Zuma-Netshiukhwi, G.N.C. & Walker, S. 2010. Potential use of dry spell information for farmer in-season decisions. Paper delivered at the 11th WaterNet/WARFSA/GWP-SA Symposium, Victoria Falls, Zimbabwe. 27-29 October.

61

AGRICULTURAL SCIENCES | DEPARTMENT OF SOIL, CROP AND CLIMATE SCIENCES



Contact details

Prof. Chris du Preez

Faculty of Natural and Agricultural Sciences Department of Soil, Crop and Climate Sciences University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone: Fax: E-mail: Website:

+27 (0)51 401 2212 +27 (0)51 402 2212 dpreezcc@ufs.ac.za www.ufs.ac.za

Academic staff

Professors:

Leon van Rensburg, Sue Walker

Associate Professor:

Affiliate Associate Professor:

Senior Lecturers:

Lecturers:

Elmarie Kotzé, Mr Abraham Steyn

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

Senior Assistants: Oosthuizen, Rida van Heerden

Departments in the BUILDING SCIENCES

"Top students come to our Department of Architecture. Quality attracts quality. The recent achievements of this department are proof of this."

Prof. Jonathan Jansen

05 Department of Architecture

Overview

During 2010, the Department of Architecture was involved in various activities, events and developments and experienced a number of highlights.

One such highlight was the 22nd Sophia Gray Memorial Lecture and Exhibition presented by Dr Jaco Wasserfall, Managing Director of Wasserfall Munting Architects in Windhoek, Namibia, entitled No Graffiti Please! The practice challenges traditional relationships between culture, environment, structure and space, while scale, form giving, site planning and the use of materials are dictated by the Namibian context. Transparency and legibility are key design considerations in the practice's architectural manifestations. Their work includes the Trustco Office Complex in Windhoek, the Franco-Namibian Cultural Centre and the Namibian Head Office for Ernst & Young Chartered Accountants. Dr Wasserfall holds a Ph.D. in Architecture from the Martin Centre for Architectural and Urban Studies, University of Cambridge, United Kingdom.





In 2010, the department had a total of 229 enrolled students of whom 46 graduated in the B.Arch.(Stud) degree, 37 in the B.Arch.(Stud) Hons. and 30 in the M.Arch.(Prof) degrees. Mr Pierre de Lange graduated cum laude in the M.Arch.(Prof) degree. The department received a total of 282 applications for the first year to the B.Arch.(Stud) degree in 2010, and 23 applications for the B.Arch.(Stud) Hons. degree. The four applications for the M.Arch.(Prof) degree were all applications from outside the University of the Free State (UFS).

Since 1987, first-year Architecture students have been building huts on campus as part of an introduction to architectural studies at the Department of Architecture at the UFS. The students build these full-scale huts in groups of two, with responses to orientation, materials, climate and community over a period of approximately three weeks.

Work by Dr Jaco Wasserfall, Managing Director of Wasserfall Munting Architects in Windhoek, Namibia.

65



Prof. Jonathan Jansen, Rector and Vice-Chancellor of the UFS (middle), visiting the small community of 27 huts built by the 2010 first-year Architecture students. With him are first-year students Ms Sancha Olivier and Mr René Malan.

On the day that the 2010 students completed their huts, Prof. Jonathan Jansen, Rector and Vice-Chancellor of the UFS, visited the small community of 27 huts in the veld behind the Rag Farm and addressed staff and students of the Department of Architecture. "I can smell excellence and goodness," Prof. Jansen remarked as he walked amongst the huts. "Top students come to our Department of Architecture. Quality attracts quality. The recent achievements of this department are proof of this," he said.

Special achievements

In terms of creative outputs, the department excelled in 2010. Former Head of Department, Professor Emeritus Bannie Britz, received one of only twelve Corobrik SAIA Awards of Merit, a peer-acknowledged national award of the South African Institute of Architects (SAIA) for buildings constructed during the period 2007-2008, for his Selosesha Library at Thaba Nchu. Perhaps uniquely, this was the 20th Award of Merit that Prof. Britz received.



Prof. Bannie Britz (left), Professor and former Head of the Department of Architecture at the UFS, holding the SAIA Award of Merit for his Selosesha Library at Thaba Nchu, his 20th such award. With him are SAIA Award sponsor and *Corobrik* Chairperson, Mr Peter du Trevou and SAIA President, Mr Al Stratford.

Another such award went to lecturer Mr Henry Pretorius for his Taxi Terminus on the UFS Main Campus. Moreover, this project went on to win one of only four Corobrik SAIA Awards for Excellence, the highest honour the institute can bestow for buildings. This is the first time a building in the Free State has earned this recognition and Pretorius is perhaps the youngest recipient ever.

He is also responsible for the design of the new Architecture Building. Building work started in 2010 and should be completed in September 2011.

Activities and achievements

The annual tours undertaken by students in the various year groups were once again successful and informative. The first-year students toured to Clarens and Philippolis; the second-year students to Durban; and the third-year and fourth-year students to Johannesburg. The thirdyear design students took part in the PG Bison and Des Baker Competitions.



UFS Architecture lecturer, Mr Henry Pretorius (left), holding his Award for Excellence for the UFS Main Campus Taxi Terminus. With him are SAIA Award sponsor and *Corobrik* Chairperson Mr Peter du Trevou and SAIA President, Mr Al Stratford.



Here, with the other finalists in the Corobrik Student of the Year Competition, is Mr Pierre de Lange (second from the left), regional winner of the competition.

The fourth-year students took part in the Shift Competition as well as the Saint-Gobain Competition in Johannesburg where they competed in the finals against the University of Pretoria and the Nelson Mandela Metropolitan University (NMMU).

Mr Pierre de Lange received distinctions both in design and his technical report for the M.Arch.(Prof) degree, and is the regional winner of the Corobrik Students' Competition. Mr Regardt Bekker also received a distinction for design. A further four distinctions were awarded in Building Science.

The SAIA Award for Excellence is dedicated to buildings, but by exception, it was awarded to Prof. Ora Joubert, Research Associate of the UFS and former Head of Department for her book, 10+Years 100+ Buildings – Architecture in a Democratic South Africa, published by Bell-Roberts.

Mr Jan Ras is a member of the SAIA Education Committee. He also organised the annual Sophia Gray Memorial Lecture and Mini-Conference. He has a private practice and serves on several advisory committees. He also served as an external examiner at the NMMU for the M.Arch.(Prof) degree.

Lecturer, Mr Kobus du Preez, served as external examiner for the technical component for the M.Arch.(Prof) degree at the University of Pretoria.

The department presented a Continuing Professional Development (CPD) course in collaboration with the Free



Research Associate and former Head of the Department of Architecture at the UFS, Prof. Ora Joubert, making her acceptance speech after the book that she had edited received a SAIA Award for Excellence.

State Institute of Architects on *Campus Planning and Educational Buildings* as well as a research workshop under the leadership of Prof. Pattabi Raman. The CPD course took place at the department on 12 and 13 February 2010 and was attended by students and architectural practitioners from Bloemfontein. Papers were presented by staff members and invited guest speakers, including Profs. Verna Nel, Bannie Britz, Jo Noero and Barry Senior, Ludwig Hansen and Heinrich Wolff. The research workshop took place on 12 March 2010 and was well attended. Staff members who presented work at the CPD course and research workshop included Messrs Hendrik Auret, Jako Olivier and Kobus du Preez, Ms Martie Bitzer and Prof. Raman.

The department continued to host special lectures on Thursdays. Guest speakers included Prof. Jan Smit, Hugh Fraser, renowned South African architect, Prof. Jo Noero of Noero Wolff Architects, Daniel van der Merwe, Professional Architect to the Cement and Concrete Institute and Pierre Swanepoel of studioMAS Architects and Urban Planners.



National and international collaboration

As a partner of the UNESCO Chair Earthen Architecture, the Unit for Earth Construction (UEC) at the Department of Architecture was invited to The International Centre for Earth Construction at the National Superior School of Architecture of Grenoble (CRATerre-ENSAG) in France. Mr Gerhard Bosman visited Grenoble from 23-28 May 2010 and presented the curricula developments, research and projects of the UEC at a conference and also attended workshops and seminars. The organisers applauded the UEC for the completed South Africa-Netherlands Research Programme on Alternatives in Development (SANPAD) project which addresses the acceptability of earth construction in South Africa.

In July 2010, Mr Bosman presented a paper at the Sustainable Architecture and Urban Development Conference in Amman, Jordan. He also presented papers at the Architecture.ZA 2010 (AZA 2010) Conference and the National Indaba on Home Building Technologies, both in Johannesburg, during September 2010.

Prof. Pattabi Raman en Mr Jako Olivier at the launch of their book.

The city of Petra in Jordan.

A book on the contemporary architecture of the Free State entitled Architecture of the Third Landscape, compiled by Prof. Pattabi Raman and Mr Jako Olivier, is now available. The book, published by Xpozure, goes beyond a mere description of the architecture of the buildings, but locates them in the specific physical and cultural landscape of the Free State. It is thus an attempt to engage with the turbulent history of the Free State and its impact on the work of architects. In linking architecture, landscape and cultural history, the book provides lessons that may have application beyond the Free State.

Community service

The Winter School for high-school learners took place on 7 and 8 July 2010 in order to provide prospective students with a more intimate perspective on architecture as a career option. 35 prospective students attended this event.



Staff matters

Ms Martie Bitzer was appointed as Acting Chairperson of the Department of Architecture on 12 April 2010. The department also appointed quite a number of new academic staff members in 2010. Prof. Walter Peters, formerly from the University of KwaZulu-Natal, was appointed as new Special Professor. Dr Diaan van der Westhuizen was appointed as a senior lecturer and will also form part of the Young Scholars Programme. Prof. Ora Joubert, previous Departmental Head, has been appointed as Research Associate and Messrs Jan-Hendrik Nel (a former student of this department) and JT Erasmus as junior lecturers.

Prof. Pattabi Raman left the department in October 2010, following his appointment as Chairperson of Architecture at the Cape Peninsula University of Technology. He made valuable contributions in the design studios and especially to research at the Department of Architecture of the UFS.

research **OUTPUTS**

70

Research articles

Bitzer, M. 2010. In the footsteps of Sophia Gray [on recognition for local architects building projects]. *De Kat* September/October: 121.

Peters, W. 2010. Durban's Moses Madhiba Stadium: A crater for many purposes. Architecture SA July/ August: 28-33.

Peters, W. 2010. Book review: Architecture of the Third Landscape: Award-winning buildings of the Free State. Architecture SA September/ October: 53.

Peters, W. 2010. Exhibition review: No graffiti, please! 22nd Sophia Gray Memorial Exhibition, Bloemfontein, August 2009. Architecture SA November/December: 33.

Raman, P.G. & Auret, H. 2010. Parsimonious Bloemfontein. *Architecture SA* July/August: 60-62.

Raman, P.G. 2010. Constructivism reinterpreted: Architecture of City Sense: Circa Gallery, Johannesburg. *Architecture SA* March/April: 8-13.

Raman, P.G. 2010. Transferable themes: Idwala and Ukhuni Lodges, KZN. Architecture SA January/ February: 36-41.

Chapter in book

Bosman, G., Smit, P. & Steyn, J. 2010. Changing attitudes on sustainable earth architecture: A case study in the central parts of South Africa. In: Sustainable Architecture and Urban Development , edited by S. Lehmann (et al). Amman: CSAAR Press. Volume IV: 325-340.

Book

Raman, P.G. & Olivier, J. 2010. Architecture of the Third Landscape: Award-winning buildings of the Free State. Bloemfontein: Xposure.

Report

Peters, W. 2010. Heritage Survey eThekwini West: Queensburgh. Report to Amafa aKwaZulu-Natali, South Africa.

Conference contributions

Bitzer, M.D. 2010. *The architect as mythmaker*. Paper delivered at the Architecture.ZA2010 Event+City Conference: A city reimaging Joburg. Johannesburg, South Africa. 22-24 September.

Bosman, G., Smit, P. & Steyn, J. 2010. Changing attitudes on sustainable earth architecture: A case study in the central parts of South Africa. Proceedings of the 2nd International Conference on Sustainable Architecture and Urban Development, Amman, Jordan. 12-14 July. Volume IV: 325-340.

Bosman, G. 2010. Sustaining sustainable construction in Higher Education curricula: A case study. Paper delivered at the Architecture. ZA2010 Event+City Conference: A city reimaging Joburg. Johannesburg, South Africa. 22-24 September.

Peters, W. 2010. (A)mending older buildings. Paper delivered at the Workshop of the Heritage Committee of the South African Institute of Architects, Durban, South Africa. 16-17 July.

Peters, W. 2010. 'n Gebou as 'n uitdruk van 'n idee: (Rand Afrikaans) University of Johannesburg, Kingsway Campus. Mediating ideology and ideogram. Paper presented at the SA Journal of Art Historians Conference, University of the Witwatersrand, Johannesburg, South Africa. 30–31 July.

Steyn, J. & Bosman, G. 2010. The story of the great plans of mice and men: Selling sustainable earth construction. Proceedings of the Alternative Building Technologies Indaba: Alternative Solutions for Homes, Sandton Convention Center, Johannesburg, South Africa. 29-30 September. In: Human Settlement Review 1(1): 193-216.



Academic staff

Special Professor: Prof. Walter Peters

Research Associate: Prof. Ora Joubert

Associate Professor: Prof. Jan Smit

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

Junior Lecturers:

Contract Lecturers:

Mr Charl-Pierre Cilliers, Ms Carmen Ms Helena Jordaan-Olivier

Contact details

Ms Martie Bitzer

Faculty of Natural and Agricultural Sciences Department of Architecture University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone: Fax: E-mail: Website:

+27 (0)51 401 2332 +27 (0)51 444 5108 pretoriusy@ufs.ac.za www.ufs.ac.za/architecture NATURAL AND AGRICULTURAL SCIENCES | ANNUAL REPORT 2010

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

– Prof. Basie Verster
D6 Department of Quantity Surveying and Construction Management



During 2010, the Department of Quantity Surveying and Construction Management was involved in various activities, events and developments and experienced a number of highlights.

The University of the Free State (UFS) is still the only university outside the United Kingdom (UK) that offers an internationally accredited open-learning programme in Quantity Surveying, accredited by the Royal Institution of Chartered Surveyors (RICS).

In terms of its education programmes, the department offers students lectures through residential and openlearning programmes. In 2010, the department served a total of 294 undergraduate students, 125 Honours students, 44 students at Master's level and nine Ph.D. students.



Special achievements

Some of the department's outstanding students once again received prestigious national awards. Mr Franré Swanepoel (an Honours student) received the national Gold Medal of the Association of South African Quantity Surveyors (ASAQS) at a gala event in Cape Town in October 2010. Ms Lerika Pietersen was awarded the Bell-John Prize of ASAQS for the best student in Quantity Surveying at the UFS and the RICS Prize for an outstanding student



A Kovsie, Mr Franré Swanepoel, was awarded the Gold Medal of the Association of South African Quantity Surveyors. He received the prestigious award from Mr Gert Meyer, President of ASAQS, at a gala event in October 2010.



Some outstanding students of the Department of Quantity Surveying and Construction Management received prestigious awards. Here are, from the left: Mr Pierre Oosthuizen (lecturer), Ms Ensslee, Ms Samuel, Mr Brown and Ms Lerika Pietersen (recipients) and Mr Carl van Zyl (lecturer).

University of the Free State



awarded by the Royal Institution of Chartered Surveyors in London for her outstanding academic achievements.

Prof. Verster was awarded life membership of ASAQS at the gala event in Cape Town in October 2010.

Activities and achievements

The department took part in continuous research projects in collaboration with the Council for Scientific and Industrial Research (CSIR) and the Construction Industry Development Board (CIDB) and comprehensive results were published. Departmental lecturers and students also presented 15 successful papers at international conferences in Sussex, Salford, Singapore, Paris, Leeds and Istanbul. An additional total of 15 research outputs were achieved by the department.

The department also presents various registered short programmes and courses as an additional training action. In 2010, 75 students were registered for the Quantity Surveying, Construction Management and Project Management (QCP) open-learning programme; 91 students completed the Facilities Management Programme (FMP) supported by the South African Property Owners Association (SAPOA); and 59 students completed the Intensive Project Management Programme (IPMP), also supported by SAPOA.

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

Students attending the National Construction Summit in Johannesburg in April 2010 and promoting the UFS at the UFS display stand. From left to right: Messrs Louwrens Swanepoel, Dean de Klerk, Junior Truter, Alec McKenzie, Dawie Malan and Hendrik van der Merwe.

for the Quantity Surveying Profession (SACQSP) and RICS, and is published biannually by the UFS. In 2010, the journal celebrated its 17th year. This journal offers publication opportunities for independent, peer-reviewed articles by local and overseas researchers in the fields of physical and development sciences. Since 1993, 79 research articles, 15 review articles, 12 international articles, 14 commentaries, eight book reviews and eight introductions have been published.

In 2010, the 26th edition of the student journal, *Bouvaria*, was published by the department.

Eight Honours students in the Construction Management programme attended the National Construction Summit in Johannesburg in April 2010 and participated in promoting the UFS at the UFS display stand.

Many students from the department visited various construction sites to see the practical implications of construction. Students also attended the SACQSP National Congress in East London during October 2010, as well as the Association of Schools of Construction of Southern Africa (ASOCSA) congress.

75



Students of the Department of Quantity Surveying and Construction Management visited the site of the City Lodge Hotel at the Bloemfontein Airport in 2010.

National and international collaboration

Over the past few years, the department has made significant contributions to the various professions and to the construction industry as a whole. The department has also maintained statutory accreditation by SACQSP, the South African Council for the Project and Construction Management Professions (SACPCMP) and the South African Council for the Property Valuers' Profession (SACPVP). Internationally, the department is accredited by RICS, as well as the Chartered Institute of Building (CIOB), both in the UK.

Prof. Basie Verster, Head of the Department, is the Vice-President (Education) of the CIOB Southern Africa. Prof. Verster also serves on the UFS Council. Prof. Verster and Mr Carl van Zyl also serve on the CIOB Council.

Dr Hendrik Marx is a Council Member of ASOCSA.



Students and staff of the Department of Quantity Surveying and Construction Management competed in a soccer event to celebrate the 2010 FIFA World Cup.

research **OUTPUTS** Quantity Surveying and Construction Management

Research articles

Berry, F.H., Verster, J.J.P., Zulch, B.G. 2010. 'n Verkennende meting van die kommunikasie volwassenheid van die bourekenaars- en ingenieursprofessies in die konstruksiebedryf. ACTA Structilia 17(2): 1-8.

Hauptfleisch, A.C. 2010.

Fasiliteitebestuur: Strukturering van 'n kennisraamwerk vir voortgesette en tersiêre opleiding in Suid-Afrika. South African Journal of Science and Technology 29(3): 97-106.

Conference contributions

Archer, M.M. & Verster, J.J.P. 2010. Development project leaders for the modern building industry. Paper delivered at the South African Council for the Quantity Surveying Profession (SACQSP) Conference: The P8 Summit - Procurement, process, problems, people, property, position, professionalism and price, East London, South Africa. 14-15 October.

Archer, M.M., Verster, J.J.P. & Zulch,

B.G. 2010. Leadership in construction project management: Ignorance and challenges. Paper delivered at the 5th Built Environment Conference of the Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Built Environment (CBE), Southern Sun, Elangeni, Durban, South Africa. 18–20 July.

Archer, M.M., Zulch, B.G. & Verster,

J.J.P. 2010. Project managers' ignorance and challenges: Leadership. Paper delivered at the 24th International Project Management Association (IPMA) World Congress: Challenges and Opportunities, Istanbul, Turkey. 1-3 November.

Burger, M. & Verster, J.J.P. 2010. The importance of knowledge in project management: an empirical study within the built environment. Paper delivered at the South African Council for the Quantity Surveying Profession (SACQSP) Conference: The P8 Summit - Procurement, process, problems, people, property, position, professionalism and price, East London, South Africa. 14-15 October.

Du Preez, O.R.C., Berry, F.H. & Oosthuizen, P.M. 2010. Mediation and conciliation as methods of alternate dispute resolution (ADR) in the construction industry. Paper delivered at the 5th Built Environment Conference of the Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Built Environment (CBE), Southern Sun, Elangeni, Durban, South Africa. 18–20 July.

Du Preez, O.R.C., Ramabodu, M.S. & Berry, F.H. 2010. Personal attributes for effective mediation in the construction industry. Paper delivered at the South African Council for the Quantity Surveying Profession (SACQSP) Conference: The P8 Summit - Procurement, process, problems, people, property, position, professionalism and price, East London, South Africa. 14-15 October.

Flame, R. & Hauptfleisch, A.C. 2010. Integrated facilities management: Gauteng municipalities. Paper delivered at the South African Council for the Quantity Surveying Profession (SACQSP) Conference: The P8 Summit - Procurement, process, problems, people, property, position, professionalism and price, East London, South Africa. 14-15 October.

Hauptfleisch, A.C. 2010. Facilities management defined: A discussion paper. Paper delivered at the South African Council for the Quantity Surveying Profession (SACQSP) Conference: The P8 Summit - Procurement, process, problems, people, property, position, professionalism and price, East London, South Africa. 14-15 October.

Hauptfleisch, A.C. 2010. Facilities management: Tertiary education is South Africa. Paper delivered at the Construction, Building and Real Estate Research Conference (COBRA) of the Royal Institution of Chartered Surveyors (RICS), Université Paris-Dauphine, Paris, France. 2–3 September.

Hauptfleisch, A.C. & Dlungwana,

S. 2010. Development of business management skills for small contractors in South Africa: Can we really measure it? Paper delivered at the 18th CIB (International Council for Research and Innovation in Building and Construction) World Building Congress 2010: TG74 - New Production and Business Models in Construction, The Lowry, Salford Quays, UK. 10-13 May.

Hauptfleisch, A.C., Campbell, M. & Marx, H.J. 2010. Regional property development and socio-economic impacts resulting from a development corridor. Paper delivered at the

77



Construction, Building and Real Estate Research Conference (COBRA) of the Royal Institution of Chartered Surveyors (RICS), Université Paris-Dauphine, Paris, France. 2–3 September.

Jacobs, E. 2010. *Health & Safety in South African construction: Status Quo*. Paper delivered at the 5th Built Environment Conference of the Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Built Environment (CBE), Southern Sun, Elangeni, Durban, South Africa. 18–20 July.

Jacobs, E. & Verster, J.J.P. 2010. Professional maturity in quantity surveying and project management: A comparison. Paper delivered at the South African Council for the Quantity Surveying Profession (SACQSP) Conference: The P8 Summit - Procurement, process, problems, people, property, position, professionalism and price, East London, South Africa. 14-15 October.

Lazarus, S.J. & Hauptfleisch, A.C.

2010. The application of facilities maintenance within the public sector: An exploratory study. Paper delivered at the 5th Built Environment Conference of the Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Built Environment (CBE), Southern Sun, Elangeni, Durban, South Africa. 18–20 July.

Marx, H.J. 2010. Condition of the South African Construction Industry as evaluated by Contractors, Employers and Agents. Paper delivered at the 5th Built Environment Conference of the Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Built Environment (CBE), Southern Sun, Elangeni, Durban, South Africa. 18-20 July. Marx, H.J. 2010. Employers' and agents' perspectives of the condition of the construction industry in South Africa. Paper delivered at the 26th Association of Researchers in Construction Management (ARCOM) Annual Conference, Leeds Metropolitan University, Leeds, UK. 6-8 September.

Marx, H.J. 2010. Satisfaction measurement of contractors in construction. Paper delivered at the Construction, Building and Real Estate Research Conference (COBRA) of the Royal Institution of Chartered Surveyors (RICS), Université Paris-Dauphine, Paris, France. 2-3 September.

Oosthuizen, P.M. & Berry, F.H. 2010. Maturity pillars of a quantity surveying company. Proceedings of the 7th International Cost Engineering Council (ICEC) World Congress & the 14th Pacific Association of Quantity Surveyors (PAQS) Congress: Sustainable Cost Management - Borderless Innovation, Singapore, South Korea. 23-27 July. pp. 1-16.

Pretorius, M.D. & Hauptfleisch, A.C.

2010. A comparative overview of facilities management Namibia and South Africa regarding building maintenance. Paper delivered at the 5th Built Environment Conference of the Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Built Environment (CBE), Southern Sun, Elangeni, Durban, South Africa. 18-20 July.

Ramabodu, M.S. & Campbell, M.M.

2010. Subsidised housing localities and residential mobility. Paper delivered at the Royal Institution of Chartered Surveyors (RICS) Rural Research Conference (ROOTS 2010), Plumpton College, East Sussex, UK. 13-14 April. 2010. An evaluation of cost overruns in public sector projects. In the Free State Province of South Africa. Proceedings of the 7th International Cost Engineering Council (ICEC) World Congress & the 14th Pacific Association of Quantity Surveyors (PAQS) Congress: Sustainable Cost Management - Borderless Innovation, Singapore, South Korea. 23–27 July. pp. 1–12.

Ramabodu, M.S. & Verster, J.J.P. 2010. Factors contributing to cost overruns of construction projects. Paper delivered at the 5th Built Environment Conference of the Association of Schools of Construction of Southern Africa (ASOCSA) and the Council for the Built Environment (CBE), Southern Sun, Elangeni, Durban, South Africa. 18–20 July.

Van Zyl, C.H., Verster, J.J.P. & Ramabodu, M.S. 2010. Dispute resolution alternatives: Problems, preference and process. Paper delivered at the Construction, Building and Real Estate Research Conference (COBRA) of the Royal Institution of Chartered Surveyors (RICS), Université Paris-Dauphine, Paris, France. 2-3 September.

Verster, J.J.P. & Zulch, B.G. 2010. Creativity and strategy: Perspectives on the quantity surveying profession. Paper delivered at the Construction, Building and Real Estate Research Conference (COBRA) of the Royal Institution of Chartered Surveyors (RICS), Université Paris-Dauphine, Paris, France. 2-3 September.

Verster, J.J.P., Ramabodu, M.S. & Van Zyl, C.H. 2010. Construction dispute resolution as seen by quantity surveyors and construction managers. Proceedings of the 7th International Cost Engineering Council (ICEC) World Congress & the 14th Pacific Association of Quantity Surveyors (PAQS) Congress: Sustainable Cost Management - Borderless Innovation, Singapore, South Korea. 23–27 July. pp. 1–17. Zulch, B.G. & Berry, F.H. 2010. Communication maturity: Dimensions and instruments for construction professions. Paper delivered at the Construction, Building and Real Estate Research Conference (COBRA) of the Royal Institution of Chartered Surveyors (RICS), Université Paris-Dauphine, Paris, France. 2-3 September.

Zulch, B.G. & Verster, J.J.P. 2010. Project management and performance strategies. Paper delivered at the 26th Association of Researchers in Construction Management (ARCOM) Annual Conference, Leeds Metropolitan University, Leeds, UK. 6-8 September.

Zulch, B.G., Archer, M.M. & Verster,

J.J.P. 2010. Leadership as an element of project management. Paper delivered at the 24th International Project Management Association (IPMA) World Congress: Challenges and Opportunities, Istanbul, Turkey. 1-3 November.

Contact details

Prof. JJP (Basie) Verster

Faculty of Natural and Agricultural Science Department of Quantity Surveying and Construction Management University of the Free State PO Box 339 Bloemfontein South Africa 9300

 Telephone:
 +27 (0)51 401 2248

 Fax:
 +27 (0)51 401 3324

 E-mail:
 versterj@ufs.ac.za

 Website:
 www.ufs.ac.za

Academic staff

Professor: Prof. JJP (Basie) Verster

Contract Professor: Prof. AC (Dries) Hauptfleisch (Midrand)

Senior Lecturers: Dr Hendrik Marx, Mr Frank Berry

Lecturers:

Messrs Ben Swart, Hendrik van Vuuren, Stephan Ramabodu, Ms Benita Zulch

Contract Lecturers:

Messrs Carl van Zyl, Pierre Oosthuizen, Mss Esti Jacobs, Mart-Marie Archer, Olive du Preez



"Our activities are directly related to improving quality of life, focusing on previously disadvantaged communities."

Prof. Verna Nel

D7 Department of Urban and Regional Planning



Overview

The Department of Urban and Regional Planning is proud that its activities are directly related to improving quality of life focusing on previously disadvantaged communities. We offer four postgraduate programmes in Housing (Honours and Master's degrees with course work) as well as Urban and Regional Planning (Honours and Master's degrees with course work).

Our vision is to be a department of excellence and our mission is to train urban and regional planners and housing practitioners who will enable communities to develop in an innovative and sustainable way.

The number of Honours graduates for 2010 increased, almost doubling from 31% of the Honours students in 2009 graduating, to 61% in 2010. Three Master's degree students in Urban and Regional Planning also graduated and another six completed their degrees.

Mr Owethu Pantswa, one of our Master's degree students, as well as Ms Erica van der Westhuizen, an alumnus and occasional part-time lecturer at our department, have been appointed to serve on the South African Council for Planners (SACPLAN), a statutory body.

Activities and achievements

Ms Lize Barclay, a lecturer in our department, attended the regional workshop on *Revitalising Planning Education*. This project is being undertaken by the Association of African Planning Schools (AAPS) and aims to achieve curricula reform on how to incorporate teaching content and methodologies that respond to current African urban issues best.

Prof. Verna Nel and Mr Yandisa Mashalaba, a lecturer in our department, attended the second biannual conference organised by AAPS on African Planning Education in Dar es Salaam, Tanzania from 5-8 October 2010. The conference sought to further the AAPS agenda around the revitalisation of planning education on the continent. The conference involved a total of 47 participants. This number included representatives of planning schools from Botswana, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, South Africa, The Sudan, Uganda, Zambia and Zimbabwe.



83



Master's degree students surveying the residential satisfaction among PHP home owners in Thaba Nchu. The three students are, from the left to the right: Messrs Paul Maluleke, Owethu Pantswa and Sydney Mothemela, with one of the homeowners.

Ms Zouna Meades presented a paper based on the research done for her Master's dissertation, *Urban design principles for low-cost housing in Turflaagte (Mangaung),* at the 2010 International Conference on the Constructed Environment in Venice, Italy, during November 2010.

Dr Maléne Campbell was invited to the Knowledge Week of the Development Bank of Southern Africa during October 2010, where the focus was on South African human settlements 2030 – rethinking the spatial development trajectory. Several national ministers delivered keynote addresses on the theme.

The community of Clarens is in the process of assessing the state of their current tourism environment in partnership with the Centre for Development Support (CDS) at the University of the Free State (UFS). Dr Maléne Campbell and Mr Wynand Myburgh are part of this multidisciplinary research team.

The department's ongoing research in local (indigenous) knowledge in local economic development resulted in three dissertations on the application of local knowledge for sustainable livelihoods in Cape Town, Lesotho and Namibia, respectively.



Master's degree students surveying the residential satisfaction among PHP home owners in Thaba Nchu. The two students are, from the left to the right (in the middle): Mss Mmabatho Mabule and Vuyo Ntsuntswana, with two of the homeowners.

Community service

The Housing module BEH752, offered to Master's degree students in Urban and Regional Planning, as well as the BEH602 module offered to the Honours students in Housing, are registered as service-learning modules at the UFS.

The Peoples' Housing Process (PHP) is a governmentsubsidised, self-help housing scheme that allows groups of income-restricted recipients to work together to pool their resources and contribute their labour to build their own homes. Current involvement is in a PHP project at Thaba Nchu.

The Regional Planning modules are also service-learning modules. During 2010, students undertook an analysis of Dealesville, a neighbouring town of Bloemfontein as part of a project by the department to prepare a regional development plan for the town.

The Environmental Management (BGO 614) students have also been involved in a community-service project, namely evaluating and planning an open space in Batho, Mangaung.

research OUTPUTS

Urban and Regional Planning

Research articles

Meades, Z. & Campbell, M.M. 2010. Urban design principles for micro level planning in low-cost housing: The case of Turflaagte. The International Journal of the Constructed Environment. Online available at http://ijv. cgpublisher.com.

Steÿn, J.J. & Bosman, G. 2010. The story of the great plans of mice and men: Selling sustainable earth construction. *Human Settlement Review* 1(1): 196–217.

Steÿn, J.J. & Stapelberg, H. 2010. Planning and planning education in the Free State, South Africa. *The Journal* of Building and Land development, Special Issue June 2010.

Book

Ullmann, C. 2010. Integrating the voices: Community participation in Cape Town, South Africa. Germany: Lambert Academic Publishing (LAP).

Report

Venter, A., Campbell, M.M., De Gouveia, A., Myburgh, W. & Marais, J.G.L.

2010. Assessment of the state of the current Clarens tourism environment in partnership with the Centre for Development Support (CDS) at the University of the Free State. CDS Publication: Bloemfontein, South Africa. Delivered to the Clarens Rate Payers Association, Clarens, South Africa.

Conference contributions

Barclay, E. 2010. Planning as stimulator of indigenous knowledge systems' based local economic development projects. Paper delivered at the South African Planning Institute (SAPI) Conference: Beyond Crisis - Opportunities & Action, Durban International Convention Centre, Durban, South Africa. 13-15 September.

Barclay, E. 2010. The application of gaming simulation as pedagogic tool in urban and regional planning tertiary education. Paper delivered at the South African Planning Institute (SAPI) Conference: Beyond Crisis - Opportunities & Action, Durban International Convention Centre, Durban, South Africa. 13-15 September.

Bosman, G., Smit, P. & Steyn, J. 2010. Changing attitudes on sustainable earth architecture: A case study in the central parts of South Africa. Conference proceedings of the 2nd International Conference on Sustainable Architecture and Urban Development, Amman, Jordan. 12-14 July. pp. 325-340.

Hauptfleisch, A.C., Campbell, M.M. & Marx, H.J. 2010. Regional property development and socio-economic impacts resulting from a development corridor. Paper delivered at the Construction, Building and Real Estate Research Conference (COBRA) of the Royal Institution of Chartered Surveyors (RICS), Université Paris-Dauphine, Paris, France. 2-3 September.

Mashalaba, Y.B. 2010. Environmental education for planners, the use of applied projects in the training of town and regional planners. Paper delivered at the Association of African Planning Schools (AAPS) Conference: Revitalizing Planning Education in Africa, Dar es-Salaam, Tanzania. 5-8 October.

Mashalaba, Y.B. 2010. The impact of open space development and planning in the renewal and revitalisation of neglected townships. Paper delivered at the South African Planning Institute (SAPI) Conference: Beyond Crisis - Opportunities & Action, Durban International Convention Centre, Durban, South Africa. 13-15 September.

Meades, Z. & Campbell, M.M. 2010. Urban design principles for micro level planning in low-cost housing: The case of Turflaagte. Paper delivered at the International Conference on the Constructed Environment, Fondazione Querini Stampalia, Venice, Italy. 17-19 November.

Nel, V.J. 2010. Adapting planning education to meet the needs of a new generation of planners. Paper delivered at the South African Planning Institute (SAPI) Conference: Beyond Crisis - Opportunities & Action, Durban International Convention Centre, Durban, South Africa. 13-15 September. Nel, V.J. 2010. Land use management for a developmental local government. Paper delivered at the South African Planning Institute (SAPI) Conference: Beyond Crisis - Opportunities & Action, Durban International Convention Centre, Durban, South Africa. 13-15 September.

Nel, V.J. 2010. Practical spatial planning and community service learning: The Dealesville experiment. Paper delivered at the Association of African Planning Schools (AAPS) Conference: Revitalizing Planning Education in Africa, Dar es-Salaam, Tanzania. 5-8 October.

Pienaar, J.J., Campbell, M.M. & Visser, G.E. 2010. The planning consequences of second-homes in South Africa. Paper delivered at the South African Planning Institute (SAPI) Conference: Beyond Crisis - Opportunities & Action, Durban International Convention Centre, Durban, South Africa. 13-15 September.

Ramabodu, M.S. & Campbell, M.M. 2010. Subsidised housing localities and residential mobility. Paper delivered at the Royal Institution of Chartered Surveyors (RICS) Rural Research Conference (ROOTS 2010), Plumpton College, East Sussex, UK. 13-14 April.

Steÿn, J.J. & Bosman, G. 2010. The story of the great plans of mice and men: Selling sustainable earth construction. Conference proceedings of the Alternative Building Technologies Indaba, Sandton Convention Centre, Johannesburg, South Africa. pp. 193–216.



86

Contact details

Prof. Verna Nel

Faculty of Natural and Agricultural Sciences Department of Urban and Regional Planning University of the Free State PO Box 339 Bloemfontein 9301

 Telephone:
 +27 (0)51 401 2486

 Fax:
 +27 (0)51 444 6550

 E-mail:
 nelvj@ufs.ac.za

 Website:
 www.ufs.ac.za/urpl

Academic staff

Professor: Prof. Verna Nel

Senior Lecturer: Dr Maléne Campbell

Lecturers: Ms Lize Barclay, Messrs PJ Potgieter, Yandisa Mashalaba

Departments in the NATURAL SCIENCES

111

"In spite of delays in the completion of our upgraded building, Chemistry succeeded in its continued pursuit of quality and excellence in pursuit of the strategic priorities of the University of the Free State and the Faculty of Natural and Agricultural Sciences."

Prof. Andreas Roodt

DB Department of Chemistry

Overview

Chemistry is proud of the continued quality and excellence in pursuit of the strategic priorities of the University of the Free State (UFS) and the Faculty of Natural and Agricultural Sciences under difficult infrastructural circumstances. The postgraduate core of Chemistry consisted of ten postdoctoral associates, 20 M.Sc. and 33 Ph.D. students in different sub-disciplines, of whom eight Ph.D. and 13 M.Sc. students graduated during 2010. Accordingly, a significant and sustained research output for 2010 was produced, as manifested by 69 research articles published in international accredited journals and 77 presentations made at local and international conferences.

Facilities

The upgrading of the Moerdyk Building and annexed buildings that house the department on the Main Campus continued. During 2010, the laboratories at the Qwaqwa Campus were upgraded to provide general facilities similar to those on the Main Campus. The overall project to the value of more than R60 million on both campuses had virtually been completed by the end of 2010, after a four and a half-year period. This unprecedented investment in Chemistry by the university management underlines the commitment to create a highly competitive teaching and research unit.



Interruptions due to the renovation process posed a range of unique problems in terms of practical classes, theory classes and research, and placed significant stress on the department. In spite of this, the enthusiasm and commitment of the department's staff were illustrated by the fact that most activities were continued without significant interruptions throughout the year. However, most high-pressure experiments, pivotal to the catalytic work, could not be performed due to the associated safety risks involved.

The support of senior UFS management as well as faculty colleagues who provided office and laboratory space and other support to Chemistry undergraduate and postgraduate students during 2010, are gratefully acknowledged.

The further upgrading of the department's research equipment continued to contribute to a sustained high research output. This new equipment strategy forms part of the UFS vision to be internationally visible, with quality research outputs in niche areas, to provide leadership



Chemistry staff and students at a team-building session at Amanzi Game Reserve.

in advanced training to the African continent student corps, and to establish it as an important player amongst South African universities as well as a competitor internationally.

Activities and achievements

The Department of Chemistry at the UFS hosted CATSA 2010, the 21st Annual Meeting of the Catalysis Society of South Africa in Bloemfontein during November 2010. Some 240 delegates from 25 institutions and eight countries participated in this international meeting. The organising committee consisted of international scientists and Profs. Andreas Roodt, Deon Visser, Gideon Steyl, Dr Johan Venter, Ms Marietjie Schutte and students of the Inorganic Chemistry group. The department also hosted the International School on Fundamental Crystallography (BloemCrystSchool), organised by the International Union of Crystallography (IUCr), during April 2010. Prof. Andreas Roodt was the Chairperson of the organising and scientific committees of both these meetings.

The collaboration between the UFS and SASOL, which supports the extended secondment of Prof. Ben Bezuidenhoudt to the department, continued. An achievement under this agreement is the successful application of *applied process chemistry* to the South African National Research Foundation's (NRF) Technology and Human Resources for Industry Programme (THRIP) from combined inputs of Inorganic, Physical and Organic Chemistry (Profs. Roodt, Swarts and Bezuidenhoudt). This has sourced an additional R3,5 million for the upgrading of equipment and the development of extended capacity.

Teaching aspects at undergraduate level have again been a prime focus of the department. The continued teaching in parallel medium on the Main Campus was quite demanding on individuals and challenged the lecturers to improve constantly, also with respect to using more sophisticated teaching methods and computers during classes. The enthusiasm in terms of lecturing in Chemistry theory and practical classes on both the Main and Qwaqwa Campuses is noted and gratefully acknowledged. Teaching at both the Main and Qwaqwa Campuses generally went well, with the main challenges being infrastructural problems with the laboratories still



At the gala dinner of the 21st Annual Meeting of the Catalysis Society of South Africa (CATSA2010) in Bloemfontein, hosted by UFS Chemistry, are: postdoctoral in UFS Chemistry Dr Nicola Barnard, receiving the cup from Mr Leon de Jager (MD, PoreTech, South Africa) as captain of the winning team of the PoreTech challenge, and Mametsi Sebitlo (M.Sc. student, UFS Physical Chemistry), winner of the CATSA2010 prize for best poster.



Installation of the New Infrared Stopped-Flow apparatus for studying fast chemical reactions. From the left: Dr Johan Venter, Tinus Viljoen and Maryke Steyn (Ph.D. students), Mr Ted King from TG Scientific in the United Kingdom, Profs. Deon Visser and Andreas Roodt.

being inadequate for most of 2010 and a lack of senior staff. The poor quality of students that are attracted is still a big problem, posing a real challenge to maintain the expected standards without having too low a pass rate. The pass rate of the department at first-year level is still low, but significantly higher at second- and third-year levels because of the filtering out of academically weak students.

The Honours course again saw the further refinement of advanced topics and heterogeneous catalysis by Drs Thys Botha and Philip Gibson from SASOL. Advanced topics were introduced and refined by outside scholars in a number of courses in the B.Sc. Honours programme, exposing the Chemistry students to international teachers. These included lectures in the biosynthesis and organic chemistry of secondary metabolites in plants by Prof. Ferreira, industrial and organometallic chemistry by Dr Petrie Steynberg from SASOL and Profs. Gideon Steyl and Jeanet Conradie from the UFS in the standard Honours courses in Organic, Inorganic and Physical Chemistry. The Department of Chemistry underwent an external audit during November 2010 and most aspects of research and teaching as currently practised were complimented by the reviewers. Aspects that require attention have been pointed out and are being addressed.

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

Apart from the national and international collaboration outlined later in the report, one has to note the extent of **national and international collaboration** that is being pursued by the department in all its academic activities.

The **Inorganic Chemistry** group concentrates on Coordination Chemistry, with the primary focus on the integrated investigation of reaction mechanisms through the use of crystallography, spectroscopy,



Setting up experiments in the synthetic laboratory are Kina van der Merwe (M.Sc.) and Leo Kirsten (Ph.D.).

computational chemistry and reaction kinetics. Two research thrusts focus on the *applications to medicine* (radiopharmaceutical and chemotherapeutical agents) and *industrial reactions/homogeneous catalysis/ applied process chemistry*. This research in the group of Prof. Andreas Roodt (NRF B3-rated) continued and the infrastructure was expanded, supported by Profs. Deon Visser, Gideon Steyl (NRF Y2-rated) from Computational Chemistry, Dr Johan Venter and 16 postgraduate students.

Members of the group visited Prof. Trevor Hambley at the University of Sydney, Australia, Prof. Peter Comba at the University of Heidelberg, Germany, Profs. Lothar Helm and André Merbach at the University of Lausanne, Switzerland, Prof. Jwu-Ting Chen at the National Taiwan University, Taipei and Prof. Peter Tasker, visiting professor at the University of São Paolo, Brazil.

The medical research focus in the Roodt group, in collaboration with the University of Missouri in the United States (Dr Hendrik Engelbrecht), Lund University, Sweden (Prof. Ola Wendt) and the University of Zürich, Switzerland (Prof. Roger Alberto), as well as with CANSA (Prof. Connie Medlen, Pharmacology, University of Pretoria and Affiliate Professor, UFS) and PETLabs Pharmaceuticals (Dr Gerdus Kemp), showed good progress and several research reports and articles in international accredited journals were published. Moreover, the project entitled *Development of novel nuclear pharmaceuticals* from Profs. Roodt and Medlen secured another R1,5 million from PETLabs Pharmaceuticals and THRIP. These funds were used to install state-of-the-art equipment in the radiopharmaceutical research laboratory.



Commissioning of UFS Chemistry's powder X-ray diffractometer purchased from SASOL and NRF support and accepting a set of books from the Royal Society of Chemistry (RSC) of South Africa. At the back, from the left: Renier Koen (M.Sc.), Alice Brink and Leo Kirsten (Ph.D.), Prof. Andreas Roodt, Prof. Dave Billing, International scholar in powder diffraction and RSC executive committee member (Wits), Dr Nicola Barnard (Sasol-supported postdoctoral). In front: Theunis Muller (Ph.D.).

Prof. Roodt and his group won the first prize in the South African Government's Department of Trade and Industry (DTI) Annual Technology Awards in the NRF's THRIP category, *Development of Small, Medium and Micro Enterprises*. Prof. Roodt was also a finalist in the category *Best Research Output in the Past 5–10 Years* in the South African Government's Department of Science and Technology's (DST) National Science and Technology Forum (NSTF).

The homogeneous catalysis research in the Inorganic group is driven in close collaboration with SASOL and the Department of Science and Technology at the University of Cape Town's Centre for Excellence in Catalysis, c*change. The focus of the research is on the conversion of simple feedstock molecules into valueadded 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), olefin metathesis and oligomerisation (ethene). Collaboration with SASOL, the North-West University, the Universities of Johannesburg, Cape Town, the Western Cape and Lund University (Sweden) forms part of this thrust. Significant funding was sourced under the *applied process chemistry* theme as noted above.



The research group of Prof. Andreas Roodt won the first prize in the category *Development of Small, Medium and Micro-Enterprises (SMME)* at the annual Department of Trade and Industry's (DTI) award ceremony for the hightechnology project *Development of novel nuclear pharmaceuticals* in the THRIP programme. At the awards ceremony were, from the left: Director-General of the Department of Trade and Industry, Mr Tshediso Matona, Prof. Andreas Roodt, and the Deputy-Minister of Trade and Industry, Ms Bongi Maria Ntuli.

An industrially related project with the Nuclear Energy Corporation of South Africa (NECSA) under the Advanced Metal Initiative (AMI) for selected metal beneficiation of the DST continued and sourced R500 000 for bursaries and project expenses. This enabled four students (Mss Maryke Steyn, Leandra Herbst and Messrs Tinus Viljoen and Renier Koen) to present their results at two overseas conferences in Australia and Germany, respectively.

Apart from CATSA 2010, the Inorganic group also organised two workshops under the new initiative Nuclear Technologies in Medicine and the Biosciences (NTeMBI) of the DST and NECSA.

The collaboration of the Inorganic group with the group of Prof. Ola Wendt from Lund University, Sweden, under the Swedish International Development Agency (SIDA) programme, enabled two students from the department, Messrs Tinus Viljoen and Leo Kirsten, to visit Lund University for research on different projects for two weeks each during 2010. Mr Michael Kondrashov, a Ph.D. student from Lund University, also visited the Main Campus in Bloemfontein under this programme. Prof. Deon Visser continued to co-supervise eight M.Sc. and Ph.D. students in the Inorganic group. He also gave lectures at the 39th International Conference on Coordination Chemistry in Adelaide, Australia during July 2010, the 15th Brazilian Meeting on Inorganic Chemistry in Angra dos Reis, Brazil during August 2010 and the 26th European Crystallographic Meeting in Darmstadt, Germany at the end of August 2010.

Dr Johan Venter gave a lecture at the 24th International Conference on Organometallic Chemistry in Taipei, Taiwan.

Prof. Gideon Steyl was invited to act as advisor and reviewer on the Inter-Ministerial Committee (IMC) dealing with the water ingress and acid mine drainage

A windy excursion on an Alpine lake in Switzerland, following a visit of M.Sc. and Ph.D. students to the École Polytechnique Fédérale de Lausanne, and presenting their research at the 26th European Crystallographic Meeting in Darmstadt, Germany, are (back, from the left): Theunis Muller (invited lecture), Leo Kirsten (poster), Thinus Viljoen (invited lecture), Truidie Venter (poster); and front: Alice Brink (Cambridge Crystallographic Structure Database prize for best poster) and Renier Koen (poster). (AMD) problems in the Witwatersrand gold mining areas convened by the Council of Geosciences, Pretoria. He is the project leader in a joint venture between Eskom and SASOL on the project *Sustainable salt sinks phase II*. He presented two lectures on mine-water-related subjects. The first lecture addressed the effect of groundwater inflow in mine voids and the second lecture dealt with the chemical composition of mine water and the effect it has on the local environment. Prof. Steyl was appointed on the reference group for the Water Research Commission (WRC) project *The use of isotope hydrology to characterise and assess water resources in South(ern) Africa (K5/1907)*. He is also the project leader in a small-scale study of the WRC to investigate uranium oxide



Prof. Andrew Marston, B-rated scientist appointed in UFS Chemistry, explaining intricate detail of the new laboratories to the Rector, Prof. Jonathan Jansen, on completion of the West Wing of the Chemistry Building. At the back are Profs. Niel Viljoen (Vice-Rector: Strategic Planning) and Andreas Roodt (Head of Department, UFS Chemistry).





Mrs Bernadette van Tonder from Organic Chemistry in the synthetic laboratory.

occurrence in South African regional waters with a dual perspective on groundwater and surface water.

Prof. Andreas Roodt visited Prof. Roger Alberto from the University of Zürich in Switzerland to discuss collaborative research. He also gave invited lectures at the University of Cape Town and at the 39th International Conference on Coordination Chemistry in Adelaide, Australia, during July 2010 and presented a keynote lecture at the 26th European Crystallographic Meeting in Darmstadt, Germany at the end of August 2010. Prof. Roodt had various consulting sessions with the management of PETLabs Pharmaceuticals and SASOL.

The Roodt group members contributed to more than 30 research articles in international Chemistry literature and presented more than 30 invited lectures and conference posters, twelve of which were oral presentations and one keynote – ten at international venues in Australia, Taiwan, Germany and Brazil.

The **Organic and Process Chemistry** division is headed by Profs. Ben Bezuidenhoudt, Andrew Marston and Jan van der Westhuizen, with Dr Susan Bonnet as senior lecturer and Ms Anke Wilhelm-Mouton as lecturer. 17 M.Sc. and Ph.D. students were studying towards higher degrees, while four postdoctoral workers were actively working in the division.

The highlight of the year was without a doubt the occupation of the long-awaited renovated research laboratories during June/July 2010. The modern laboratories, combined with the latest state-of-the-art instruments, put the Department of Chemistry and the division of Organic and Process Chemistry among the best-equipped universities in the country and on a par with world-class international universities.

Prof. Andrew Marston contributed widely to the activities of the division and obtained a B3-rating from the NRF. He also established research collaborations with a number of institutions, i.e. the University of Bergen in Norway (Prof. Stein-Ove Doskeland) and the University of Oslo in Sweden (Prof. Berit Paulsen), the Tshwane University of Technology, the University of the Witwatersrand and the Agricultural Research Council (ARC) Infruitec-Nietvoorbij. Prof. Marston also obtained new research funding from the European Union (EU) and the South African Rooibos Tea Council. He also acted as reviewer of research proposals for the NRF's Revised Thuthuka Programme, the South Africa/Japan Society for the Promotion of Science Research Partnership Programme and the European Research Council.

Prof. Jan van der Westhuizen continued his collaboration with Parexel International and finding industrial applications for flavonoid research that led to the filing of two more patents on the synthesis of flavonoids. Prof. Van der Westhuizen also obtained an L-rating from the NRF, bringing the number of rated scientists in the division to two. During June/July 2010, Dr Bonnet visited Cambridge University in the United Kingdom to study the use of ¹³C Solid State NMR in the identification and fingerprinting of synthesised flavonoids and tannin extracts with Prof. David Reid. If successful, this technique could be applied to solving problems experienced in the wattle-extract– based leather-tanning industry.

The Organic and Process Chemistry division also brought colleagues to the department for talks on topics of interest to the division at the department's Tuesday seminar series. In this regard, Prof. Daneel Ferreira, an international expert on flavonoid research, as well as several other international and local academics, including Profs. Matthias Hamburger from the University of Basel, Switzerland, and Berit Paulsen from the University of Oslo, Sweden, addressed the department on their respective fields of interest and expertise. Profs. Ferreira and Paulsen also spent additional time with students in the department discussing their research.

Staff and students from the division participated in several international and national conferences. In this regard, five staff members and five students attended

the 11th Frank Warren Conference of the South African Chemical Institute hosted by the University of KwaZulu-Natal during January 2010. Four lectures (one on invitation by Ms Wilhelm-Mouton) and six posters were presented. The group also participated in several other conferences, such as the 39th International Conference on Coordination Chemistry (Adelaide, Australia, July 2010), the 7th International Symposium on the Chromatography of Natural Products (Lublin, Poland, June 2010), the 25th International Conference on Polyphenols (Montpellier, France, August 2010), the 11th Tetrahedron Symposium (Beijing, China, June 2010), the 7th Tannin Conference (Berlin, Germany, August 2010), CATSA 2010 (Bloemfontein, November 2010) and the Bruker Nuclear Magnetic Resonance (NMR) Meeting at Hermanus, where six lectures (two plenary lectures) and four posters were presented.

The outputs from the division were further complemented by the publishing of research results in ten papers and the graduation of four M.Sc. and one Ph.D. student.

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

The Qwaqwa Campus arm of the Department of Chemistry has again done very well in terms of research and teaching during 2010 and 14 research articles were published. A highlight for the Qwaqwa Campus was the renovation of all the Chemistry laboratories, which now enables students and supervisors alike to do research in state-of-the-art facilities. Five Master's and eight Ph.D. students were registered for Chemistry at the Qwaqwa Campus in 2010, with one postdoctoral fellow.



Prof. Riaan Luyt and some of his postgraduate students in the new instrument laboratory of the Polymer Science group. In front, from the left to the right: Puseletso Mofokeng, Motshabi Sibeko, Tshwafo Motaung and Prof. Luyt. At the back, from left to right: Sibusiso Ndlovu, Teboho Mokhena, Thabang Mokhothu and Jonas Mochane.



A delicate tight-rope balancing act by postdoctoral associate in Organic Chemistry, Dr Mirek Sisha, 'supervised' by Mr Tsietsi Tsotetsi (centre back), Chemistry subject head at the Qwaqwa Campus. Postgraduate students are looking on during a team-building session at Amanzi Game Reserve.

The Luyt group is part of different official bilateral collaborative research projects. The first is with Prof. Massimo Messori from the University of Modena and Reggio Emilia in Italy on a project entitled *Nanoparticles for polymers reinforcement: A step towards the sustainable development of advanced materials.* A student of Prof. Messori, Ms Maria Elena Darecchio, spent 30 days in the Qwaqwa laboratories during April/May 2010. Prof. Messori visited the department for ten days during September 2010. One of the Qwaqwa Campus students, Mr Tshwafo Motaung, spent 30 days in Modena during June/July 2010 and Prof. Luyt visited Prof. Messori's group for ten days during June 2010. A new NRF funded collaboration between the two groups has already been approved for 2011–2013.

Another two collaborative projects are with Dr Jozef Kovács from the Budapest University of Technology and Economics, Hungary, entitled *Development and investigation of injection moulded, natural fibre reinforced composites using biodegradable matrix* and with Dr Igor Krupa from the Polymer Institute of the Slovak Academy of Sciences, Bratislava, on a project entitled *Polymeric phase change composites for advanced thermal energy storage applications.* Dr Krupa and Prof. Ivan Chodak visited the Polymer division laboratories for ten days during November 2010. Furthermore, the Luyt group is collaborating on several projects with Dr Vladimir Djoković from the Vinća Institute of Nuclear Sciences, Belgrade, Serbia. Dr Djoković spent three months at the UFS with the Luyt group. Nationally the Luyt group is collaborating with Prof. Walter Focke of the Institute for Applied Materials at the University of Pretoria on a project entitled *Graphitefilled polyethylene/wax phase-change blends for energy storage applications*, as well as with Prof. Albert van Reenen from Stellenbosch University on a project entitled *Wood-polymer composites utilising degraded polyolefins as compatibilisers*.

Prof. Luyt is also the leader of one of the university's NRFfunded research niche areas, namely modified polymers, as well as one of the focus areas within the university's Research Cluster 5: Material and Nano-Sciences.

As part of these collaborations, a number of national and international visitors visited the department at the Qwaqwa Campus. There was also close collaboration with the Polymer Institute from Stellenbosch University in terms of Honours training. Three staff members from this institute (Profs. Klumperman, Van Reenen and Mallon) came to the Qwaqwa Campus to lecture to the Honours students. Prof. Luyt spent one week at Stellenbosch University lecturing to their Honours students.

The research group further acquired a new thermal conductivity meter that is used to measure thermal conductivity in polymer blends and composites designed to be used as phase-change materials for energy storage. A further R706 000 was received from the NRF to purchase a Scanning Electron Microscope (SEM).



The **Physical Chemistry** division has two research groups headed by Profs. Jannie Swarts and Jeanet Conradie, respectively. At present, Drs Langner and Erasmus are developing their own autonomous research topics.

Prof. Swarts is currently C1-rated by the NRF and Prof. Conradie C3. Both held NRF research grants, while Dr Langner is the holder of a NRF Thuthuka grant. The Swarts group was also funded by THRIP, industry research grants from SASOL and internationally by a grant jointly sponsored by the Deutche Forschungsgemeinschaft (DFG) and the NRF.

Both Profs. Conradie and Swarts were peer reviewers for the NRF in evaluating the quality of the research outputs of other researchers and for advanced bursary applications. Prof. Swarts also contributed in the same way to the Irish Health Board. Both also frequently evaluated international publications as peer reviewers, are external examiners for M.Sc. and Ph.D. degrees of candidates at other universities and act as moderators for third-year and Honours courses at other universities. Ph.D. student Chris Joubert in front of the sophisticated fume hood housing the new reduction oven used for the study of heterogeneous catalysis.

The main research question of the Swarts research group concerns synthetic and physical chemistry aspects of multinuclear metallocenes. The group currently focuses on five projects, i.e. 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; and industrial studies on carboxylato complexes in collaboration with SASOL.

The Conradie research group 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 currently being investigated: Transitionmetal porphyrin and related compounds; 0,0'-Chelated titanocene and titanium complexes; Beta-diketonatocarbonyl complexes of rhodium(I) and rhodium(III) and Dithizonato compounds of transition metal complexes.

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

During research visits to Europe, Prof. Swarts paid research visits to Prof. Henry Lang at the Chemnitz University of Technology, Germany and to Prof. Hans Niemantsverdriet of the Schuit Institute of Catalysis at the Eindhoven University of Technology, The Netherlands. Dr Conradie visited the Department of Physical Chemistry, University of Tromsø in Norway. During these visits, both staff members presented research lectures.

Three staff members of the Physical Chemistry division spent part of 2010 on sabbatical leave, namely Prof.

Bidding farewell to the old Physical Chemistry laboratory were Dr Lizette Erasmus (in front), Prestige Scholar under the Rector's new initiative, and other members of the Physical Chemistry group. Conradie (three months), Dr Langner (six months) and Dr Erasmus (three months). They visited Prof. Hans Niemantsverdriet in Eindhoven, The Netherlands, to enhance different aspects of the UFS Department of Chemistry's research on heterogeneous catalysis, partly funded by SASOL. They also attended several summer schools and workshops, including the Integrated Design of Catalytic Nanomaterials for Sustainable Production (IDECAT) Summer School on Computational Methods for Materials Science and Catalysis in Lyon, France, during May 2010 and the Materials Studios Workshop of the Centre for High Performance Computing (CHPC) at the Council for Scientific and Industrial Research (CSIR), Pretoria, during September 2010. Furthermore, they attended the Gaussian Workshop in Cape Town from 8-9 December 2010, and the Ziegler-Natta Work Group of the Dutch Polymer Institute in Noordwijkerhout, The Netherlands, during March 2010.

The industry research collaboration of the Swarts group led to visits to the UFS by Drs Thys Botha and Philip Gibson, both from SASOL, on various industry-related research issues with respect to heterogeneous catalysis. Prof. Henry Lang from the Chemnitz University of Technology in Germany paid a research visit to Prof. Swarts.

Highlights from the Physical Chemistry division include the move into new labs after four years of being temporarily housed in different locations. Prof. Swarts

Prof. Jannie Swarts, second from the right, explaining intricate detail of the new laboratories to the Rector, Prof. Jonathan Jansen, on completion of the West Wing of the Chemistry Building. Looking on is Ms Adéle van As and postdoctoral associate Dr Uwe Siegert.





99





gave a keynote lecture at CATSA 2010 in November 2010 and M.Sc. student Ms Mametsi Sebitlo received the prize for the best student contribution at the same conference, the third time that one of the Swarts group students received the award. Dr Langner purchased a special oven with fine temperature control up to 300°C and a bomb reactor for the synthesis of Metal Organic Framework (MOF) nano-particles. The Micromeritics ASAP 2020 gas adsorption apparatus and Seteram Scanning Differential Calorimeter, as well as a reduction oven were deployed. The total value of the apparatus amounts to R3 million.

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

The Analytical Chemistry group was involved in a number of analytical and inorganic projects during 2010. These involved the dissolution, quantification and method validation of a number of inorganic and ore samples such as zircon, tantalite and columbite to establish methods to identify and quantify the different elements in these samples accurately. Some of these projects are done in close cooperation with industrial partners such as the NECSA AMI of the DST and Thuthuka Group Limited. Microwave and acid dissolution procedures were also employed, while Inductively-Coupled Plasma Optical Emission Spectroscopy (ICPOES), Atomic Absorption Spectroscopy (AAS) and Graphite Furnace AAS, Ultraviolet/ visible and Infrared Spectroscopy were used for the identification and quantification of the different elements, with ISO 17025 criteria as benchmark. Techniques such

Preparing solutions for ICP analysis are Analytical Chemistry postgraduate students supported by NECSA scholarships under the DST AMI programme, Steven Lotter (left, Ph.D.) and Tommy Theron (best M.Sc. student 2010).

as X-ray diffraction and X-ray fluorescence, Differential Scanning Calorimetry (DSC) and Thermal Gravimetric Analysis (TGA) were used during these studies. Elements that are currently being investigated are niobium, tantalum, zirconium and rhodium. The LECO microanalyser has been commissioned and tested. C-, H-, N-, O-, and S-analyses have been carried out on a number of organic and organometallic compounds.

The group is also involved in different Inorganic Chemistry projects, i.e. kinetic and structural studies of organometallic complexes of Iridium (I) and Rhodium (I) oxidative addition reactions, kinetic and structural studies of Rhenium (V) and Osmium (VI) cyano complexes, as well as some Cobalt and Chromium aqueous chemistry. All these studies made use of XRD, IR UV/vis, NMR and computational methods.

Another study involves the investigation of photochromic reactions in different transition-metal complexes, with potential applications in high-density, optical-molecularswitching mechanisms. Instrumental techniques such as Pulsed Laser, UV/visible, IR, NMR, Cyclic-Voltammetry, Quantum Computational Chemistry (ADF & Gaussian) and X-ray Crystallography are employed in these studies.

Cooperation with NECSA was continued and they are still funding four students to do research on the establishment of digestion methods and element quantification in plasma-dissociated and natural zircon as well as tantalite minerals. Cooperation with Thuthuka Group Limited continued and routine analyses were carried out on samples supplied by them.

Mutual collaboration between Dr Von Eschwege and Prof. Heinrich Schwoerer of the Laser Research Institute (LRI) at Stellenbosch University (Physics) exists to use ultra-high speed spectroscopy (Femto seconds) to investigate photochromic inorganic compounds. He also

101

attended the Centre for High Performance Computing Workshop on *Gaussian* quantum calculations in Cape Town during December 2010 and gave a guest lecture at the Department of Chemistry of the University of Bayreuth, Germany during the year. Dr Von Eschwege also presented a poster at the XXIII IUPAC Photochemistry Symposium in Ferrara, Italy, during July 2010.

Prof. Purcell and Dr Von Eschwege contributed to different Eskom Science Expo projects, which were held at the UFS in July/August 2010.

Additional research-related outputs

Different researchers of the Department of Chemistry participated in the UFS Material and Nanosciences Cluster (MNS). Profs. Riaan Luyt, Jannie Swarts and Andreas Roodt are three of the four focus-area leaders and Prof.

Forty-two delegates from eight countries at BloemCrystSchool, the International School on Fundamental Crystallography from the IUCr, hosted by the department in Bloemfontein. Three of the six micro-symposium presenters were, in front, from the left: Profs. Moys Aroyo, (Bilbao, Spain), and Massimo Nespolo (Nancy, France), as well second from the right: Dr Melanie Rademeyer, University of Pretoria. Roodt is the interim cluster coordinator appointed by the UFS. Seven students were supported from the MNS Cluster during 2010, which yielded more than 20 research papers. Prof. Jan van der Westhuizen participates in the Advanced Biomolecular Research Cluster of the UFS.

Mss Marietjie Schutte and Alice Brink (Advanced Biomolecular Research Cluster) and Ellen Kuo (MNS Cluster) hold prestigious Ph.D. scholarships under this initiative.

Prof. Swarts was coordinator and principle negotiator for new apparatus purchases for research for the Faculty of Agricultural and Natural Science.

Prof. Roodt, as member of the Executive Committee of the European Crystallographic Association (ECA), attended the Executive Meetings in Budapest, Hungary (February 2010) and Darmstadt, Germany (August 2010). He is the Vice-President of the ECA and member of the International Scientific Committee of the 26th European Crystallographic Meeting (ECM26). He acted as Chairperson of the 5th Max Perutz Prize Committee of the ECA, the 3rd Lewy Bertaut Prize Committee of the ECA, as well as the Poster Prize Committee at ECM26. Prof. Roodt also served on the international editorial board of the *Journal of Coordination Chemistry*.



National and international collaboration

More than 20 prominent international scientists visited the department. They presented lectures and held research discussions with researchers and postgraduate students at CATSA 2010 during November 2010, and at BloemCryst School and in the departmental research seminar programme, which continued very successfully with approximately thirty research presentations during 2010.

They are Profs. Massimo Messori (University of Modena and Reggio Emilia, Italy), Massimo Nespolo (University on Nancy, France), Ola Wendt (Lund University, Sweden), Daneel Ferreira (University of Mississippi, United States), Henry Lang (Chemnitz University of Technology, Germany), Bert Klumperman (Polymer Science, Stellenbosch University, South Africa), Hartmut Frank (University of Bayreuth, Germany), Bruce Gates (University of California at Davis, USA), Mois Aroyo (University of Bilbao, Spain), Dave Billing (University of the Witwatersrand, South Africa), Drs Ettiene Snyders, Johann Nel, Jan Rijn Zeevaart and Neil Jarvis (NECSA), Fanie Otto, Philip Gibson and Thys Botha (SASOL), Gerdus Kemp (PETLabs Phamaceuticals, Pretoria), Vladimir Djoković (Vinca Institute, Belgrade, Serbia), Igor Krupa and Ivan Chodak (Polymer Institute, Bratislava, Slovak Republic) and Jozef Kovács (Budapest University of Technology and Engineering, Hungary).

Community service

Prof. Jannie Swarts and Mrs Ina du Plessis organised the 16th successive science quiz competition, MINQUIZ, one of the faculty's five community-service flagships and jointly sponsored by the UFS and MINTEK. A group of some 200 pupils, comprising the three top Physical Science learners from each secondary school in the Free State Province, visited the Main Campus during May 2010, where they were exposed to information on career opportunities in Chemistry, Physics and Geology. Six winning schools in two categories were awarded financial prizes to enhance their school science laboratories.

Prof. Deon Visser and Dr Johan Venter presented the Chemistry Magic Show on seven occasions at different Bloemfontein schools and other venues. This initiative illustrates different aspects of simple, but exciting experiments in a tangible way to create further awareness for Chemistry and to inspire primary and secondary school learners and teachers for the subject.

Prof. Steyl was involved in a community service project on the water supply at Eunice Secondary School and legal water usage in conjunction with the South African Police Service (SAPS) (Free State) and the Public Prosecutor's Office (Bloemfontein).

Mss Moipone Mokoena, Mpondi Molefe, Maryam Jordaan and Mrr Mphiso Mngomezulu, Tsietsi Tsotetsi and Mr Tswafu Motaung attended a number of workshops offered by the UFS Centre for Higher Education Studies and Development (CHESD), as well as skills development in terms of the utilisation of computer programmes. Mrs Mokoena and Mrs Jordaan also registered for the short course SPALHE (assessor training) offered by CHESD.

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

Staff matters

Unfortunately, Mrs Dorine Masiangoako resigned from her position as lecturer in Inorganic Chemistry at the Qwaqwa Campus. Messrs Thabu Mokhothu, Jeramia Sefadi, Mphiso Mngomezulu and Prof. Riaan Luyt assisted on a part-time basis to take care of her lecturing responsibilities.

Dr Rebotsamang Shago, lecturer in the Analytical Chemistry division on the Main Campus, obtained her Ph.D. degree during 2010.

Prof. Van der Westhuizen obtained an L-rating from the NRF, bringing the number of rated scientists in the Department of Chemistry to eight.



research OUTPUTS

Research articles

Bem, D.B., Swart, H.C., Luyt, A.S., Coetzee, E. & Dejene, F.B. 2010. Properties of Green SrAl₂O₄ Phosphor in LDPE and PMMA Polymers. *Journal of Applied Polymer Science* 117: 2635-2640.

Božanić, D.K., Trandafilović, L.V., Luyt, A.S. & Djoković, V. 2010. 'Green' synthesis and optical properties of silver-chitosan complexes and nanocomposites. *Reactive & Functional Polymers* 70: 869–873.

Brink, A., Roodt, A., Steyl, G. & Visser, H.G. 2010. Steric vs. electronic anomaly observed from iodomethane oxidative addition to tertiary phosphine modified rhodium(I) acetylacetonato complexes following progressive phenyl replacement by cyclohexyl [PR₃ = PPh₃, PPh₂Cy, PPhCy₂ and PCy₃]. *Dalton Transactions* 39: 5572-5578.

Capar, C., Hansen, L-K., Conradie, J. & Ghosh, A. 2010. β-octabromomeso-tris(pentafluorophenyl) corrole: reductive demetalationbased synthesis of a heretofore inaccessible, perhalogenated freebase corrole. Journal of Porphyrins and Phthalocyanines 14: 509–512.

Cloete, N., Visser, H.G. & Roodt, A. 2010. [N,N-Bis(diphenylphosphino) propylamine- $\kappa^2 P$,P'] dichloridoplatinum(II). Acta Crystallographica Section E E66: m51-m52.

Conradie, J. & Ghosh, A. 2010. Electronic Structure of an IronPorphyrin-Nitrene Complex. *Inorganic Chemistry* 49: 243–248.

Conradie, J. 2010. A DFT and NBO Analysis of the Bonding in Titanocenyl Complexes containing a Fivemembered L,L'-cyclic Ligand: L,L' = 0,0'; S,S' or Se, Se'. *South African Journal of Chemistry* 63: 65-71.

Conradie, J. 2010. Bonding in Titanocenyl Complexes Containing 0,0'-Cyclic Ligands. *International Journal of Quantum Chemistry* 110: 1100-1107.

Conradie, J., Hopmann, K.H. & Ghosh, A. 2010. Understanding the Unusually Straight: A Search For MO Insights into Linear {FeNO}⁷. *Journal of Physical Chemistry B* 114: 8517–8524.

Conradie, M.M. & Conradie, J. 2010. A density functional theory study of the oxidative addition of methyl iodide to square planar $[Rh(acac)(P(OPh)_3)_2]$ complex and simplified model systems. *Journal of Organometallic Chemistry* 695: 2126–2133.

Conradie, M.M. & Conradie, J. 2010. Vereenvoudigde chemiese modellering van rodiumkatalisator - Wen of verloor? Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie 29(3): 147-148.

Conradie, M.M., Conradie, J. & Ghosh, A. 2010. Capturing the spin state diversity of iron(III)-aryl porphyrins: OLYP is better than TPSSh. *Journal of Inorganic Biochemistry* 105: 84-91.

Dennis, C.R., Potgieter, I.M. & Basson, S.S. 2010. A kinetic study of the reduction of the octacyanomolybdate(V) ion by the hydroxide ion. *Reaction Kinetics Mechanisms and Catalysis* 99: 63-68.

Dennis, I., Pretorius, J. & Steyl, G. 2010. Effect of fracture zone on DNAPL transport and dispersion: a numerical approach. *Environmental Earth Science* 61: 1531–1540.

Dikobe, D.G. & Luyt, A.S. 2010. Comparative study of the morphology and properties of PP/LLDPE/wood powder and MAPP/LLDPE/wood powder polymer blend composites. *Express Polymer Letters* 4: 729-741.

Dikobe, D.G. & Luyt, A.S. 2010. Morphology and Thermal properties of Maleic Anhydride Grafted Polypropylene/Ethylene-Vinyl Acetate Copolymer/Wood Powder Blend Composites. *Journal of Applied Polymer Science* 116: 3193-3201.

Engelbrecht, I., Visser, H.G. & Roodt, A. 2010. Bis[N,N-bis(diphenylphosphanyl) pentylamine- $\kappa^2 P, P'$]platinum(II) bis(hexafluoridophosphate) dichloromethane disolvate. Acta Crystallographica Section E E66: m922-m923.

Engelbrecht, I., Visser, H.G. & Roodt, A. 2010. Bis[N,N-bis(diphenylphospanyl)cyclo-hexylamine- $\kappa^2 P, P'$]platinum(II) bis(hexafluoridophosphate) dichloromethane disolvate. Acta Crystallographica Section E E66: m994-m995.

Engelbrecht, I., Visser, H.G. & Roodt, A. 2010. *N*,*N*-Bis(diphenylphosphanyl) cyclo-pentanamine. *Acta Crystallographica Section E* E66: 03322-03323.

105

Engelbrecht, I., Visser, H.G. & Roodt, A. 2010. N,N-Bis(diphenylphosphanyl) cyclo-propylamine. Acta Crystallographica Section E E66: o2881.

Fourie, E., Swarts, J.C., Lorcy, D. & Bellec, N. 2010. Synthesis, Substitution Kinetics, and Electrochemistry of the First Tetrathiafulvalene-Containing Beta-Diketonato Complexes of Rhodium(I). Inorganic Chemistry 49: 952-959.

Gericke, H.J., Barnard, N.I., Erasmus, E., Swarts, J.C., Cook, M.J. & Aquino, M.A.S. 2010. Solvent and electrolyte effects in enhancing the identification of intramolecular electronic communication in a multi redoxactive diruthenium tetraferrocenoate complex, a triple-sandwiched dicadmium phthalocyanine and a ruthenocene-containing Betadiketone. *Inorganic Chimica Acta* 363: 2222-2232.

Grove, J.J.C., Van Heerden, P.S., Ferreira, D. & Bezuidenhoudt, B.C.B. 2010. Conversion of pravastatin into an advanced intermediate for the synthesis of the HMG-CoA reductase inhibitor BB-476. *Tetrahedron Letters* 51: 57-59.

Hato, M.J., Ray, S.S. & Luyt, A.S. 2010. The Thermal and Rheological Properties of POSS-Containing Poly(methyl methacrylate) Nanocomposites. *Advanced Science Letters* 3: 1-7.

Herbst, L., Koen, R., Roodt, A. & Visser, H.G. 2010. (Acetylacetonato- κ^2 0,0') chloride-trimethanolatoniobium(V). *Acta Crystallographica Section E* E66: m801-m802.

Hildebrandt, A., Rűffer, T., Erasmus, E., Swarts, J.C. & Lang, H. 2010. A Star-Shaped Supercrowded 2,3,4,5-Tetraferrocenylthiophene: Synthesis, Solid-State Structure, and Electrochemistry. *Organometallics* 29: 4900-4905.

Hill, T.N. & Steyl, G. 2010. [*N*,*N*'-Bis(4-chlorophenyl)pentane-2,4diiminato]-dicarbonylrhodium(I). Acta Crystallographica Section E E66: m205.

Hopmann, K.H., Stuurman, N.F., Muller, A. & Conradie, J. 2010. Substitution and Isomerization of Asymmetric β -Diketonato Rhodium(I) Complexes: A Crystallographic and Computational Study. *Organometallics* 29: 2446-2458.

Johnson, M.T., Johansson, R., Kondrashow, M.V., Steyl, G., Ahlquist, M.S.G., Roodt, A. & Wendt, O.F. 2010. Mechanisms of the CO_2 Insertion into (PCP) Palladium Allyl and Methyl σ -Bonds. A Kinetic and Computational Study. *Organometallics* 29: 3521– 3529.

Kotze, P.D.R., Roodt, A., Venter, J.A. & Otto, S. 2010. (*N*-Benzoyl-*N'*-phenylthiourea- κ S)-chlorido(η^{4} -1,5-cyclooctadiene)-rhodium(I). Acta Crystallographica Section E E66: m1028-1029.

Kuhn, A. & Conradie, J. 2010. Electrochemical and density functional theory study of bis(cyclo-pentadienyl) mono(beta-diketonato) titanium(VI) cationic complexes. *Electrochimica Acta* 56: 257-264.

Luyt, A.S., Krupa, I., Assumption, H.J., Admad, E.E.M. & Mofokeng, J.P. 2010. Blends of polyamide 12 and maleic anhydride grafted paraffin wax as potential phase change materials. *Polymer Testing* 29: 100–106.

Marston, A., Cawood, M., Van der Westhuizen, J. & Zietsman P. 2010. High-performance countercurrent chromatography for the efficient isolation of alkaloid acetylcholinesterase inhibitors from *Nerine* species (Amaryllidaceae). *Planta Medica* 76: 1208.

Marston, A., Van der Westhuizen, J.H. & Zietsman, P. 2010. Investigation of South African Amaryllidaceae for inhibitors of acetylcholinesterase. *Planta Medica* 75: 944.

Mishra, S.B., Mishra, A.K., Luyt, A.S., Revaprasadu, N., Hillie, K.T., Van

der Merwe Steyn, W.J., Coetsee,

E. & Swart, H.C. 2010. Ethyl Vinyl Acetate Copolymer-SrAl₂O₄:Eu,Dy and Sr₄Al₁₄O₂₅:Eu,Dy Phosphor-Based Composites: Preparation and Material Properties. *Journal of Applied Polymer Science* 115: 579-587.

Mngomezulu, M.E., Luyt, A.S. & Krupa,

I. 2010. Structure and Properties of Phase Change Materials Based on HDPE, Soft Fischer-Tropsch Paraffin Wax, and Wood Flour. *Journal of Applied Polymer Science* 118: 1541-1551.

Molefi, J.A., Luyt, A.S. & Krupa, I. 2010. Comparison of LDPE, LLDPE and HDPE as matrices for phase change materials based on a soft Fischer-Tropsch paraffin wax. *Thermochimica Acta* 500: 88-92.

Molefi, J.A., Luyt, A.S. & Krupa, I. 2010. Comparison of the influence of copper micro- and nano-particles on the mechanical properties of polyethylene/copper composites. Journal of Material Science 45: 82-88.

Molefi, J.A., Luyt, A.S. & Krupa, I. 2010. Investigation of Thermally Conducting Phase-Change Materials Based on Polyethylene/Wax Blends Filled with Copper Particles. Journal of Applied Polymer Science 116: 1766-1774.

Mosoabisane, T. & Van der Westhuizen, J. 2010. A novel approach towards the syntheses of proanthocyanidins and biflavonoids. *Planta Medica* 76: 1164.

Motaung, T.E. & Luyt, A.S. 2010. Effect of maleic anhydride grafting and the presence of oxidized wax on the thermal and mechanical behaviour of LDPE/silica nanocomposites. *Materials Science and Engineering A* 527: 761-768.

Muller, A.J., Conradie, J., Purcell, W., Basson, S.S. & Venter, J.A. 2010. Characterization and Oxidative Addition Reactions of Different Rhodium and Iridium Triazolato Complexes. *South African Journal of Chemistry* 63: 11–19. Nete, M., Purcell, W., Snyders, E. & Nel, J.T. 2010. Alternative dissolution methods for analysis of niobium containing samples. South African Journal of Chemistry 63: 130–134.

Osthoff, G., Hugo, A., Bouwman, H., Buss, P., Govender, D., Joubert, C.C. & Swarts, J.C. 2010. Comparison of the lipid properties of captive, healthy wild, and pansteatitis-affected wild Nile c rocodiles (*Crocodylus niloticus*). *Comparative Biochemistry and Physiology, Part A* 155: 64-49.

Otto, S. 2010. Structure and solution behaviour of cyclooctadiens complexes of platinum(II). *Inorganica Chimica Acta* 363: 3316–3320.

Patra, A.K., Dube, K.S., Papaefthymiou, G.C., Conradie, J., Ghosh, A. & Harrop, T.C. 2010. *Inorganic Chemistry* 49: 2032-2034.

Schutte, M., Visser, H.G. & Roodt, A. 2010. Tetraethylamonium bromidotricarbonyl-(tropolonato) rhenate(I). Acta Crystallographica Section E E66: m859-m860.

Sisa, M., Bonnet, S.L., Ferreira, D. & Van der Westhuizen, J.H. 2010. Photochemistry of Flavonoids. *Molecules* 15: 5196–5245.

Steyl, G., Muller, T.J. & Roodt, A. 2010. Bis(2-(*N*-methylamino)troponato) copper(II). Acta Crystallographica Section E E66: m1508-m1508.

Suthiram, J., Zeevaart, J.R., Visser, H.G. & Roodt, A. 2010. Tetraethylammonium tricarbonylchlorido(quinoxaline-2carboxylato- $\kappa^2 N^1$,0)rhenate(I). Acta Crystallographica Section E E66: m1042-m1043.

Tábi, T., Sajó, I.E., Szabó, F., Luyt, A.S. & Kovács, J.G. 2010. Crystalline structure of annealed polylactic acid and its relation to processing. *eXPRESS Polymer Letters* 4: 659–668.

Tangen, E., Conradie, J., Franz, K., Friedle, S., Telser, J., Lippard, S.J. & Ghosh, A. 2010. Electronic Structure of a Paramagnetic {MNO}⁶ Complex: MnNO 5,5-Tropocoronand. *Inorganic Chemistry* 49: 2701-2705.

Van der Merwe, K.A., Visser, H.G. & Venter, J.A. 2010. Pyridinium diaquabis(methylene-diphosphonato- κ^2 0,0')chromate(III) tetrahydrate. Acta Crystallographica Section E E66: m1011-m1012.

Van der Westhuizen, H.J., Meijboom, R., Schutte, M. & Roodt, A. 2010. Mechanism for the Formation of Substituted Manganese(V) Cyanidonitrido Complexes: Crystallographic and Kinetic Study of the Substitution Reactions of *trans*-[MnH(H₂O)(CN),]²⁻ with Monodentate Pyridine and Bidentate Pyridine-Carboxylate Ligands. *Inorganic Chemistry* 49: 9599–9608.

Van der Westhuizen, H.J., Roodt, A. & Meijboom, R. 2010. Equilibrium and kinetic studies of reactions of $[MnN(H_2O)(CN)_4]^{2-}$ with monodentate ligands and the molecular structure of $[MnN(NCS)(CN)_4]^{3-}$. Polyhedron 29: 470–476.

Van der Westhuizen, H.J., Roodt, A. & Meijboom, R. 2010. Kinetics of thermal decomposition and of the reaction with oxygen, ethane and 1-octene of first generation Grubbs' catalyst precursor. *Polyhedron* 29: 2776-2779.

Van Tonder, J.H., Bezuidenhoudt, B.C.B. & Janse van Rensburg, J.M. 2010. Racemic tricarbonyl(A-η⁶-flavan)chromium(0). *Acta Crystallographica Section E* E66: m1086.

Van Tonder, J.H., Bezuidenhoudt, B.C.B. & Janse van Rensburg, J.M. 2010. Racemic tricarbonyl(η⁶-7methoxy-flavan)chromium(0). *Acta Crystallographica Section E* E66: m907-m908.

Van Tonder, J.H., Marais, C., Cole-Hamilton, D.J. & Bezuidenhoudt, B.C.B. 2010. Regioselective Hydrogenation of α,β-Unsaturated Ketones over Wilkinson's Catalyst. *Synthesis*: 0421-0424.

Van Tonder, J.H., Muller, T.J. & Bezuidenhoudt, B.C.B. 2010. 2',3,4,4'-Tetramethoxy-chalcone. *Acta Crystallographica Section E* E66: 01798-01799.

Van Tonder, J.H., Muller, T.J. & Bezuidenhoudt, B.C.B. 2010. 2',3,4,4',5-Penta-methoxychalcone. *Acta Crystallographica Section E* E66: 02889-02890.

Venter, G.J.S., Steyl, G. & Roodt, A. 2010. 4-(2-Methylanilino)pent-3-en-2-one. Acta Crystallographica Section E E66: 01593-01594.

Venter, G.J.S., Steyl, G. & Roodt, A. 2010. 4-[(4-Methylphenyl) amino]pent-3-en-2-one. Acta Crystallographica Section E E66: o3011-o3012.

Viljoen, J.A., Visser, H.G. & Roodt, A. 2010. Tetrakis(1,3-diphenylpropane-1,3-dionato)hafnium(IV). Acta Crystallographica Section E E66: m1053-m1054.

Viljoen, J.A., Visser, H.G. & Roodt, A. 2010. Tetrakis(8-quinolinolato- $\kappa^2 N, O$) hafnium(IV) dimethylformamide solvate monohydrate. Acta Crystallographica Section E E66: m603-m604.

Visser, H.G. & Clegg, J.K. 2010. Bis(tetraphenylarsonium) di-µhydroxido-bis[(nitrilotriacetato) cobalt(III)] octahydrate. Acta Crystallographica Section E E66: m1401-m1402.

Visser, H.G., Venter, J.A. & Van der Merwe, K.A. 2010. Dipotassium diaquabis(methylene-diphosphonato- $\kappa^2 O$), O')cobaltate(II). Acta Crystallographica Section E E66: m159.

Von Eschwege, K.G. & Kuhn, A. 2010. Low-temperature redetermination of 1,3-bis(pentafluorophenyl)triazene. Acta Crystallographica Section E E66: 03177. Von Eschwege, K.G. & Swarts, J.C. 2010. Chemical and electrochemical oxidation and reduction of dithizone. *Polyhedron* 29: 1727-1733.

Patent

Van der Westhuizen, J.H., Ferreira, D., Joubert, E. & Bonnet, S.L. 2010. Synthesis of asphalatin and analogues thereof. Report application number PCT/IB2010/055398 based on ZA Provinsional Patent Applications 2009/08304, 2009/08308 and 2009/08309 (with the South African Medical Research Council).

Conference contributions

Ahmad, E.E.M. & Luyt, A.S. 2010. The influence of peroxide initiated crosslinking on the morphology and physical properties of OE/sisal fibre micro- and nanocomposites. Oral presentation delivered at the Polymer Processing Society 26th Annual Meeting (PPS-26), Banff, Canada. 4-8 July.

Barnard, N.I. & Swarts, J.C. 2010. The influence of ligand chain length and central metal on the thermal and structural properties of metal carboxylates. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Bezuidenhoudt, B.C.B., Sunil, A.C., Marais, C. & Langner, E.H.G. 2010. Mechanism of the copper catalysed rearrangement of o-toluic acid to meta-cresol. Poster presented at the 39th International Conference on Coordination Chemistry (ICCC39), Adelaide, Australia. 25-30 July.

Brink, A., Roodt, A. & Visser, H.G. 2010. Crystallographic Study of N-O Schiff Bidentate Rhenium and Copper Complexes. Poster presented at the 26th European Crystallographic Meeting (ECM-26), Darmstadt, Germany. 29 August - 2 September. Brink, A., Visser, H.G. & Roodt, A. 2010. Anomalies observed from iodomethane oxidative addition to rhodium(1) acetylacetonato complexes. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Buitendach, B.E. & Swarts, J.C. 2010. Syntheses and electrochemistry of Zr(IV) and Hf(IV) phthalocyanines with ferrocene-containing betadiketones as axial ligands. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Cawood, M., Marston, A., Van der Westhuizen, J.H. & Zietsman,

P. 2010. High-performance countercurrent chromatography for the efficient isolation of alkaloid acetylcholinesterase inhibitors for Nerine species (Amaryollidaceae). Poster presented at the National Postdoctoral Research Forum, Somerset West, South Africa. 6-9 December.

Chiweshe, T.T., Purcell, W., Venter, J.A. & Mtshali, T. 2010. Quantification of rhodium in inorganic and organometallic compounds. Poster presented at the Analitika2010 Conference, Stellenbosch University, Stellenbosch, South Africa. 5-10 December.

Conradie, J., Gracia, J. & Niemantsverdriet, J.W. 2010. *H-spillover between rutile and rhodium - is it possible? A DFT view.* Paper delivered at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Conradie, J. & Ghosh, A. 2010. π-Acceptors to the rescue: Designing iron-group imido transfer reagents. Poster presented at the 239th ACS (Alabama Section of the American Chemical Society) National Meeting & Exposition, San Francisco, California, 21–25 March.

Conradie, J. 2010. Once upon a time there were no Super Computers. Lecture delivered at the Centre for High Performance Computing (CHPC) National Meeting 2010: Advancing Research and Development through the National Cyber-infrastructure Initiatives, Cape Town, South Africa. 7-9 December.

Conradie, M.M. & Conradie, J. 2010. A DFT study of the Oxidative Addition of Methyl lodide to acetylacetonato bis(triphenylphosphite)rhodium(I). Poster presented at the First Principles Quantum Chemistry International Conference: From Elementary Reactions to Enzymes, Bad Herrenalb, Germany. 14-17 April.

Conradie, M.M. & Conradie, J. 2010. DFT mechanistic investigation of the oxidative addition and methyl migration steps in the reaction. $[Rh(acac)(CO)(PPh)_3] + CH_3I$. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Conradie, M.M. & Conradie, J. 2010. DFT modeling of simplified and full experimental molecular systems - a case study. Lecture delivered at the Centre for High Performance Computing (CHPC) National Meeting 2010: Advancing Research and Development through the National Cyber-infrastructure Initiatives, Cape Town, South Africa. 7-9 December.

Engelbrecht, I., Roodt, A. & Visser, H.G. 2010. Kinetic and Crystallographic Investigation of Model Iridium(Carbonyl) (Acetylacetonato) Complexes in Olefin Hydroformylation/-Transformations. Poster presented at the 39th International Conference on Coordination Chemistry (ICCC39), Adelaide, Australia. 25-30 July. 107

Engelbrecht, I., Visser, H.G. & Roodt,

A. 2010. Structural/Kinetic study of phosphine-based model iridium compounds for application in olefin hydroformylation. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Erasmus, E. & Niemantsverdriet, J.W. 2010. 2010 *Single-source precursor for Pd-Co/SiO*₂ *heterogeneous bimetallic catalysts*. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Grove, J.J.C., Bezuidenhoudt, B.C.B. & Ferreira, D. 2010. Conversion of Pravastatin into an advanced Intermediate in the Synthesis of the HMG-CoA Reductase Inhibitor BB-476. Oral presentation delivered at the 11th Frank Warren Conference of the South African Chemical Institute, Pietermaritzburg, South Africa. 17-21 January.

Hansson, C., Kirsten, L., Oskarsson, A. & Roodt, A. 2010. $[Pt(tht)_4](CF_3SO_3)_2$ in the Temperature Range 202-295K. Poster presented at the 26th European Crystallographic Meeting (ECM-26), Darmstadt, Germany. 29 August - 2 September.

Herbst, L., Visser, H.G. & Roodt, A.

2010. Identification of Niobium(V) Complexes for the possible Separation of Niobium and Tantalum. Poster presented at the 39th International Conference on Coordination Chemistry (ICCC39), Adelaide, Australia. 25-30 July.

Herbst, L., Visser, H.G. & Roodt, A.

2010. Investigation into the catalytic activities of niobium pentachloride and its derivatives. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010),

Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Hill, T., Roodt, A. & Steyl, G. 2010. Crystallographic and computational aspects of β -diketonate palladium systems. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Joubert, C.C. & Swarts, J.C. 2010. The synthesis and characterization of ruthenocene-containing poly(aminoacid) derivatives as possible catalysts. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Koen, R., Visser, H.G. & Roodt, A. 2010. Synthesis of Model Tantalum(V) Complexes for the Separation of Niobium and Tantalum. Poster presented at the 26th European Crystallographic Meeting (ECM-26), Darmstadt, Germany. 29 August - 2 September.

Koen, R., Visser, H.G. & Roodt, A. 2010. Synthesis of model tantalum(V) multidentate complexes for use in industrial catalysis. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Kuo, C-M. & Bezuidenhoudt, B.C.B. 2010. Studies towards the Synthesis of a naturally occurring novel Homoisoflavanone. Poster presented at the 11th Frank Warren Conference of the South African Chemical Institute, Pietermaritzburg, South Africa. 17-21 January.

Langner, E.H.G., Cheruvathur, A.V., Niemantsverdriet, J.W. & Thűne, P.C. 2010. Surface Chemistry of MgC12 thin films used as support for model Ziegler-Natta catalysts. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Lötter, S., Nkabiti, L., Purcell, W. & Nel, J.T. 2010. Rapid quantification of major and trace components of high purity zirconium metal by ICP-OES. Oral presentation delivered at the Light Metals Conference 2010, Misty Hills, Muldersdrift, South Africa. 27-29 October.

Luyt, A.S. 2010. Polymer/wax blends as phase change materials for energy storage: Benefits and challenges. Oral presentation delivered at the 1st International Conference on Recent Trends in Materials Science and Technology (ICMST) of the Indian Institute of Space Science and Technology (IIST) and the Materials Research Society of India (MRSI), Thiruvananthapuram, Kerale, India. 29-31 October.

Marston, A. 2010. Application of centrifugal countercurrent chromatography in the separation of natural products. Lecture delivered at the Analitika2010 Conference, Stellenbosch University, Stellenbosch, South Africa. 5-10 December.

Marston, A. 2010. *High-Speed Countercurrent Chromatography – New Applications*. Lecture delivered at the 7th International Symposium on the Chromatography of Natural Products, joined with the 6th International Symposium of the International Society for the Development of Natural Products: The Application of Analytical Methods for the Development of Natural Products, Lublin, Poland. 14–17 June.

Marston, A. 2010. *High-Speed Countercurrent Chromatography in the Separation of Polyphenols*. Lecture delivered at the 25th International Conference on Polyphenols, Montpellier, France. 23-27 August.

Marston, A. 2010. Isolation of acetylcholinesterase inhibitors from
the Amaryllidaceae by high-speed countercurrent chromatoaraphy. Lecture delivered at the 11th Frank Warren Conference of the South African Chemical Institute, Pietermaritzburg, South Africa. 17-21 January.

Marston, A. 2010. LC/NMR in the study of unstable compounds from Jamesbrittenia fodina (Scrophulariaceae). Lecture delivered at the Bruker NMR Meeting, Hermanus, South Africa. 28-29 January.

Marston, A. 2010. What exactly is there in a cup of Rooibos? Paper delivered at the Annual General Meeting and Research Day of the South African Rooibos Council, Clanwilliam, South Africa. 5 May.

Marston, A., Cawood, M., Van der Westhuizen, J.H. & Zietsman, P. 2010. The isolation of inhibitors of acetylcholinesterase inhibitors from Nerine species (Amaryllidaceae). Paper delivered at the Indigenous Plant Use Forum, Keimoes, South Africa. 28 June - 1 July.

Marston, A., Cawood, M., Van der Westhuizen, J.H. & Zietsman, P. 2010. High-performance *countercurrent chromatography* for the efficient isolation of alkaloid acetylcholinesterase inhibitors from Nerine species (Amaryllidaceae). Poster presented at the 58th International Congress and Annual Meeting of the Society for Medicinal Plant and Natural Product Research, Berlin, Germany. 29 August - 2 September.

Miller, B.J. & Bezuidenhoudt, B.C.B. 2010. Ring-closing metathesis for the Synthesis of Phenyl Substituted 4H-Chromes. Poster presented at the 11th Frank Warren Conference of the South African Chemical Institute. Pietermaritzburg, South Africa. 17-21 January.

Mngomezulu, M.E., Luyt, A.S. & Krupa, I. 2010. Phase change materials based on polyethylene, paraffin wax

and wood flour. Poster presented at the MACRO2010 43rd IUPAC World Polymer Congress, Glasgow, Scotland. 11-16 July.

Msutu, A., Hunter, R., Bezuidenhoudt, B.C.B. & Young, D.A. 2010. New Chemistry of CO₃. Poster presented at the 11th Frank Warren Conference of the South African Chemical Institute. Pietermaritzburg, South Africa. 17-21 January.

Muller, T.J., Steyl, G. & Roodt, A. 2010. Copper Based Oxidation Catalysis. Oral presentation delivered at the 26th European Crystallographic Meeting (ECM-26), Darmstadt, Germany. 29 August - 2 September.

Muller, T.J., Steyl, G. & Roodt, A. 2010. Copper based oxidation catalysis. Oral presentation delivered at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Nete, M., Purcell, W., Snyders, E. & Nel. J.T. 2010. Alternative dissolution methods for analysis of niobium containing samples. Poster presented at the Analitika2010 Conference, Stellenbosch University, Stellenbosch, South Africa, 5-10 December,

Nete, M., Purcell, W., Snyders, E. & Nel. J.T. 2010. Dissolution and analytical characterization of tantalite ore. Oral presentation delivered at the Light Metals Conference 2010, Misty Hills, Muldersdrift, South Africa. 27-29 October.

Oyourou, J.-N., Combrinck, S., Regnier, T. & Marston A. 2010. Purification of verbascoside from plant extracts using column and countercurrent chromatography. Poster presented at the Analitika2010 Conference, Stellenbosch University. Stellenbosch. South Africa. 5-10 December.

Pretorius, C., Roodt, A. & Venter, J.A. 2010. Synthesis of novel vanadium(III) and vanadium(IV) complexes with 0,0' bidentate ligands for catalytic application. Poster presented at the

21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010). Bains Game Lodge, Bloemfontein, South Africa, 7-10 November,

Pretorius, C., Roodt, A. & Venter, J.A. 2010. Vanadium(III) and Vanadium(IV) Complexes with 0, 0- Bidentate Ligands. Poster presented at the 39th International Conference on Coordination Chemistry (ICCC39), Adelaide, Australia. 25-30 July.

Roodt, A. 2010. Relevance of X-ray Structure Data to Kinetic Studies. Keynote lecture delivered at the 26th European Crystallographic Meeting (ECM-26), Darmstadt, Germany. 29 August - 2 September.

Roodt, A., Visser, H.G. & Cloete, N. 2010. Ethylene Tetramerisation: Diphosphinoamine Ligand Evaluation in Metal-Based Catalyst Precursor Models. Oral presentation delivered at the 39th International Conference on Coordination Chemistry (ICCC39), Adelaide, Australia. 25-30 July.

Schutte, M., Visser, H.G. & Roodt, A. 2010. Interesting Observations between Kinetic and Crystallographic data of $[Re(CO)_{2}(L,L')(H_{2}O)]$ Compounds. Oral presentation delivered at the 39th International Conference on Coordination Chemistry (ICCC39), Adelaide, Australia. 25-30 July.

Schwoerer, H., Von Eschwege, K.G., Bosman, G., Krok, P. & Conradie, J. 2010. Ultrafast photochemistry of dithizonatophenylmercury(II): *Isomerisation around a C=N double* bond. Poster presented at the Ultrafast Phenomena XVII Conference, Snowmass, Colorado, USA. 18-23 July.

Sebitlo, M.R., Erasmus, E. & Swarts, J.C. 2010. Synthesis and Characterisation of Rh(I) polysiloxane catalyst *derivatives*. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Steyn, M., Roodt, A. & Visser,

H.G. 2010. A coordinative and behavioral study of mixed halido and N,O-donor multidentate ligand complexes of zirconium(IV). Oral presentation delivered at the Light Metals Conference 2010, Misty Hills, Muldersdrift, South Africa. 27-29 October.

Steyn, M., Visser, H.G. & Roodt,

A. 2010. Formation Kinetics of Mixed Halido and N-O-donor Multidentate Ligand Complexes of Zirconium. Poster presented at the 39th International Conference on Coordination Chemistry (ICCC39), Adelaide, Australia. 25-30 July.

Stuurman, N.F., Hopmann, K.H., Muller,

A. & Conradie, J. 2010. *CO* substitution in the catalytic precursor [*Rh*(*bdiketonato*) (*CO*)₂]. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Sunil, C.A., Marais, C. & Bezuidenhoudt, B.C.B. 2010. *Probing the application*

B.C.B. 2010. Probing the application of the Diels-Alder Reaction in the Synthesis of Resorcinol. Poster presented at the 11th Frank Warren Conference of the South African Chemical Institute, Pietermaritzburg, South Africa. 17-21 January.

Swarts, J.C. 2010. Catalysts in Rockets, Fine Chemicals and Biology. Oral presentation delivered at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Swarts, J.C. 2010. Syntheses and Characterisation of Water-Soluble Polymer-Bound Lipophylic Phthalocyanines and Porphyrins. Oral presentation delivered at the 6th International Conference on Porphyrins and Phthalocyanines (ICPP6) of the Society of Porphyrins and Phthalocyanines (SPP), Albuquerque, New Mexico, USA. 4-9 July.

Trzebiatowska-Gusowska, M.,

Erasmus, E. & Swarts, J.C. 2010. Preparation of 2D iron catalysts based on silicon wafers. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Van der Merwe, K., Visser, H.G. & Venter, J.A. 2010. Investigation of the catalytic behavior of cobalt- and chromium-diphosphonate complexes. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Van der Westhuizen, J.H. 2010. Photochemistry Synthesis of Flavonoids and Related Compounds. Lecture delivered at the 11th Frank Warren Conference of the South African Chemical Institute, Pietermaritzburg, South Africa. 17-21 January.

Van der Westhuizen, J.H. 2010. Solid state NMR and MALDI-TOF investigation of Acacia mearnsii (Black Wattle) Tannin Extracts. Lecture delivered at the Bruker NMR Meeting, Hermanus, South Africa. 28-29 January.

Van der Westhuizen, J.H., Bonnet, S.L. & Achilonu, M.C. 2010. A Novel Approach to wards the Syntheses of Proanthocyanidins and Biflavonoids. Lecture delivered at the 7th Tannin Conference, Berlin, Germany. 29 August - 2 September.

Van Tonder, B., Chiweshe, T.T. & Bezuidehoudt, B.C.B. 2010. Synthesis of Phenolic Dimethyl acetals. Poster presented at the 11th Frank Warren Conference of the South African Chemical Institute, Pietermaritzburg, South Africa. 17-21 January.

Van Tonder, J.H. & Bezuidenhoudt, B.C.B. 2010. Studies toward the Regioselective Formation of Flavonoid Chromium(0)tricarbonyl complexes. Poster presented at the 11th Frank Warren Conference of the South African Chemical Institute, Pietermaritzburg, South Africa. 17–21 January.

Venter, G.J.S., Steyl, G. & Roodt,

A. 2010. Influence of Substituents on PhonyH and its Associated Rh(I) Carbonyl Complexes. Oral presentation delivered at the 26th European Crystallographic Meeting (ECM-26), Darmstadt, Germany. 29 August - 2 September.

Venter, G.J.S., Steyl, G. & Roodt, A.

2010. Influencing 4-(phenylamino) pent-3-en-2-one and its associated Rh(I) dicarbonyl complexes through halide substitution. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Venter, J.A. & Purcell, W. 2010. Modelling of the separation of steric and electronic effects of phosphine ligands in rhodium complexes of N-aryl-N-nitrosohydroxylamines. Oral presentation delivered at the 24th International Conference on Organometallic Chemistry (ICOMC), Taipei, Taiwan. 18-23 July.

Viljoen, J.A., Roodt, A. & Visser, H.G. 2010. Complex Formation of Hf(IV) with 0,0'- and N,O-Bidendate Ligands. Oral presentation delivered at the Light Metals Conference 2010, Misty Hills, Muldersdrift, South Africa. 27-29 October.

Viljoen, J.A., Visser, H.G. & Roodt,

A. 2010. Multistep Bidentate Ligand Coordination at Hafnium(IV). Oral presentation delivered at the 26th European Crystallographic Meeting (ECM-26), Darmstadt, Germany. 29 August - 2 September.

Visser, H.G., Roodt, A., Brink, A., Kemp, G. & Schutte, M. 2010. When Crystallography meets Kinetics. A study of Rhenium(1) tricarbonyls. Oral presentation delivered at the 26th

NATURAL SCIENCES | DEPARTMENT OF CHEMISTRY

European Crystallographic Meeting (ECM-26), Darmstadt, Germany. 29 August - 2 September.

Visser, H.G., Roodt, A., Schutte, M., Brink, A. & Kemp, G. 2010. Coordinated Ligand Effects in the Substitution Kinetics of Re(I) Tricarbonyls: Application in Radiopharmaceutical Design. Oral presentation delivered at the XV Brazilian Meeting on Inorganic Chemistry (XV BMIC 2010), Angra dos Reis, Brazil. 16-20 August.

Visser, H.G., Roodt, A., Schutte, M., Brink, A. & Kemp, G. 2010. When basic Chemistry meets Radiopharmaceutical Design: Coordinated Ligand Effects in the Substitution Kinetics of $[Re(CO)_3(L,L')(H_2O)]^n$. Oral presentation delivered at the 39th International Conference on Coordination Chemistry (ICCC39), Adelaide, Australia. 25–30 July.

Von Eschwege, K.G., Schwoerer, H., Swarts, J.C. & Conradie, J. 2010. Photochromic dithizonatophenylmercury(II). Poster presented at the XXIIIrdIUPAC Photochemistry Symposium, Ferrara, Italy. 11–16 July.

Wilhelm-Mouton, A. 2010. Syntheses of Biflavonoids. Lecture delivered at the 11th Frank Warren Conference of the South African Chemical Institute, Pietermaritzburg, South Africa. 17-21 January.

Young, C., Bezuidenhoudt, B.C.B. &

Roodt, A. 2010. *Bipyridine type Ligand Bridged Complexes of Palladium(II) and Gold(III) as Carbon-Carbon Bond Formation Catalysts.* Poster presented at the 39th International Conference on Coordination Chemistry (ICCC39), Adelaide, Australia. 25-30 July.

Young, C.A., Roodt, A. &

Bezuidenhoudt, B.C.B. 2010. Bipyridine based bridging ligands as building blocks for square planar Palladium(II) catalysts. Poster presented at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Academic staff

MAIN CAMPUS

Professors:

Profs. Andreas Roodt, Jannie Swarts, Ben Bezuidenhoudt, Andrew Marston

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

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

Affiliate Associate Professor: Prof. Fanie Otto

Senior Lecturer: Dr Susan Bonnet

Lecturers:

Drs Karel von Eschwege, Johan Venter, Ernie Langner, Lizette Erasmus, Rebotsamang Shago and Ms Anke Wilhelm-Mouton

Subject Coordinators: Dr Marietjie Versteeg, Ms Rina Meintjes

QWAQWA CAMPUS

Professor: Prof. Riaan Luyt

Lecturers: Mr Tsietsi Tsotetsi, Mss Moipone Mokoena, Maryam Jordaan, Dorine Dikobe, Mpondi Molefe

Junior Lecturer: Mr Rantooa Moji

Contact details

Prof. Andreas Roodt

Faculty of Natural and Agricultural Sciences Department of Chemistry University of the Free State PO Box 339 Bloemfontein South Africa 9300

 Telephone:
 +27 (0)51 401 9212

 Fax:
 +27 (0)51 444 6384

 E-mail:
 roodta@ufs.ac.za

 Website:
 www.ufs.ac.za/chem.

"Members of our staff and students received excellence awards during 2010.

Dr Anelize van Biljon

19 Department of Computer Science and Informatics

Overview

The Department of Computer Science and Informatics at the University of the Free State (UFS) focuses on Information Technology (IT)-related training, research and community service that are reflected in the courses offered in the undergraduate and postgraduate programmes.

The department is involved with two major undergraduate learning programmes, namely B.Sc. (IT) and B.Com. (IT), which form part of the Private Sector Management Programme introduced by the Faculty of Economic and Management Sciences at the UFS. The B.Sc. (IT) programme delivers highly trained information



Dr Liezel Nel with the departmental banner.



technologists with skills in programming, Internet programming, database and system analysis and design, as well as software engineering, network management, human-computer interaction, complemented by natural sciences subjects.

Within the B.Sc. (IT) learning programme, students can specialise to apply their IT skills in Mathematics, Industry and Mining, Geographical Information Systems (GIS) or IT Management. The powerful combination of Computer Science with Mathematics and/or Mathematical Statistics provides the student with a solid knowledge base and excellent background for a career in the IT industry or at research institutions such as universities. For specialisation in Industry and Mining, the student can combine IT with the physical- and/or geosciences to open up a career in the chemical industry or mineralogy sectors. The connection of GIS and computer technology prepares a student for a challenging career in diverse directions such as defence planning, agriculture, tourism or environment and resource management. Specialisation in IT Management is directed towards





At a Friday IT Talk where some technical aspects of the department's robots were discussed. On the photo are, from the left: Mr Gavin Dollman (Qwaqwa Campus), Ms Tanya Beelders (Main Campus), Prof. Neil Heideman (Dean of the Faculty of Natural and Agricultural Sciences) and Mr Brian Campbell (Main Campus).



Eduloan presented Mr Johan Visagie with a laptop as best first-year achiever in 2009. On the photo are Dr Anelize van Biljon (Departmental Chairperson), Mr Visagie and Dr Liezel Nel (one of his first-year lecturers).

preparing a student for a career as IT manager in both the public and private sectors.

Changes were made to our postgraduate programme to ensure that our students obtain their degrees with appropriate knowledge and skills that can be applied successfully in the industry. The restructured postgraduate modules that also contribute to our research areas have been implemented in 2010. As part of the restructured postgraduate courses, the department obtained three robots for use by our students. One of the lecturers, Mr Gavin Dollman from the Qwaqwa Campus, is doing research for his Master's degree with a robot and an e-motiv that allow people to give instructions to the robot by means of their emotions and thoughts.

From the department's research outputs for 2010 it is evident that an active research programme was followed. Our research focus is on human-computer interaction led by Prof. Pieter Blignaut and Dr Lizette de Wet; data warehousing led by Prof. Theo McDonald and Dr Eduan Kotzé, and e-learning driven by Dr Liezel Nel.

Although funding is very limited and often lacking, external funds are generated by using our modern eyetracking equipment and the Centre of Excellence (COE). The projects undertaken by the COE are funded by an industry partner. These projects are research related and are implemented to develop and provide assistance to postgraduate students. New eye-tracking equipment was acquired to enable the department to do usability studies at a highly competitive level. During 2010, 317 students were registered on the Main and Qwaqwa Campuses for the IT programming courses at first-year level. About 105 second-year students and 100 third-year students completed the undergraduate student component at the two campuses. At postgraduate level there were three Ph.D. students, 11 Master's and 39 Honours students registered in 2010. About 1 000 students were registered at the South Campus for the Computer Literacy module.

During May 2010, the department was evaluated externally and received a positive report from the evaluators, Profs. Carina de Villiers from the University of Pretoria and Sonia Berman from the University of Cape Town. The suggestions have already been implemented with positive results.

Activities and achievements

Every Friday during the term, the department hosts an IT Talk. During these sessions, staff members have the opportunity to report on their research development, while postgraduate students discuss their research topics. Three seminars, covering specific topics, were arranged during the course of the year. The first was presented by Mr Cobus van Breda and Mrs Elizna Prinsloo concerning the Clicker system.

The second seminar was presented by Mr Nico Benson and Ms Natale le Roux of the Department of Research Development at the UFS. Dr Ariane Neethling presented



Mr Silas Verkijika (a third-year student) and Dr Lizette de Wet. Mr Verkijika presented a paper at the 3rd International Conference on ICT for Africa 2010 in Yaounde, Cameroon, during March 2010, under the supervision of Dr Lizette de Wet, a senior lecturer in the department.

the third seminar and the topic was data processing and the interpretation of results.

During 2010, staff members attended various national and international conferences and congresses where they delivered papers.

Prof. Pieter Blignaut and Ms Tanya Beelders attended the Eye-Tracking Research & Applications (ETRA) 2010 symposium in Austin, Texas, during March 2010. Dr Liezel Nel attended the Southern African Computer Lecturers' Association (SACLA) conference in Durban during June 2010.

Dr Eduan Kotze attended the IASTED African Conference on Health Informatics in Gaborone, Botswana, during September 2010 and Mr Jaco Marais attended the IT WEB Security Summit in Johannesburg during May 2010.

Staff members of the department received various awards during 2010. Dr Liezel Nel received the Senior Award for Excellence in Teaching during the 3rd Prestige Forum for Teaching and Learning held at the UFS. She also received the 2010 Faculty Honorary Award for Teaching and Learning. Mr Johan Visagie, a second-year IT-student, was the proud recipient of a laptop sponsored by Eduloan during April 2010 for his performance in the Computer Science modules during his first-year. He maintained an average above 80% for all his first year IT-modules. Mr Silas Verkijika, a third-year B.Sc. (IT) Mathematics student, attended the 3rd International Conference on ICT for Africa 2010 in Yaounde, Cameroon, during March 2010. He presented a paper entitled *A unique and innovative ICT approach to empowering businesses in Africa* under the supervision of Dr Lizette de Wet, a senior lecturer in the department.

During the New Academic Tutor Programme (NATP) awards ceremony, Mr Jean-Pierre du Plessis, a student and tutor in the department, came second in the category Best Tutor in the Faculty of Natural and Agricultural Sciences.

Mr Brian Campbell represented the department at the Eskom Expo in August 2010 with a demonstration of the "abilities" of the new robots. The visitors were impressed by the actions and movements that the robots performed and many showed interest in studying Computer Science.



The department's display, prepared by Mr Brian Campbell, at the Eskom Expo in August 2010.



National and international collaboration

Two lecturers, Mr Sommai Khantong and Ms Sirilak Kaiwinit from the Mahasarakham University, Thailand, spent six weeks with the department. They attended lectures, took part in community-service activities and were involved in research activities of the department.

Four members of the University of British Columbia, Canada, who are also involved in the Global Health Research Programme, visited the department to establish research participation. Funding for research was made available by the Canadian Institutes of Health Research in order to develop software that is currently being used by the Free State Health Department at the Pelonomi Hospital. Dr Eduan Kotze and Prof. Theo McDonald, who represented the department, were the collaborators of the Canadian Institutes of Health Research.

Community service

Community service is regarded a high priority in the department. It also showcases the department to prospective students and the general public. One of our most successful projects of 2010 was the computer training

Learners from Bloemfontein schools attended lectures on the Main Campus and were introduced to the computer programming language, Python. On the photo are learners from various schools, two of our visitors from Thailand (Sirilak Kaiwinit and Sommai Khantong), Mr Francois Greeff (a postgraduate student), two second-year students who also presented a number of the classes as part of their service-learning module, and Dr Anelize van Biljon, who initiated the Python classes.

programme presented by students from the servicelearning modules of the department, in collaboration with the Mangaung/University of the Free State Community Partnership Programme (MUCPP) to a group of unemployed persons from previously disadvantaged population groups. The classes were presented at the South Campus during the second semester. At the end of the programme a ceremony was held where the successful individuals received certificates. Prof. Theo McDonald presented the course in 2010.

As part of the department's community service obligation, computers were donated to various schools in Bloemfontein, including the Martie du Plessis School for physically disabled learners.

The department introduced a programming training course for learners and invited Grade 7–9 learners from



Some of the learners who started with the Python classes in 2010, admiring the robot.

Bloemfontein schools to attend lectures on campus. These learners were introduced to a high level computer programming language, Python, and attended classes in one of our training labs. The classes are free of charge, as they form part of the training of our second-year students. These classes commenced on 16 March 2010 and 26 learners attended. Many of the learners also took part in the Mathematics Olympiads and, with the background that the Python classes provide, they will now also be able to take part in national Computer Science Olympiads at school level.

Dr Anelize van Biljon is involved in preparing Grade 7, 9 and 10 learners for participation in Mathematics Olympiads. She is actively involved in the Nautilus Mathematics Project for Grade 10 learners and serves on the Senior National Committee for the South African Mathematics Olympiad. She did the final training of the junior Free State/Northern Cape A-team that won the first prize in South Africa during the Interprovincial Mathematics Olympiad in September 2010.



The department donated ten computers to learners from the Martie du Plessis School for physically disabled learners. Here are some of the learners with Mr Pieter Viljoen (principal), Mrs Rita Nel (teacher), Dr Anelize van Biljon and Mr Wynand Nel (staff members of the department).

Prof. Theo McDonald and Mr Frederick Mudavanhu in one of the computer laboratories on the Qwaqwa Campus.

The Eskom Expo was held in August 2010 and one of our Grade 7 Python learners, Marthinus Schoombie from Willem Postma Primary School, won the prize for the best primary school project in the Free State. He wrote a programme in Python that his class mates enjoyed playing

With the Eskom Expo in August 2010, Marthinus Schoombie (Grade 7 learner) won the prize for the best primary school project in the Free State with a Python computer programme that he had written.

and that enabled him to gather data about specific aspects of the programme. He also competed at the National Expo in Pretoria and was awarded a silver medal.

Facilities

A number of our offices in the Mathematical Sciences Building were upgraded. The Hans Messerschmidt Laboratory, with a capacity of 16, is exclusively equipped for our postgraduate students, allowing them to work on postgraduate and research projects. The department has computer laboratories on all three UFS campuses where our students do practical assignments. Computers in these labs are never older than three years, as we replace computers on a rotation basis every year. The "old" computers are donated to schools in and around Bloemfontein as part of the department's community service plan.

Staff matters

Mr Emrys Hart was appointed as junior lecturer and assisted with Computer Literacy modules on the Main Campus. Mr Robert Alfonsi was appointed as lecturer for the Computer Literacy modules at the Qwaqwa Campus.

Many of our staff members are involved in postgraduate studies themselves and have obtained degrees or postgraduate diplomas in 2010.





research OUTPUTS

Computer Science and Informatics

Research articles

Breytenbach, J. & McDonald, T. 2010. Soekenjindekking van Suid-Afrikaanse en Afrikaanse webruimtes. South African Journal on Science and Technology 29(3): 107-118.

Kotze, J.E. & McDonald, T. 2010. An information system to manage the rollout of the antiretroviral treatment programme in the Free State. *Curationis* 33(2): 60–68.

Report

Beelders, T.R. 2010. Retention and reader reaction to printed advertisements and advertorials. Report number 01/2010 to Voermol Feeds, Maidstone, South Africa.

Conference contributions

Beelders, T.R. & Blignaut, P.J. 2010. Using vision and voice to create a multimodal interface for Microsoft Word 2007. Proceedings of the Eye Tracking Research & Application – ETRA 2010: ACM Symposium on Eye-Tracking Research and Application, Austin, Texas, USA. 22–24 March. pp. 173–176.

Beelders, T.R., Blignaut, P.J. & Greef, F. 2010. *Oogvolging en spraakherkenning in plaas van 'n rekenaarmuis.* Paper delivered at the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns Studentesimposium 2010", Pretoria, Suid-Afrika. 4-5 November. Bergh, L., Beelders, T.R. & Van Zyl, J. 2010. A reference point perspective on eye focus positions in multimodal tests. Paper delivered at the Southern African Communication Association (SACOMM) Conference 2010, RAU, Johannesburg, South Africa. 27-29 September.

Blignaut, P.J. 2010. Visual span and other parameters for the generation of heatmaps. Proceedings of the Eye Tracking Research & Application - ETRA 2010: ACM Symposium on Eye-Tracking Research and Application, Austin, Texas, USA. 22-24 March. pp. 125-128.

Blignaut, P.J. & Oosthuysen, C.G. 2010. *A usability and functionality study of intranet websites at South African universities.* Proceedings of the 12th Annual Conference on World Wide Web Applications, Durban, South Africa. 21-23 September. pp. 4–19.

Du Plessis, A.G. & De Wet, L.

2010. *Mens-rekenaar interaksie: 'n Nuwe dimensie*. Paper delivered at the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns Studentesimposium 2010", Pretoria, South Africa. 4-5 November.

Kotze, J.E. & McDonald, T. 2010. Using record linkage to conform the patient dimension of an antiretroviral therapy data warehouse. Proceedings of the 3rd International Association of Science and Technology for Development (IASTED) African Conference on Modelling and Simulation (AfricaMS 2010), Gaborone, Botswana. 6-8 September. pp. 187-194. Mabanza, N. & De Wet, L. 2010. Measuring the usability effect of incorporating educational agents in adult computer literacy training in the South African context. Paper delivered at the Annual Information Society Technologies in Africa (IST-Africa) 2010 Conference & Exhibition, Durban, South Africa. 19–21 May.

Ndereya, C.N. & Nel, E. 2010. Enhancing social presence in open and distance learning: The role of communication. Paper delivered at the National Association of Distance Education and Open Learning in South Africa (NADEOSA) Annual Conference: Towards Sustainable Open and Distance Learning Developmental State - Policy, Ethics and Practice, University of North West, Potchefstroom, South Africa. 6-8 September.



Nel, E. 2010. Blended learning in South African undergraduate classrooms: directives for the effective use of a learning management system. Proceedings of the 12th Annual Conference on World Wide Web Applications, Durban, South Africa. 21-23 September. pp. 4-18.

Nel. E. 2010. Bridaina teachinalearning gaps: Engagement through technology. Proceedings of the South African Computer Lecturers' Association (SACLA) Conference 2010, Pretoria, South Africa. 3-5 Junie. pp. 1-5.

Potgieter, L. & De Wet, L. 2010. Die assessering van die impak van virtuele opvoedkundige koppelvlak-agente op volwassenes met beperkte of geen rekenaarvaardighede. Paper

delivered at the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns Studentesimposium 2010". Pretoria. South Africa, 4–5 November,

Verkijika, S.F. & De Wet, L. 2010. A unique and innovative ICT approach to empowering businesses in Africa. Proceedings of the 3rd International Conference on ICT for Africa (ICIA 2010) Conference, Yaounde, Cameroon. 25-28 March. pp. 143-150.

Wario, R.D. & McDonald, T. 2010. An investigation into the access and usage of the internet in Kenya. Proceedings of the IADIS International Conference WWW/Internet 2010: Cognition and Exploratory Learning in Digital Age, Timisoara, Romania. 14-17 October. pp. 57-64.

Academic staff

MAIN CAMPUS

Professors: Profs. Pieter Blignaut, Theo McDonald

Affiliate Professor:

Senior Lecturers:

Lecturers:

Mss Tanya Beelders, Engela Wynand Nel, Casper Wessels, Ruhan Junior Lecturers: Ms Marina Botha, Messrs Rouxan Fouché, Jaco Marais, Emrys Hart

QWAQWA CAMPUS

Junior Lecturers: Ms Ruth Wario. Messrs Ben Mase. Frederick Mudavanhu, Fani Radebe, Benedict Sebastian, Gavin Dollman,

Lecturer:

Mr Robert Alfonsi

SOUTH CAMPUS

Lecturer: Mr Ronnie Brown

Contact details

Dr Anelize van Biljon

Faculty of Natural and Agricultural Sciences Department of Computer Science and Informatics University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone:	+27 (0)51 401 2754
Fax:	+27 (0)51 401 2754
E-mail:	anelize@ufs.ac.za
Website:	www.ufs.ac.za/it

"The department leads postgraduate students to undertake research projects to strengthen the scientific basis from which the consumer can benefit in the field of textiles and foods."

Prof. Hester Steyn

10 Department of Consumer Science



Overview

The Department of Consumer Science seeks to equip undergraduate students with the knowledge to identify and understand the needs of individuals and families regarding food, clothing and housing and the skills to help them fulfil these needs with available resources. The department also strives to motivate and lead postgraduate students to undertake research projects to strengthen the scientific basis from which the consumer can benefit in the field of textiles and foods.

The Department of Consumer Science offers three undergraduate programmes and three postgraduate degrees. In the B.Consumer Science (General) programme,



The department's staff members: Mrs Nonnie Heyman, Mrs Minnie Ras, Prof. Hester Steyn, Mrs Sonia van Zyl, Mrs Jana Vermaas, Ms Natasha van Heerden, Ms Nicola Bezuidenhout, Mrs Ismari van der Merwe, Mrs Petro Swart, Mrs Wilma van der Walt and Mrs Doretha Jacobs (absent: Mrs Fransie Lombard, Mrs Lotte Venter, Mrs Mary Makhapela and Mrs S Senokoana).

123

NATURAL SCIENCES | DEPARTMENT OF CONSUMER SCIENCE



Members of the Programme Committee on *Household Technology* and *Sustainability* at the IFHE Council Meeting 2010 in Sligo, Ireland. Here are Mrs JS van Zyl (far left at the back) and Prof. Hester Steyn (third from the left in the back row) with Prof. Stamminger, Chairperson of this committee and other members.

145 students were registered in 2010, 18 students in the B.Consumer Science (Foods) and five in the B.Sc. Home Economics (Foods). Ten students were registered for the B.Sc. Honours in Home Economics, three for M.Sc. Home Economics and two for a Ph.D. The department experienced a 23% increase in undergraduate student numbers and a 58% increase in postgraduate student numbers.

Activities and achievements

Prof. Hester Steyn, Mrs Sonia van Zyl and Ms Nicola Bezuidenhout attended the Council Meeting 2010 of the International Federation for Home Economics (IFHE) in Sligo, Ireland from 19–23 July 2010. They also attended the research session and Programme Committee Meeting of the Household Technology and Sustainability (PC HT&S) Committee in Sligo, Ireland on 18 July 2010.

Prof. Steyn and Mrs Van Zyl are members of the PC HT&S of the IFHE.

Research

In 2010, the research done in the Department of Consumer Science mainly focused on the following projects:

- Investigating the possibility of using electrochemically activated water (Anolyte and Catholyte) as detergent alternative and the effect of the treatment on the properties of textiles;
- Determining energy and water consumption patterns in laundry practices; and
- Research on natural textile fibres and fabrics available in Southern Africa, for example, Gonometa Postica silk and Alpaca Huycaya fibres. This study is currently in progress.



Ms Elri van der Westhuizen, with a community member, Kula.



Ms Mariza Prinsloo en Engelina Mothope.

Community service

The Department of Consumer Science continued with the Mamello Community Development Programme in the "old milk shed" on the experimental farm of the University of the Free State (UFS). In the first semester, the final-year students, under the supervision of Mrs Ismari van der Merwe, worked with a group of unemployed members from the community. They identified the needs of the group and planned a skills development plan for 2010. The students and the community group identified income-generating skills as one of their major needs. They planned a series of lectures, demonstrations and workshops to enable the community group members to make table cloths, bags, baby blankets, hats, bible covers, wall clocks, bead key holders and curtains. They use these skills to make products that can be sold.

In the second semester, Mrs Doretha Jacobs continued with the Mamello group to improve their sewing skills. They learned how to sew chef's jackets and are now making jackets which are sold to students who work in the Foods laboratory.



Mss Jean-Marie Minnie and Mariza Prinsloo, with Mss Nellie Moletsane and Engelina Mothope as part of the Mamello Community Development Programme.

research OUTPUTS

Consumer Science

Research article

Steyn, H.J.H. & Olivier, Y. 2010. The evaluation of hydrogen peroxide bleaching of *Gonometa Postica* silk. *Journal of Family Ecology and Consumer Sciences* 38: 84–91.

Conference contributions

Steyn, H.J.H. & Bezuidenthout, N.

2010. Energy consumption patterns in households in the Free State in South Africa. Oral presentation delivered at the Conference of the International Federation of Home Economics (IFHE): Household Technology and Sustainability, Angela's College, Sligo, Ireland. 18-23 July. Van Zyl, J.S. & Jordaan, A. 2010. Water consumption in the fruit and vegetable rinsing practices in households in the central region of South Africa. Poster presented at the Conference of the International Federation of Home Economics (IFHE): Household Technology and Sustainability, Angela's College, Sligo, Ireland. 18–23 July.

Contact details

Prof. Hester Steyn

Faculty of Natural and Agricultural Science Department of Consumer Science University of the Free State PO Box 339 Bloemfontein South Africa 9300

 Telephone:
 +27 (0)51 401 2572

 Fax:
 +27 (0)51 401 9995 or

 +27 (0)86 69 34974

 E-mail:
 steynhj@ufs.ac.za

 Website:
 www.ufs.ac.za

Academic staff

Associate Professor: Prof. Hester Steyn

Lecturer: Mrs Ismari van der Merwe

Junior Lecturers: Mrs Petro Swart, Mrs Sonia van Zyl, Mrs Jana Vermaas



"The launch of the Forensic Genetics programme during 2010 was one of the department's highlights."

Prof. Johan Spies

NATURAL SCIENCES | DEPARTMENT OF GENETICS

11 Department of Genetics

Overview

The Department of Genetics showed exceptional growth over the past few years. Student numbers have more than doubled since 2008. The appointment of Mrs Letecia Wessels as junior lecturer in Forensic Genetics during 2010 was therefore a welcome addition to the staff component of the department. Sophisticated equipment worth more than R4 million that will further improve the quality of research in the department was acquired during the year.

A highlight of 2010 was the admission of the first students in Forensic Genetics. The official launch of this programme was in the form of a symposium on 12 March 2010. At this occasion several speakers involved with various aspects of Forensics in Africa participated.



Staff members and participants at the launch of the Forensic Genetics programme on 12 March 2010.



Special achievements

In 2010, a 2006 paper by Prof. Paul Grobler on enzyme structure, enzyme function and variability in mammals was ranked the 7th most assessed paper in African Zoology during the previous year by BioOne. The work on the use of vervet monkeys as a model system for neurological, metabolic and immune systems was also detailed extensively in a report in the Sunday newspaper *Rapport*.

At the 1st Annual Research Symposium of the Centre for Conservation at the National Zoological Gardens that was held in Pretoria on 26 November 2010, Mr Christiaan Labuschagne, Ph.D. student, won the prize for the best student presentation with his paper on *Endonuclease V mismatch cleavage mediated SNP discovery*. The work was also detailed in a report in the Gauteng Afrikaans daily newspaper *Beeld*.

Activities and achievements

In terms of the department's activities and achievements during 2010, one has to note the extent of **national and international collaboration** that is being pursued by the department.

During April 2010, the department organised and hosted the 21st Congress of the South African Genetics Society. Seven lectures and eight posters were presented by staff and postgraduate students of the department at this occasion. A further eight lectures and twelve posters involved alumni from the department. The department was also involved with organising the 5th International Clivia Conference in Cape Town during September 2010. Three lecturers presented papers at the conference, among them the key note address. Staff members were active in various organisations and Prof. Johan Spies is currently the Chairperson of the Clivia Society.

Prof. Paul Grobler acts as Adjunct Associate Professor for the Department of Fisheries and Wildlife Sciences at Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, United States of America (USA) and visited that department in March 2010. He was also re-elected to the Council of the Southern African Wildlife Management Association (SAWMA) from 2010, his third term in this position. He is the Genetics Subeditor for the Southern African Journal of Aquatic Sciences and he reviewed manuscripts for The Journal of Zoology, South African Journal of Wildlife Research and the South African Journal of Animal Science during 2010.



Prof. Antoinette Kotzé is currently the Chairperson of the African Association of Zoos and Aquariums (PAAZAB) Research and Monitoring Working Group and the Chairperson of the National Zoological Gardens of South Africa's Research and Ethics Committee. She serves on the Board of Directors of the Mabula Ground Hornbill Research and Conservation Project and the Institute for the Breeding of Rare and Endangered African Mammals (IBREAM) SA. She is also a member of the National Cheetah Conservation Forum of South Africa and a management member of the Vulture Conservation Programme.

Mrs Paula Spies was elected as a member of the Executive Council of the South African Genetics Society. During the year she also visited the Royal Botanic Gardens, Kew, where she worked on a flow cytometer to determine DNA quantities in various plants. Mrs Paula Spies in front of the Jodrell Laboratory during her research visit.

The animal genetics team comprising Profs. Grobler and Kotzé, Dr Dalton and Ms Ehlers is involved with a number of projects, including the following:

- a project that aims to investigate the nature and extent of hybridisation between blue and black wildebeest in South Africa, in collaboration with the University of Pretoria, the National Zoological Gardens in Pretoria, the National Museum in Bloemfontein and conservation officers from the Free State and KwaZulu-Natal Provinces;
- endonulease V mismatch cleavage mediated SNP discovery in white rhino together with the National Zoological Gardens in Pretoria;



- an individual-based conservation genetics project on white rhino in collaboration with the Mpumalanga Tourism and Parks Agency;
- tracking of the origin of pea weavils (a serious threat to agriculture) in Ethiopia;
- the genetic management of baboon populations with the Gauteng Department of Agriculture;
- the National Genetic Database for cheetah in association with the National Zoological Gardens in Pretoria, the Department of Genetics of the University of Pretoria, the De Wildt Cheetah and Wildlife Trust, Hillsdale College in the USA and the University of Vienna in Austria;
- population management of crane species with the National Zoological Gardens in Pretoria and the Endangered Wildlife Trust;
- genetic and population studies on ground hornbills, in collaboration with the National Zoological Gardens in Pretoria, the Endangered Wildlife Trust, the Ground Hornbill Working Group, the Mabula Ground Hornbill Research and Conservation Project, the University of Pretoria and the Natural History Museum in Paris, France;
- the compilation of an atlas for haemoglobin profiles with Bio-Rad Laboratories, Germany, SANParks and the University of Limpopo;

- the genetic diversity of freshwater mussels in the South-Eastern United States; and
- the geographic genetic structure of vervet monkey populations with the University of California, Los Angeles (UCLA) and the UWM.

Prof. Trudy Turner from the Department of Physical Anthropology at the UWM, USA, visited the department again during 2010. The collaboration between Profs. Grobler and Turner was strengthened by participating in a project with Prof. Nelson Freimer from UCLA. The project is aimed at the use of vervet monkeys as model systems for integrated genetic and genomic research. As part of this project, extensive sampling of vervets occurred during 2010 and the department hosted two researchers from UCLA and two M.Sc. students from UWM. Four M.Sc. students from the UFS also participated in this project.

The plant genetic team comprising Prof. Spies, Mr Maleka and Mrs Spies are concentrating their studies on *Clivia*. A number of M.Sc. students are working on genetic diversity in different *Clivia* species and the possible application of these results in forensics is currently being investigated. Barcoding DNA regions were identified to recognise several species. Research on the genes involved in the formation of flower colour in *Clivia* has already identified four genes in the anthocyanin pathway. Their expression in different cultivars was tested.

Mr Maleka's research interest is on the genetics of flower pigmentation in *Clivia*. He previously used a highthroughput sequencing technology, namely Illumina Genome Analyzer, to sequence the flower-derived ds-cDNA molecules in *Clivia miniata*. Analysis of the sequence data yielded more than 37 000 gene sequences (termed contigs) that represented genes being expressed in the *Clivia* flower tissues. Contigs were analysed further using various software packages and bioinformatic databases. Using the approach, *Clivia* contigs were identified that are homologous to six genes involved in the flavonoid biosynthetic pathway. Two of the genes were studied further as part of Honours projects in 2010. Another gene is also currently being studied as part of an M.Sc. research project that was initiated in 2010.

Prof. Johan Spies acts as information officer for the distribution of knowledge obtained during the research on *Clivia* and handles many enquiries from the *Clivia* breeders.

research OUTPUTS

Dalton, D.L., Kotzé, A. & Howitt, M.

2010. Assessment of CHD-specific primers for gender determination in red-billed oxpeckers (*Buphagus erythrorhynchus*). Ostrich: Journal of African Ornithology 81: 251-257.

Besearch articles

Engelbrecht, G.M., Du Preez, C.C. & Spies, J.J. 2010. Response of *Lachenalia* growing in soil to phosphorous fertilisation during the pot plant phase. *South African Journal of Plant and Soil* 27: 221-228.

Garrine, C.M.L.P., Kotze, A., Els, H. & Grobler, J.P. 2010. Genetic characterization of the indigenous Landim and Pafuri goat breeds from Mozambique. African Journal of Agricultural Research 5: 3130-3137.

Grobler, J.P. & Turner, T.R. 2010. A novel trap design for the capture and sedation of vervet monkeys (Chlorocebus aethiops). South African Journal of Wildlife Research 40: 163-168.

Monadjem, A., Bamford, A.J., Earnshaw, J.K., Dalton, D.L. & Kotzé, A. 2010 Temporal and sex-specific

variation in growth rates of Marabou Stork Leptoptilos crumeniferus chicks. Ostrich: Journal of African Ornithology 81: 85–91.

Peters, F., Kotze, A., Van der Bank, F.H. & Grobler, J.P. 2010. Genetic profile of the locally developed Meatmaster sheep breed in South Africa based on microsatellite analysis. *Small Ruminant Research* 90: 101-108.

Spies, J.J. & Reinecke, S.M.C. 2010. Poaceae. In: IAPT/IOPB Chromosome Data 9, edited by K. Marhold. *Taxon* 59: 1301-1302.

Swart, H., Kotze, A., Olivier, P.A.S. & Grobler, J.P. 2010. Microsatellitebased characterization of Southern African domestic pigs (*Sus scrofa domestica*). South African Journal of Animal Science 40: 121-132.

Chapter in book

Harris, E.J., Van Marle-Koster, E. & Kotze, A. 2010. Application of DNA technology in beef cattle breeding. In *Beef Breeding in South Africa* (2nd edition), edited by M.M. Scholtz. Pretoria: ARC. pp. 82-88.

Conference contributions

Botha, M.E., Albertyn, J., Spies, J.J. & Maleka, M.F. 2010. Cloning and expression analysis of the phytoene synthase (Psy) gene in Clivia miniata. Poster presented at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9-10 April.

Bubb, A., Ehlers, K., Kotze, A. & Grobler, J.P. 2010. Preliminary results on the genetic structure of baboons on the Suikerbosrand Nature Reserve with notes on the efficacy of DNA extraction from faecal samples. Paper delivered at the Annual Symposium of the Primate Ecology and Genetics Group, Hogsback, South Africa. 25-27 June.

Coetzer, W.G., Grobler, J.P. & Turner, T.E. 2010. Nuclear and mtDNA diversity in vervet monkeys from the Free State, Eastern Cape and KwaZulu-Natal provinces of South Africa. Poster presented at the Southern African Wildlife Management Association (SAWMA) 40th Anniversary Symposium: Biodiversity Conservation in a Changing World, Buffelspoort, South Africa. 19-22 September.

Coetzer, W.G., Grobler, J.P. & Turner, T.E. 2010. Population genetic structure of vervet monkeys (Chlorocebus aethiops) in the south-eastern parts of South Africa. Poster presented at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9-10 April.

Coetzer, W.G., Turner, T.R. & Grobler, J.P. 2010. Population genetic structure of vervet monkeys in southern and central regions of South Africa. Paper delivered at the Annual Symposium of the Primate Ecology and Genetics Group, Hogsback, South Africa. 25-27 June.

Danzy, J., Grobler, J.P., Lorenz, J., Freimer, N. & Turner, T.R. 2010. *Geographic variation in scrotal coloration of vervet monkeys.* Paper delivered at the Annual Symposium of the Primate Ecology and Genetics Group, Hogsback, South Africa. 25–27 June.

Danzy, J., Grobler, J.P., Lorenz, J.G. & Turner, T.R. 2010. Developmental patterns of scrotal coloration among free-ranging African and Caribbean vervet monkeys. Paper delivered at the XXIIIth International Primatological Society Congress, Kyoto, Japan. 12-18 September.

Ehlers, K. 2010. Compiling a set of STR markers for forensic applications

in black and white rhinos. Paper delivered at the 2nd Annual African DNA Forensics Conference, Die Wilgers, Pretoria, South Africa. 28-29 October.

Ehlers, K., Grobler, J.P. & Kotze, A.

2010. Compiling a set of STR markers for forensic applications in black and white rhinos. Paper delivered at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9–10 April.

Grobler, J.P. 2010. Applications and limitations of some statistical approaches in animal forensics: case studies from South Africa. Paper delivered at the 2nd Annual African DNA Forensics Conference, Die Wilgers, Pretoria, South Africa. 28-29 October.

Grobler, J.P. 2010. Chlorocebus aethiops *decoded: A journey of vervet monkey research.* Paper delivered at the Faculty Series, Faculty of Agriculture, Science & Maths, University of Limpopo, Polokwane, South Africa. 30 September.

Grobler, J.P. & Turner, T.R. 2010. A novel trap design for capturing vervet monkeys, with a demographic analysis of trapped animals. Poster presented at the Southern African Wildlife Management Association 40th Anniversary Symposium: Biodiversity Conservation in a Changing World, Buffelspoort, South Africa. 19–22 September.

Grobler, J.P. & Turner, T.R. 2010. Chlorocebus aethiops *decoded: A journey of vervet monkey population genetic research*. Paper delivered at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9–10 April.

Jackson, B.C., Herselman, L., Spies, J.J. & Maleka, M.F. 2010. Differential gene expression in the floral tepals of Clivia miniata using cDNA-AFLP. Poster presented at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9-10 April.

Kotze, A., Dalton, D.L., Lekgethisho, D. & Du Toit, R. 2010. Genetic characterization of black rhinoceros (Diceros bicornis) populations from Zimbabwe using microsatellite markers. Paper delivered at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9-10 April.

Kotze, A., Grobler, J.P. & Dalton,

D. 2010. Determining the origin of cheetah in southern Africa using assignment methods. Paper delivered at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9-10 April.

Lorenz, J., Grobler, J.P., MacAuliffe Dore, K., Freimer, N., Jasinska, A. & Turner, T.R. 2010. *Genetic* variation among geographically widespread populations of vervets (Chlorocebus aethiops) in Southern and Eastern Africa. Paper delivered at the 79th Annual Meeting of the American Association of Physical Anthropologists, Albuquerque, New Mexico, USA. 14–17 April.

Maleka, M.F., Mafofo, J., Rees, D.J.G., Albertyn, J.J. & Spies, J.J. 2010. The identification of genes involved in colour formation in Clivia miniata flowers. Paper delivered at the 5th International *Clivia* Conference, Bellville, South Africa. 21-22 September.

Maleka, M.F., Mafofo, J., Rees, J., Litthauer, D., Albertyn, J. & Spies, J.J. 2010. Characterization of the Clivia transcriptome using the Illumina sequencing technology. Paper delivered at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9-10 April.

Reinecke, S.M.C. & Spies, J.J. 2010. Cell fusion in the family Poaceae. Poster presented at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9–10 April.

Spies, J.J., Spies, P., Van der Westhuizen, H.M., Stegman, S. & Watson, M. 2010. *Implications* of basic research results for Clivia breeders. Paper delivered at the 5th International *Clivia* Conference, Bellville, South Africa. 21-22 September.

Spies, P., Spies, J.J. & Grobler, J.P. 2010. The origin and phylogeny of Clivia. Paper delivered at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9-10 April.

Spies, P., Van der Westhuizen, H.M., Stegman, S., Watson, M. & Spies, J.J. 2010. *Bar-coding* Clivia for species *identification*. Paper delivered at the 5th International *Clivia* Conference, Bellville, South Africa. 21-22 September.

Theron, N., Kotze, A., Jansen, R., Grobler, J.P. & Turner, A. 2010. A multi-disciplined approach to future conservation of the southern ground hornbill (Bucorvus leadbeateri) in Africa. Paper delivered at the 25th International Ornithological Conference, Campos do Jordão, Brazil. 22-28 August.

Turner, T.R. 2010. *Primates: Our shared ancestry*. Inaugural Lecture, Department of Genetics, University of the Free State, Bloemfontein, South Africa. 11 August.

Turner, T.R., Lorenz, J.G., Pampush, J.D., Freimer, N. & Grobler, J.P. 2010. The utility of genetic and morphological data in understanding

NATURAL SCIENCES | DEPARTMENT OF GENETICS

taxonomy in vervet monkeys. Paper delivered at the XXIIIth International Primatological Society Congress. Kyoto, Japan. 12-18 September.

Van Aswegen, E. & Grobler, J.P.

2010. A link between phenotypical variation and diversity at the bone morphogenesis gene in springbok (Antidorcas marsupialis). Poster presented at the Southern African Wildlife Management Association (SAWMA) 40th Anniversary Symposium: Biodiversity Conservation in a Changing World, Buffelspoort, South Africa. 19-22 September.

Van Aswegen, E. & Grobler, J.P.

2010. Gene flow among springbok populations and the possible role of bone morphogenesis genes in body size differences. Poster presented at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9-10 April.

Van der Westhuizen, H.M., Spies, P. & Spies, J.J. 2010. Potential barcoding regions for species identification in Clivia nobilis and C. mirabilis. Poster presented at the 21st Biennial Congress of the South African Genetics Society, University of the Free State. Bloemfontein, South Africa. 9-10 April.

Watson, M., Spies, P. & Spies, J.J. 2010. Clivia "mzamba": A new species? Poster presented at the 21st Biennial Congress of the South African Genetics Society, University of the Free State, Bloemfontein, South Africa. 9-10 April.

Wessels, L., Kotze, A., Ehlers, K., Vrahimis, S. & Grobler, J.P. 2010. Cross-species microsatellite markers for the detection of hybrids in the genus Connochaetes. Paper

delivered at the 21st Biennial Congress of the South African Genetics Society, University of the Free State. Bloemfontein, South Africa. 9-10 April.

Whitten, P., Grobler, J.P., Lorenz, J., Barrett, C., Ortiz, M., Pampush, J.D. & Turner, T.R. 2010. Ecogeographic analysis of nutritional states in South African vervet monkeys, Paper delivered at the 79th Annual Meeting of the American Association of Physical Anthropologists, Albuquerque, New Mexico, USA. 14-17 April.

Contact details

Prof. Johan Spies

Faculty of Natural and Agricultural Sciences Department of Genetics University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone: +27 (0)51 401 2595 +27 (0)86 518 7317 Fax: E-mail: spiesjj@ufs.ac.za www.ufs.ac.za Website:

Academic staff

Professor:

Affiliate Professor: Prof. Trudy Turner

Associate Professor:

Affiliate Associate Professor: Prof Antoinette Kotzé

Affiliate Senior Lecturer: Dr Desiré Dalton

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

Affiliate Lecturer: Lt.Kol. Anton Lucassen

Junior Lecturers: Mss Zurika Odendaal, Letecia

Senior Professional Officer: Ms Susan Reinecke



"The Department of Geography at the University of the Free State continues to make a unique academic contribution in that it teaches and conducts research at the interface between human society and the natural environment that sustains both human existence and the environment."

Prof. Peter Holmes

12 Department of Geography

Overview

Academic interest in the field of Geography continues to grow. This is evident in the fact that 2010 saw a further growth in our student numbers at both the Main and Qwaqwa Campuses. A record number of more than 600 first-year students were enrolled at the Qwaqwa Campus. New staff members, Dr Geoffrey Mukwada and Ms Merle Naidoo, were therefore appointed at the Qwaqwa Campus, in line with the growth in student numbers.

Special achievements

Prof. Gustav Visser's National Research Foundation (NRF) rating changed to a C1-rating with effect from 2011. The department congratulates him on this well-deserved achievement.

Activities and achievements

Prof. Peter Holmes was an invited keynote speaker at the Arid Zone Ecology Forum (AZEF) annual meeting that was held at the Gariep Dam in October 2010. His talk was entitled *Erosion processes in marginal Karoo environments; recent trends.*

Prof. Gustav Visser organised and co-hosted a study group meeting on behalf of the International Geographical Union's Commission on Tourism, Leisure and Global Change that took place in Stellenbosch during



September 2010. Forty of the world's leading academics in tourism research addressed the theme *Global change and economic crisis in tourism*.

Dr Shirley Brooks was interviewed on national radio for SAFM's programme, *Science Matters*, in early November 2010. This was in response to her article on qualitative approaches to environmental risk assessment published in the *South African Journal of Science* during the year.

Mr Mnqobi Ngubane received funding from the University of the Free State (UFS) research cluster on Poverty Alleviation and Sustainable Development to undertake research for his Master's degree on the relationship between game farming and land reform in the KwaZulu-Natal Province, with special emphasis on the emergence of community game farms. Dr Brooks and Mr Ngubane, who also received the JS le Roux Award as the top Geography Honours student for 2009 at a faculty function early in 2010, conducted several field trips to the KwaZulu-Natal Midlands.



Mr Francois Deacon completed his M.Sc. study on the spatial ecology of small predators in the Southern Free State under the supervision of Dr Barker. Ms Likelele Talime completed her M.Sc. on aspects of environmental impact assessments in Lesotho under the supervision of Ms Eldalize Kruger. Mr Gijsbert Hoogendoorn completed his Ph.D. that focused on the economic impacts of second home development on host communities and their contribution to the development of post-productivist countrysides. The thesis was promoted by Prof. Gustav Visser.

At the Qwaqwa Campus, Dr Hennie Claassen, Dr Geoffrey Mukwada, Mr Pululu Mahasa and Ms Merle Naidoo are involved in a research project investigating the economic viability of black commercial farmers in the North-Eastern Free State and how their situation has changed since 50 000 hectares of land were allocated to them in 1987. Identifying factors limiting production and viability, assessing coping strategies amongst farmers, and identifying measures to enhance productive capacity are amongst the main aims of this ongoing research.

National and international collaboration

Significant progress was made in advancing the joint, ongoing research programme on game farming led by Dr

At one of their recent game-farming workshops, Dr Shirley Brooks emphasises a point with the help of a map, while Prof. Marja Spierenburg (Vrije Universiteit, Amsterdam) looks on.

Shirley Brooks and Prof. Marja Spierenburg from the Vrije Universiteit, Amsterdam, in The Netherlands. Funding was obtained from The Netherlands Organisation for Scientific Research and Science for Global Development (NWO-WOTRO) to support two fulltime doctoral students in the Department of Geography. They are supervised jointly by Dr Brooks and Prof. Spierenburg. After a competitive selection process, Mr Tariro Kamuti and Ms Jenny Josefsson were awarded these prestigious scholarships and began work on their doctorates in 2010. Mr Kamuti's study focuses on the role of the state and governance issues related to private game farming, while Ms Josefsson's study focuses on the farm-dweller communities affected by these processes of agrarian change in the South African (and specifically the KwaZulu-Natal) countryside.

An exciting interdisciplinary initiative was launched by Dr Brooks in September 2010 in collaboration with Prof. Neil Roos, Director of the Postgraduate School at the UFS. The focus of this initiative is a monthly seminar at which scholars from the UFS, as well as visiting scholars present pre-circulated papers for discussion and constructive critique by a group of interested and committed peers.

NATURAL AND AGRICULTURAL SCIENCES | ANNUAL REPORT 2010

141

Prof. Maitland Seaman looks on as Dr Andrew Carr from the University of Leicester (on the ladder) and Prof. Louis Scott from UFS Plant Sciences sample a late quaternary sedimentary sequence in the Langkloof for pollen and isotope analysis.

The initiative, in part a response to the university's call to promote an enriched academic culture on campus, is intended to strengthen collaborative and collegial relationships among UFS academics. It is hoped that a further spinoff will be to promote the publication of previously unpublished work by UFS-based academics. Dr Jennifer Houghton, a postdoctoral fellow in the Department of Geography, presented the first paper on the topic *Theoretical engagements with urban development – thinking through 'entanglement' in contemporary Durban*.

Prof. Holmes joined Prof. Louis Scott from Plant Sciences, Prof. Maitland Seaman from the Centre for Environmental Management and Drs Mark Bateman (Sheffield) and Andrew Carr (Leicester) for fieldwork as part of a new, collaborative programme investigating *late quaternary palaeo-environments in the Langkloof of the Southern Cape*. This fieldwork took place in May 2010. Preliminary results will be presented at the International Union for Quaternary Research (INQUA) conference in Bern, Switzerland in July 2011.

Staff matters

Apart from the new staff appointments at the Qwaqwa Campus, staffing remained unchanged at the Main Campus. Prof. Margaret Marker, retired Professor of Geography at Fort Hare, was appointed as a Research Associate. She and Prof. Holmes will continue to undertake collaborative research. Dr Dan Hammett (University of Sheffield) was appointed as an Affiliate Researcher in the department and will work on collaborative projects with Prof. Gustav Visser.

Dr Charles Barker acted as Head of Department for the second semester in the absence of Prof. Holmes, who was on leave.



research OUTPUTS

Research articles

Booyens, I. & Visser, G.E. 2010. Tourism SMME development on the urban fringe: The case of Parys, South Africa. *Urban Forum* 21: 367-385.

Brooks, S.J., Sutherland, C., Scott, D. & Guy, H. 2010. Integrating qualitative methodologies into risk assessment: Insigths from South Durban. *South African Journal of Science* 106(9): 1-10.

Carr, A.S., Boom, A., Dunajko, A.C., Bateman, M.D., Holmes, P.J. & Berrio, J-C. 2010. New evidence for the age and palaeoecology of the Knysna formation, South Africa. South African Journal of Geology 113(3): 241-256.

Carr, A.S., Bateman, M.D., Roberts, D.L., Murray-Wallace, C.V., Jacobs, Z. & Holmes, P.J. 2010. The last interglacial sea-level high stand on the southern Cape coastline of South Africa. *Quaternary Research* 73: 351-363.

Douglas, R.M., Holmes, P.J. & Tredoux, M. 2010. New perspectives on the fossilization of faunal remains and the formation of the Florisbad archaeozoological site, South Africa. *Quaternary Science Reviews* 29: 3275-3285.

Hoogendoorn, G. & Visser, G.E. 2010. The role of second homes in local economic development in five small South African towns. *Development Southern Africa* 27(4): 547–562.

Manatsa, D., Mukwada, G., Siziba, E. & Chinyanganya, T. 2010. Analysis of multidimensional aspects of agricultural droughts in Zimbabwe using the Standardized Precipitation Index (SPI). Theoretical and Applied Climatology 102: 287-305.

Marker, M.M. & Holmes, P.J. 2010. The geomorphology of the coastal platform in the southern Cape. South African Geographical Journal 92(2): 105-116.

Msilimba, G.G. & Holmes, P.J. 2010. Landslides in the Rumphi District of Northern Malawi: Characteristics and mechanisms of generation. *Natural Hazards* 54: 657-677.

Staeheli, L. & Hammett, D.P. 2010. Educating the new national citizen: Education, political subjectivity and divided societies. *Citizenship Studies* 14(6): 667-680.

Visser, G.E. & Hoogendoorn, G. 2010. The economic impact of second home development in small-town South Africa. *Tourism Recreation Research* 35(1): 55-66.

Visser, G.E. 2010. Leisurely lesbians in a small city in South Africa. *Urban Forum* 21: 171-185.

Reports

Seaman, M.T., Watson, M., Avenant, M.F., Barker, C.H., Buschke, F., Dennis, I., Esterhuyse, S., Joubert, A., Kemp, M., King, J., Le Roux, P., Redelinghuys, N., Rossouw, L., Rowntree, K., Sokolic, F., Van der Waal, B., Van Rensburg, L., Van Tol, J. & Vos, A.T. 2010. Deliverable 8: Report on catchment delineation, site selection and fieldwork for the Mokolo River case study. Testing a prototype methodology for Environmental Water Assessments in Non-perennial Rivers. Water Research Commission contract K5/1798. Report by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa.

Seaman, M.T., Avenant, M.F., Watson, M., King, J., Armour, J., Barker, C.H., Dollar, E., Du Preez, P.J., Hughes, D., Rossouw, L. & Van Tonder, G. 2010. Developing a method for determining the environmental water requirements for non-perennial systems. WRC Report no. TT 459/10 to the Water Research Commission, Pretoria, South Africa.

Chapter in book

Visser, G.E. 2010. White gay women's leisure spaces in Bloemfontein, South Africa. In: Sex and the sexual during people's leisure and tourism experiences, edited by N. Carr & Y. Poria. Newcastle, UK: Cambridge Scholars. pp. 143–163.

Conference contributions

Avenant, M.F., Seaman, M.T., Armour, J., Barker, C.H., Du Preez, P.J., Hughes, D., King, J.M., Rossouw, L., Van Tonder, G. & Watson, M. 2010. Southern African nonperennial rivers: Proposing a new prototype methodology for assessing environmental water requirements. Paper delivered at the Flood Pulsed Wetlands International Symposium, Harry Oppenheimer Okavango Research Centre, Maun, Botswana. 1-5 February.

Brooks, S.J. & Spierenburg, M. 2010. *Creating a commodified wilderness: Tourism, private game farming and*

the construction of "third nature" landscapes in KwaZulu-Natal. Paper delivered at the 9th North Eastern Workshop on Southern Africa, Burlington, Vermont, USA. 9-11 April.

Brooks, S.J. & Spierenburg, M. 2010. Wildlife tourism and South Africa's rural crisis: Creating wilderness and restructuring labour (tenant) relations. Paper delivered at the Global Change and Economic Crisis in Tourism Conference of the International Geographical Union Commission on Tourism, Leisure and Global Change, Stellenbosch, South Africa. 5-8 September.

Brooks, S.J. & Spierenburg, M. 2010. Wildlife tourism and South Africa's rural crisis: Creating wilderness and restructuring labour (tenant) relations. Paper delivered at the Biennial Conference of the African Studies Association of the United Kingdom, Oxford, UK. 16-19 September.

Brooks, S.J. 2010. Transforming conservation landscapes? Reflections

on change and continuity in postapartheid South Africa. Paper delivered at the Annual Meeting of the Association of American Geographers, Washington DC, USA. 14-18 April.

Deacon, F., Avenant, N.L. & Barker, C.H. 2010. Spatial ecology of damage caused by black-backed (Canis mesomelas) in the southern Free State. Paper delivered at the Southern African Wildlife Management Association (SAWMA) 40th Anniversary Symposium: Biodiversity Conservation in a Changing World, Buffelspoort, South Africa. 19-22 September.

Holmes, P.J. 2010. Erosion processes in marginal Karoo environments; recent trends. Invited keynote paper delivered at the 2nd Arid Zone Ecology Forum (AZEF): Change and stasis in the Arid Zone, Gariep Dam, South Africa. 4-7 October.

Holmes, P.J. & Wiggs, G.F.S. 2010. Wind erosion on ploughed land in the western Free State, South Africa. Paper delivered at the Biennial Conference of the South African Association of Geomorphologists, Grahamstown, South Africa. 2-5 September.

Janecke, B.B., Smit, G.N. & Barker, C.H. 2010. Spatial and temporal variation in habitat use of some herbivore game species in a small fenced property, central Free State. Paper delivered at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and

pasture systems, with an emphasis on

arid regions, Kimberley, South Africa.

19-23 July.

Visser, G.F. & Hoogendoorn, G. 2010. Second homes-led local economic development in five small town in South Africa. Paper delivered during the Annual Meeting of the Association of American Geographers, Washington DC, USA. 14-18 April.

Academic staff

MAIN CAMPUS

Professors: Profs. Peter Holmes and Gustav Visser

Senior Lecturers: Drs Charles Barker and Shirley Brooks

Lecturers: Mss Eldalize Kruger, Tobeka Mehlomakhulu and Sheila Vrahimis Junior Lecturer: Ms Mulalo Rabumbulu

QWAQWA CAMPUS

Senior Lecturer: Dr Hennie Claassen

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

Junior Lecturer: Mr Pululu Mahasa

Contact details

Prof. Peter Holmes

Faculty of Natural and Agricultural Sciences Department of Geography University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone: Fax: E-mail: Website:

+27 (0)51 401 2255 +27 (0)51 4013816 holmespj@ufs.ac.za www.ufs.ac.za "The annual AngloGold Ashanti competition for bursars from the universities took place in January 2010 and an Honours student from the Department of Geology at the University of the Free State, Mr Van Niekerk, excelled by winning the competition for Geology students. He also came second in the overall competition, which included other disciplines such as metallurgy and engineering."

Prof. Willem van der Westhuizen
13 Department of Geology

Overview

The Department of Geology at the University of the Free State (UFS) is a leading institution for learning and research of the Earth Sciences in South Africa, with research contributions published in first-rate international journals. We actively pursue broad exposure through international field trips and frequently host international guests at our department.

The introduction of a pre-registration selection process and the splitting of General Geosciences (GWS114) into Geology (GLG114) and Geography (GEO114) reduced firstyear student numbers in the Department of Geology from 351 to 240 students. Second-year numbers were still high and the Mineralogy class (GLG214) consisted of 109 students. This posed a big challenge in terms of the practical sessions, since multiple sessions needed to be conducted in order to accommodate all the students. There were 90 third-year students and 29 Honours students enrolled in 2010, the highest in the history of the department. The course in Mineral Resource Management (MRM) has also reached an all-time high with 15 candidates enrolling for 2010. Postgraduate numbers have also increased significantly. A contributing factor is the department's participation in the international Inkaba yeAfrica (IyA) initiative, a German-South African collaborative Earth Science research initiative. From the department, Profs. Marian Tredoux and Christoph Gauert are supervising the students who participate in



this initiative. More information about this programme is outlined later in the report.

The continued growth in student numbers puts pressure on the capacity of the existing lecturing staff and physical infrastructure of the department.

The following number of Geology degrees were conferred in 2010: 45 B.Sc., 16 Honours, two M.Sc. and four MRM degrees.

Activities and achievements

Ms Kennedy, an Honours student, visited the Steinmann Institute for Geology, Mineralogy and Palaeontology at the University of Bonn, Germany, for two weeks during the year, in order to prepare experiments as part of her research project under the supervision of Prof. Ballhaus. Later in the year, Ms Kennedy and M.Sc. student, Ms McDonald, also visited Prof. Helmy at the Minia University in Egypt to discuss research findings. 145



In terms of Inkaba yeAfrica, 12 South African institutions (eight universities and four parastatals) take part in the research. Since 2009, the UFS has been a major participant in IyA and at the 7th IyA Workshop in Potsdam, Germany, in November 2010, the UFS delegation was by far the largest, accounting for nearly 30% of the South African contingent.

Of the 16 UFS postgraduate students who presented posters and talks about their research at the Potsdam meeting, nine were from the Department of Geology. Three of them worked under the auspices of one of the environmental sub-programmes, with two of the projects having direct relevance to diamond exploration. The other six students' work formed part of the *Platinum value chain* sub-project that aims to investigate aspects of all stages of the exploration for, and to the benefit of, platinum-group element (PGE) ores.

Ms McDonald discussing her poster during the Potsdam conference.

Students and lecturers getting ready for the visit to Potsdam. The Dean, Prof. Heideman, is sitting in front (wearing a tie).





Two of the UFS Geology students won prizes. The award for the best poster was for work related to the Orange River gravels in the Douglas area (Mr Clarke supervised by Prof. Gauert) and the second prize was for the poster on experimental petrology on PGE-bearing sulphides (Ms Kennedy supervised by Prof. Tredoux). The UFS delegation distinguished themselves by their professionalism and a letter of congratulations was sent to the Dean of the faculty by the IyA management, following the event.

A number of excursions took place during 2010. Mrs Pretorius again accompanied 12 Honours students in Mineralogy to Mintek and the University of Pretoria from 25-26 February 2010. The purpose of the excursion is to broaden the scope of study for the Honours programme in Mineralogy and especially to include more Applied Mineralogy. This opportunity will enhance the learning and understanding of applications in the study of ore forming minerals.

Dr Hermann Praekelt and Prof. Wayne Colliston conducted a number of field excursions for students in the course on Advanced Field Applications/Techniques. 89 students accompanied them on these excursions on Fridays from 12 February to 12 March 2010. The following aspects were covered during the excursions:

 Mapping of the Karoo and application of geological techniques

UFS students Ms Lebenya from the Department of Soil, Crop and Climate Sciences (runner-up for the best presentation). Mr Clarke (best poster) and Ms Kennedy (runner-up for the best poster), both from the Department of Geology.

- Measuring stratigraphic sections
- Geophysical applications (use of magnetometer) to identify dolerite dykes in subsurface and graphically recording their shape and orientation
- Report writing

Prof. Colliston undertook his annual mine-mapping excursion to the Tshepong mine from 16-20 March 2010 for the Honours students studying Structural Geology, with 13 Honours students participating in the excursion. Presentations regarding their mapping were made to the management of Tshepong Mine.

From 24 September to 2 October 2010, Dr Praekelt and Mr Leon Nel accompanied the second-year students on a field school to Barkly East. The students had instruction in field mapping, geological observations, section drawing, sedimentary and volcanological interpretations and report writing. 130 students accompanied them in two groups on the excursion.

Prof. Gauert and students in Economic Geology paid three visits to Welkom between 27 August and 9 October 2010 to investigate economic aspects of gold mining at the Tshepong, Masimong and Phakisa shafts of Harmony, a gold-mining company. 83 students participated in these visits.

Prof. Tredoux and 94 Geochemistry students visited the Vredefort impact structure, a World Heritage Site, from 23-25 April 2010 to investigate the theories concerning the genesis of the dome.

Visits to the Austin's Post area south of Bloemfontein. Lockshoek near Jagersfontein and to Slypsteenberg 147



were arranged and conducted by Dr Johan Loock and Mr Odendaal for first-year students. The students were introduced to Karoo geology, sedimentology, stratigraphy, palaeontology and dolerite intrusions, as well as aspects of geomorphology.

Staff and students had interaction with the following mining companies during the year: AngloGold Ashanti, African Nickel, African Rainbow Minerals (Nkomati mine), Deutsche Rohstoff AG, Gold One International Limited, Harmony, Xstrata, Norilsk Nickel, Samancor Eastern Chrome Mines, Xstrata Alloys (Kroondal mine), Great Basin Gold Limited and Rand Uranium.

The annual AngloGold Ashanti competition for bursars from all the South African universities took place in January 2010 and an Honours student from the Department of Geology at the UFS, Mr Van Niekerk, excelled by winning the competition for Geology students. He also came second in the overall competition, which included other disciplines such as metallurgy and engineering. The competition consists of a presentation regarding results from vacation work that the students conduct at AngloGold Ashanti operations. Postgraduate students from the Department of Geology are also encouraged and supported financially to attend specialised courses presented by the Geological Society of South Africa.

For example, during March 2010, 15 students from the Department of Geology attended a workshop on applied geological skills for junior geologists in Johannesburg.

Four students from the department also attended the Mineralogical Society of South Africa workshop on the introduction to chemical and analytical techniques in Johannesburg in May 2010.

A course on modern mapping techniques was also presented by the Geological Society of South Africa in Johannesburg in September 2010. Seven Honours students from the department attended this workshop.



National and international collaboration

Prof. Alterman (Kumba-Exxaro Chair in Geodynamics, University of Pretoria) visited the department in April 2010 to discuss research regarding the Ventersdorp and Transvaal Supergroups.

Prof. Huizenga (North-West University) visited the department during July 2010 and presented a two-day fluid inclusion workshop.

Prof. Kruger, from GeoActive, visited the department in April 2010. He presented a lecture entitled *A compressional tectonic setting for the Bushveld Igneous Complex: The isotopic evidence.*

Mr Kenyon, guest lecturer in the course GLG374, formerly from Anglo-American Research Laboratories, visited the department during February 2010 to present a short course on sampling theory.

Mr Chris Botha from Advanced Laboratory Solutions provided training on the new SEM-EDX/WDX instrument.

Students measuring profiles in the Barkly East area during an excursion.

Messrs Visje and Dyckstra from Thermo Fisher Scientific in The Netherlands visited the department in October/ November 2010.

Prof. Marian Tredoux travelled to Hungary and Austria in August and September 2010, where she presented a keynote address at the 20th General Meeting of the International Mineralogical Association in Budapest, as well as an invited lecture at the Commission on Ore Mineralogy of the International Mineralogical Association (IMA-COM) Workshop on Platinum Group Elements at the University of Leoben, Austria. In November 2010, she attended the 7th IyA Workshop in Potsdam, Germany, as part of the UFS delegation.

During May-June 2010, Prof. Christoph Gauert visited Prof. Cuney, world-renowned expert on uranium deposits, at the Henri Poincaré University Nancy 1, France, where he attended the defence procedure of the Ph.D. thesis by Isabelle Duhamel-Achin on the Characterisation of Archaean uranium sources - mechanisms of the genesis of the oldest uranium deposits (3.0 to 2.2 Ga) and palaeoproterozoic preconcentrations of U. They also discussed research aspects of the !Khure Africa bilateral French-South African collaboration. He also visited the Curt-Engelhorn Centre of Archaeometry of the University of Tuebingen in Mannheim, Germany, for LA-ICP-MS analyses of gold grains from the Black Reef (Transvaal Supergroup) and the B-Reef (Witwatersrand Supergroup) conglomerates. During August 2010, Prof. Gauert also paid a visit to Budapest to attend and present research at the 20th General Meeting of the IMA. He also visited the BAMline BESSY Synchrotron XRF facility in Berlin for the planning of experiments. During this visit, he also

attended a Raman workshop at the University of Vienna, Austria.

He also participated in a field trip with his postgraduate student, Mr Ngaruye, which included a trip to the Geological Survey of Rwanda in Kigali and to several Sn-W-coltan-prospects. This visit was to investigate economic aspects and collect samples for analysis for Mr Ngaruye's research.

Dr Holger Sommer and M.Sc. students Mss Purchase and Potgieter attended the European Geosciences Union (EGU) General Assembly in Vienna, Austria, during May 2010, where they presented four posters.

Dr Sommer also organised a workshop on mantle rocks at the Department of Geological Sciences, at the Seoul National University in South Korea on 20 June 2010. Another workshop on diamond exploration was organised by Dr Sommer and Prof. Wayne Colliston at the UFS in April 2010, and was attended by UFS students, staff and industry geologists from GEM Diamonds and De Beers.

Community service

The EarthWISE programme forms part of community service by the Department of Geology and the outreach component of the Africa Earth Observation Network (AEON). 2010 was a full and exciting year for this programme.

The EarthWISE coordinator, Mrs Mariette Erwee, attended the South African Association for Research in Mathematics, Science and Technology Education (SAARMSTE) conference at the University of KwaZulu-Natal from 18–21 January 2010. She presented a talk entitled *Practical activities implemented by the AEON* EarthWISE programme during their training workshops for South African Grade 4-9 teachers, as well as a poster with the title An evaluation of the educational impact of the EarthWise teacher training project.

School groups visited the Department of Geology on 3, 8 and 10 February 2010. Learners were given a briefing session on possible careers in Geology and was also given a tour of the geology museum in the department.

The Centre for Education Development (CED) was provided with 18 Geology laboratory boxes during 2010. These boxes contain geological samples for use by the CED during teacher training. EarthWISE also assisted the CED in presenting a science day at the De Aar High School for 300 learners on 26 October 2010.

The department assisted and contributed to road shows held by WetSA, a private organisation that promotes science in South Africa. During the road show, interactive presentations in Earth Science were presented to high school learners. Learners from Jim Fouché Secondary School and Sentraal Secondary School in Bloemfontein benefited from this programme.

The Faculty of Natural and Agricultural Sciences took part in SciFest Africa that was held at Grahamstown in March 2010. The theme of the exhibition was *Sense Science*, with specific sections for taste, sight, sound, feel and smell. EarthWISE and the Department of Geology contributed to this exhibition by adding several geological elements to each of the sections.

EarthWISE also participated in the national coordinated physics outreach programme workshop that was held in Pretoria on 22 April 2010. It is an initiative of the South African Institute of Physics (SAIP) to coordinate outreach

151

NATURAL SCIENCES | DEPARTMENT OF GEOLOGY

programmes to learners, teachers and the public via science centres or any other organisations.

The Kovsies Open Day took place on 1 May 2010. EarthWISE assisted the department with its interactive exhibition in order to encourage learners to study Geology.

A Science Adventure Camp was held as a marketing event by the Faculty of Natural and Agricultural Science and the top Grade 12 achievers from 30 different secondary schools in the Free State were invited. A group of 44 learners attended the camp at the Boyden Science Centre from 8–10 July 2010, during which several life sciences, physical science and space science activities and presentations were given.

EarthWISE, in association with the Faculty of Natural and Agricultural Sciences, also contributed to the TechnoX science exhibition that was held in Sasolburg from 16–20 August 2010.



research OUTPUTS

Research articles

Douglas, R.M., Holmes, P.J. & Tredoux, M. 2010. New perspectives on the fossilization of faunal remains and the formation of the Florisbad archaeozoological site, South Africa. *Quaternary Science Reviews* 29: 3275-3285.

Haschke, M., Ahmadian, J., Murata, M. & McDonald, I. 2010. Copper mineralization prevented by arc-root delamination during Alpine-Himalayan collision in central Iran. *Economic Geology* 105: 855-865.

Conference contributions

Chabangu, N. 2010. Investigation of the relationship between the Bon Accord Ni-oxide body and the Bon Accord Ni-sulphide mineralization near Barberton, South Africa. Poster presented at the 7th Inkaba yeAfrica (IyA) Workshop, GFZ Potsdam, Germany. 1-5 November.

Clark, J. 2010. River geomorphology and palaeo-terrace formation of the Orange and Vaal Rivers in the Hopetown-Douglas-Prieska area. Poster presented at the 7th Inkaba yeAfrica (IyA) Workshop, GFZ Potsdam, Germany. 1-5 November.

Colliston, W.P. 2010. A crack in the kimberlite model for the upper crust. Proceedings of the European Geosciences Union General Assembly 2010 (UNESCO IGCP 557 Contribution: Diamonds, xenoliths and kimberlites: A window into the Earth's Interior), Vienna, Austria. 2-7 May. Abstracts: p. 15656.

Erwee, M. 2010. Investigation of the level of understanding that Grade 4-9 Natural Science teachers in South Africa have of the Earth-Moon system, and methods to correct misunderstandings. Paper delivered at the 7th Inkaba yeAfrica (IyA) Workshop, GFZ Potsdam, Germany. 1-5 November.

Fuchs, S. & Gauert, C.D.K. 2010. Provenance analysis of gold and associated heavy minerals in the Black Reef Formation, South Africa, using geochemical fingerprints. Proceedings of the 20th General Meeting of the International Mineralogical Association (IMA 2010): Bonds and Bridges – Mineral Sciences and their Applications, Budapest, Hungary. 21-27 August. Abstract Series 6: p. 232.

Gauert, C.D.K., Deacon, J. & Fuchs, S. 2010. Mineralogy and Geochemistry of the Black Reef Au mineralization at Consolidated Modderfontein, East Rand, South Africa. Proceedings of the 20th General Meeting of the International Mineralogical Association (IMA 2010): Bonds and Bridges – Mineral Sciences and their Applications, Budapest, Hungary. 21-27 August. Abstract Series 6: p. 302.

Kennedy, B. 2010. Experimental investigation of the behaviour of the PGE in systems which contain Ni, Fe and S. Poster presented at the 7th Inkaba yeAfrica (IyA) Workshop, GFZ Potsdam, Germany. 1-5 November.

Lekgetho, T. 2010. Investigation of the behaviour of the PGE relative to the base metal sulphides during flotation.

Poster presented at the 7th Inkaba yeAfrica (IyA) Workshop, GFZ Potsdam, Germany. 1-5 November.

MacDonald, N. 2010. The sediment petrography of palaeoterraces on the Orange River in the Hopetown-Douglas-Prieska area in relation to the geomorphology. Poster presented at the 7th Inkaba yeAfrica (IyA) Workshop, GFZ Potsdam, Germany. 1-5 November.

Madala, F. 2010. Investigation of samples from the Bon Accord region, Barberton. Poster presented at the 7th Inkaba yeAfrica (IyA) Workshop, GFZ Potsdam, Germany. 1-5 November.

Milanzi, K. 2010. The mineralogy and geochemistry of the MG Chromitite at Kroondal Chrome Mine West Section, DH KD-85, western Bushveld Complex. Poster presented at the 7th Inkaba yeAfrica (IyA) Workshop, GFZ Potsdam, Germany. 1-5 November.

Netshitungulwana, R. 2010. Investigation of the geochemistry of native gold and a comparison with archeological artefacts. Poster presented at the 7th Inkaba yeAfrica (IyA) Workshop, GFZ Potsdam, Germany. 1-5 November.

Ngaruye, J.C. & Gauert, C.D.K. 2010. Mineralogy of Sn-Nb-Ta-W(-Au) mineralizations in the Musha-Ntunga, Bugarura-Kuluti & Rwinkwavu mineral districts, Southeastern Rwanda. Proceedings of the 20th General Meeting of the International Mineralogical Association (IMA 2010): Bonds and Bridges – Mineral Sciences and their Applications, Budapest, Hungary. 21-27 August. Abstract Series 6: p. 239. Potgieter, J. 2010. OH and CO2 diffusion profiles in garnets from eclogitic xenoliths from the Roberts Victor diamond mine, South Africa. Proceedings of the European Geosciences Union General Assembly 2010 (UNESCO IGCP 557 Contribution: Diamonds, xenoliths and kimberlites: A window into the Earth's Interior), Vienna, Austria. 2–7 May. Abstracts: p. 10415.

Purchase, M. 2010. OH partitioning coefficients between garnets and melt inclusions in Iherzolite xenoliths from Kimberley, South Africa. Proceedings of the European Geosciences Union General Assembly 2010 (UNESCO IGCP 557 Contribution: Diamonds, xenoliths and kimberlites: A window into the Earth's Interior), Vienna, Austria. 2-7 May. Abstracts: p. 10295.

Sommer, H. 2010. Weertman cracks and the fast extraction of diamonds from the earth's mantle. Proceedings of the European Geosciences Union General Assembly 2010 (UNESCO IGCP 557 Contribution: Diamonds, xenoliths and kimberlites: A window into the Earth's Interior), Vienna, Austria. 2-7 May. Abstracts: p. 10225.

Tredoux, M., Chabangu, N., Wildau, A., Miller, D.E. & Madala, F. 2010. A PGE-rich rock type from the Barberton greenstone belt, South Africa. Paper delivered at the 7th Inkaba yeAfrica (IyA) Workshop, GFZ Potsdam, Germany. 1-5 November. Tredoux, M., Chabangu, N., Wildau, A., Miller, D.E., Zaccarini, F., Garuti, G. & Madala. F. 2011. Jamestownite: a new PGE-rich rock type from the Barberton greenstone belt, South Africa. Keynote address delivered at the 20th General Meeting of the International Mineralogical Association (IMA 2010): Bonds and Bridges – Mineral Sciences and their Applications, Budapest, Hungary. 21-27 August. Abstract

Series 6: p. 266.

Academic staff

Professor: Prof. Willem van der Westhuizen

Associate Professors: Profs. Wayne Colliston, Christoph Gauert, Marian Tredoux

Senior Lecturers: Drs Hermann Praekelt (Programme Director), Holger Sommer

Junior Lecturer: Ms Huibrie Pretoriu:

Part-time Lecturers: Messrs Johan Loock, Leon Ne EarthWise-officer: Ms Mariette Erwee

Affiliate Lecturers: Prof. Gerhard Beukes, Messrs André Dunne, Johann Grobler, Derek Hall, Ian Hunt, PG Laurens, Ron Vrijens, Adrian Paine, Philip Viljoen

Contact details

Prof. Willem van der Westhuizen

Faculty of Natural and Agricultural Sciences Department of Geology University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone: Fax: E-mail: Website: +27 (0)51 401 2515 +27 (0)51 401 3815 vdwestwa@ufs.ac.za www.ufs.ac.za 153

"The department's programmes in Actuarial Science, Mathematical Statistics, Risk Analysis and Statistics continue to attract a significant proportion of our university's top students."

lar

Prof. Robert Schall

14 Department of Mathematical Statistics and Actuarial Science



The Department of Mathematical Statistics and Actuarial Science has more than 4 000 undergraduate and 40 postgraduate students. The Actuarial programme is accredited (Level 1) with the Actuarial Society of South Africa under a mutual recognition agreement with the Institute of Actuaries in the United Kingdom (UK).

The department's programmes in Actuarial Science, Mathematical Statistics, Risk Analysis and Statistics continue to attract a significant proportion of our university's top students.



Students and staff of the department during the welcoming function for first-year students.



Special achievements

Mr Dirk Bester, an Honours student in Actuarial Science, was awarded a Rhodes Scholarship for Ph.D. study at the Oxford University in the UK from October 2011. Subsequently, Mr Bester was invited by Ms Gill Marcus, Governor of the SA Reserve Bank, to do an internship at the Reserve Bank during the first half of 2011.

Activities and achievements

The department received several national and international visitors, among them Profs. Emiliano Valdez from the University of Connecticut in the United States, Marc Goovaerts and Jan Dhaene, both from the Katholieke Universiteit in Leuven, Belgium, Pieter van Gelder from the Delft University of Technology in The Netherlands and Dr Chris Prins of the De Beers Group. All five visitors presented lectures at the annual workshop on Applications of Statistics and Probability in Energy, Finance and Actuarial Science, hosted by the department



in March 2010. The workshop was organised by Mr Frans Koning, leader of the department's Actuarial programme.

Three first-year students in Actuarial Science, Ms Livhuwani Khangale, Mr Steven Maandamela and Ms Resego Masenya, were awarded bursaries sponsored by the Hannover Reinsurance Group. The bursaries comprehensively cover all the costs of their studies up to Honours level. The bursaries were awarded competitively among first-year Actuarial Science students from the University of the Free State (UFS) and the University of KwaZulu-Natal (UKZN). All three bursaries on offer were awarded to UFS students.

Dr Andréhette Verster, who does research in extreme value theory and high-quantile estimation, was selected as one of 25 young scholars in the Vice Chancellor's Prestigious Young Scholars programme.

Dr Martin van Zyl published papers on weighted estimation for stable distributions.

Mrs Linda van der Merwe conducted research towards her Ph.D. in Statistics education and completed a technical report on *Mapping the field of Statistics education research in search of scholarship.* An article arising from this report has been accepted for publication. The Actuarial Students' Representative Council.

National and international collaboration

Staff members were involved in several national and international collaborative research projects:

Dr Delson Chikobvu, with his Ph.D. student, Mr Caston Sigauke, from the University of Limpopo, won the award for the best paper at the 2nd Annual Eskom Forecasting Conference held in Midrand in December 2010. Subsequently Dr Chikobvu was invited to present this paper at the 19th Triennial Conference of the International Federation of Operational Research (IFORS) to be held in Melbourne, Australia in July 2011. Furthermore, Dr Chikobvu was invited to present a series of lectures in Actuarial Science at the Al-Neelain University in The Sudan between June and July 2010.

Prof. Max Finkelstein, an international authority in the area of mathematical reliability, was plenary speaker for the stream "Survival Analysis" at the DAGStat2010 conference in Berlin in March 2010. Furthermore, Prof. Finkelstein was a visiting researcher at the Max Planck Institute for Demographic Research in Rostock, Germany, from July to August 2010. This is an ongoing research project on *Stochastics in demography*. He also paid research visits to the St. Petersburg *Elektropribor* Institute, Russia, in July and December 2010, for another ongoing research project on *Reliability of complex systems*. At the *Elektropribor* Institute, Prof. Finkelstein presented a short series of lectures on the reliability of large systems. Prof. Finkelstein is the Editor of the *South African Statistical Journal*.

Prof. Daan de Waal and his research group continued their work on risk in the energy market, a project funded





From the left are the organisers of the workshop on *Applications of Statistics and Probability in Energy, Finance and Actuarial Science*: Prof. Daan de Waal and Mr Frans Koning (Department of Mathematical Statistics and Actuarial Science, UFS), as well as the four international speakers, Prof. Pieter van Gelder (Delft University of Technology, The Netherlands), Profs. Jan Dhaene and Marc Goovaerts (Katholieke Universiteit, Leuven, Belgium), and Prof. Emiliano Valdez (University of Connecticut, USA).

by Eskom. Research concentrated on the modelling and prediction of rainfall and inflow into the Gariep Dam. The research is relevant to the optimisation of hydro-electric power generation by Eskom. Prof. De Waal presented invited lectures at the 26th Annual Conference of the South African Society for Atmospheric Sciences (SASAS) in September 2010 and two papers (one in collaboration with Dr Andréhette Verster) at the Workshop on Forecasting Modelling in Energy and Finance organized by the Nelson Mandela Metropolitan University (NMMU) in October 2010. Prof. De Waal also paid research visits to the Katholieke Universiteit in Leuven, Belgium and the Delft University of Technology in The Netherlands.

Prof. Abrie van der Merwe did research on Bayesian methods in quality control, random effects models and linear and non-linear functions of parameters of the binomial and Poisson distributions. Prof. Van der Merwe supervised a number of Master's and several Ph.D. students based at other South African universities.

Prof. Robert Schall is a statistical consultant to Quintiles, an international clinical contract research organisation

Staff members and students from the UFS Department of Mathematical Statistics and Actuarial Science with other visiting academics at the workshop on Applications of Statistics and Probability in Energy, Finance and Actuarial Science, hosted by the UFS. and to Boehringer Ingelheim, an international pharmaceutical company. Prof. Schall's research is in the area of clinical trials and biostatistics, in particular on the statistical modelling and analysis of electrocardiographic data. Prof. Schall was invited to present a paper in a topic contributed session at the Joint Statistical Meetings in Vancouver, Canada, in August 2010. Prof. Schall serves as an Associate Editor of the *South African Statistical Journal*.



Mathematical Statistics and Actuarial Science

Research articles

Cha, J. & Finkelstein, M.S. 2010. Burnin by environmental shocks for two ordered subpopulations. *European Journal of Operational Research* 206: 111–117.

Cha, J. & Finkelstein, M.S. 2010. Stochastically ordered subpopulations and optimal burn-in procedure. *IEEE Transactions on Reliability* 59: 635– 644.

Finkelstein, M.S. 2010. A note on converging geometric-type processes. *Journal of Applied Probability* 47: 601-607.

Finkelstein, M.S. & Marais, F. 2010. On terminating Poisson processes in some shock models. *Reliability Engineering and System Safety* 95: 874-879.

Rossouw, S., Joubert, G. & Schall, R. 2010. Profile of clinical trial biostatisticians and university courses to train them in South Africa. *South African Statistical Journal* 44: 209-234.

Schall, R. 2010. Review of: Design and Analysis of Bioavailability and Bioequivalence Studies, 3rd edition, by Shein-Chung Chow and Jen-Pei Liu. Chapman & Hall / CRC, Boca Raton, 2009. Journal of the American Statistical Association 105: 445.

Schall, R. & Endrenyi, L. 2010. Bioequivalence: Tried and tested (Editorial). Cardiovascular Journal of Africa 21: 69-71.

Schall, R. & Ring, A. 2010. Statistical characterization of QT prolongation.

Journal of Biopharmaceutical Statistics 20: 543-562.

research OUTPUTS

Schall, R., Ring, A. & Endrenyi, L. 2010. Residuals and outliers in replicate design crossover studies. *Journal of Biopharmaceutical Statistics* 20: 835-849.

Sigauke, C. & Chikobvu, D. 2010. Modeling daily peak electricity load forecasting in South Africa using a multivariate non-parametric regression approach. *Orion* 26: 97-111.

Van der Merwe, A.J. & Chikobvu, D. 2010. A process capability index for averages of observations in the case of the balanced random effects. *Journal of Statistical Planning and Inference* 140: 20-29.

Van Zyl, J.M. & Schall, R. 2010. Weighted estimation of the location parameter of a symmetric stable distribution. *South African Statistical Journal* 44: 1-16.

Verster, A. & De Waal, D.J. 2010. Investigating approximations and parameter estimation of the multivariate generalized Burr-Gamma. *South African Statistical Journal* 44: 159-192.

Book

Chikobvu, D. & Van der Merwe, A.J. 2010. Bayesian process capability indices for various sources of variability. Saarbrücken, Germany: Lambert Academic Publishing Company.

Chapters in books

Finkelstein, M.S. & Cha, J. 2010. Shocks in mixed populations. In: *Mathematical and Statistical Methods in Reliability*, edited by V.V. Rykov, N. Balakrishnan & M.S. Nikulin. Boston: Birkhauser. pp. 335–344.

Finkelstein, M.S. & Cha, J. 2010. Some shock models of degradation. In: *Advances in Degradation Modeling*, edited by M.S. Nikulin. Boston: Birkhauser. pp. 117-125.

Reports

Bekker, S.J., Pretorius, J.H. & De Waal, D.J. 2010. *Modeling inflows into the Gariep Dam.* Technical report number 405 to the University of the Free State, Bloemfontein, South Africa.

Chifurira, R. & Chikobvu, D. 2010. Predicting rainfall and drought using the southern oscillation index in drought prone Zimbabwe. Technical report number 413 to the University of the Free State, Bloemfontein, South Africa.

Chinhamu, K. & Chikobvu, D. 2010. Random walk or mean reversion? Empirical evidence from the crude oil price market. Technical report number 412 to the University of the Free State, Bloemfontein, South Africa.

De Waal, D.J. 2010. Statistical Analysis of Production Risk exposures to Orange River Hydro Plant. ESKOM Progress Report, prepared by the Risk Laboratory, Department Mathematical Statistical and Actuarial Science, University of the Free Sate, Bloemfontein, South Africa.

NATURAL AND AGRICULTURAL SCIENCES | ANNUAL REPORT 2010

159

NATURAL SCIENCES | DEPARTMENT OF MATHEMATICAL STATISTICS AND ACTUARIAL SCIENCI

De Waal, D.J. & Verster, A. 2010. *Modeling high river flows and Southern Oscillation Index jointly*. Technical report number 406 to the University of the Free State, Bloemfontein, South Africa.

Harvey, J., Groenewald, P.C.N. & Van der Merwe, A.J. 2010. Bayesian confidence intervals for the mean of a lognormal distribution: A comparison with the mover and generalized confidence interval procedures. Technical report number 408 to the University of the Free State, Bloemfontein, South Africa.

Sigauke, C. & Chikobvu, D. 2010. Daily peak electricity load forecasting in South Africa using a multivariate non-parametric regression approach. Technical report number 410 to the University of the Free State, Bloemfontein, South Africa.

Van der Merwe, L. & Wilkinson, A. 2010. Mapping the field of statistics education research in search of scholarship. Technical report number 404 to the University of the Free State, Bloemfontein, South Africa.

Van der Rijst, M., Van der Merwe, A.J. & Hugo, J. 2010. Performance of confidence intervals on the among group variance in the unbalanced one-factor random effects model. Technical report number 411 to the University of the Free State, Bloemfontein, South Africa.

Van Zyl, J.M. 2010. Application of the Kolmogorov-Smirnov test to estimate the threshold when estimating the extreme value index. Technical report number 403 to the University of the Free State, Bloemfontein, South Africa.

Verster, A. & De Waal, D.J. 2010. A method for choosing an optimum threshold if the underlying distribution is Generalised Burr-Gamma. Technical report number 402 to the University of the Free State, Bloemfontein, South Africa.

Verster, A., De Waal, D.J., Schall, R. & Prins, C. 2010. A truncated Pareto model to estimate the under recovery of large diamonds. Technical report number 407 to the University of the Free State, Bloemfontein, South Africa.

Conference contributions

Bekker, S., Pretorius, J.H. & De Waal, D.J. 2010. *Modeling inflows into the Gariep Dam.* Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10–12 November.

Bester, D.W. & Von Maltitz, M.J. 2010. Introducing momentum to the Elo rating system. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Burger, D. & Schall, R. 2010. Statistical assessment of scaled average bioequivalence. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Chikobvu, D. & Van der Merwe, A.J. 2010. Process capability indices in the case of more than one variance component. Paper delivered at the Workshop on Model Uncertainty, Centre for Research in Statistical Methodology (CRiSM), The University of Warwick, England. 30 May – 1 June.

Chikobvu, D., Van der Merwe, A.J. & De Beer, J.A. 2010. A Bayesian approach for comparing relative returns of securities using the



160

reciprocal of the coefficient of variation. Paper delivered at the 9th Valencia International Meeting on Bayesian Statistics and the 2010 World Meeting of the International Society for Bayesian Analysis, Benidorm, Alicante, Spain. 3–8 June.

Chikobvu, D., Van der Merwe, A.J. & De Beer, J.A. 2010. A Bayesian approach for comparing risk adjusted returns for two or more securities. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

De Waal, D.J. 2010. Stream flow prediction in the upper Orange River. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

De Waal, D.J. 2010. Stream flow prediction in the upper Orange River. Proceedings of the 26th Annual Conference of the South African Society for Atmosphere Science (SASAS), Gariep Dam, South Africa. 20-22 September. pp. 27-28.

De Waal, D.J. 2010. Threshold selection for determining tail dependence in a heavy tail bivariate probability model. Paper delivered at the Workshop on Applications of Statistics and Probability in Energy, Department of Mathematical Statistics and Actuarial Science, University of the Free State, Bloemfontein, South Africa. 4–5 March.

Du Plessis, E. & De Waal, D.J.

2010. Predicting the October SOI. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Finkelstein, M.S. 2010. Failure rates in heterogeneous populations. Invited paper delivered at DagStat2010, Technical University, Dortmund, Germany. 23-26 March.

Finkelstein, M.S. 2010. On the "rate of aging" in heterogeneous populations: How the decreasing mortality rate can result in the increasing rate of aging. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Finkelstein, M.S. & Cha, J. 2010. Burn-In for quality improvement in heterogeneous populations. Invited paper delivered at the Modeling and Analysis of Safety and Risk in Complex Systems (MASR√2010), 10th International Scientific School, St. Petersburg, Russia. 6-10 July.

Harvey, J. & Van der Merwe, A.J. 2010. Bayesian confidence intervals for the mean of a lognormal distribution. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Klopper, R. & Schall, R. 2010. Baseline adjustment in thorough QT trials. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Koning, F. & De Waal, D.J. 2010. Analyzing non-linear time series with varying volatility models and extreme clusters through copulas. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Malan, P. & Schall, R. 2010. Models for allergic rhinoconjunctivitis symptom scores and allergy exposure in immunotherapy clinical trials. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Raubenheimer, L. & Van der Merwe, A.J. 2010. Bayesian estimation of linear functions of binomial proportions. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Schall, R. & Ring, A. 2010. Mixed models for repeated measures crossover data and their application in the assessment of QT prolongation. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Schall, R. & Ring, A. 2010. Statistical characterization of QT prolongation. Paper delivered at the 2010 Joint Statistical Meetings (JMS2010), Vancouver, BC, Canada. 31 July - 5 August.

Sigauke, C. & Chikobvu, D. 2010. Modeling daily peak electricity load forecasting in South Africa using a multivariate non-parametric regression approach. Paper presented at the 39th Annual ORRSA (Operations Research Society of South Africa) Conference, Magoebaskloof Hotel,

161

Polokwane, South Africa. 26-29 September.

Sigauke, C. & Chikobvu, D. 2010. Modeling daily peak electricity load forecasting in South Africa using a multivariate non-parametric regression approach. Paper delivered at the 2nd Annual Eskom Forecasting Conference: Forecasting – The Science of Crystal Ball Gazing, Eskom Convention Centre, Midrand, Johannesburg, South Africa. 30 November – 2 December.

Van der Merwe, S. & De Waal, D.J. 2010. Time Series Prediction using Bayesian Additive Regression Trees. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Van der Rijst, M., Van der Merwe, A.J. & Hugo, J. 2010. Performance of confidence intervals on the among group variance in the unbalanced one-factor random effects model. Paper delivered at the 52nd Annual Conference of the South African Statistical Association for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Verster, A. & De Waal, D.J. 2010. A method for choosing an optimum threshold if the underlying distribution is Generalized Burr-Gamma distributed. Paper delivered at the Workshop on Applications of Statistics and Probability in Energy, Department of Mathematical Statistics and Actuarial Science, University of the Free State, Bloemfontein, South Africa. 4-5 March.

Verster, A. & De Waal, D.J. 2010.

How many diamonds are missing? A truncated Pareto model for estimation of under recovery of large diamonds in diamond mining. Paper delivered at the 52nd Annual Conference of the South African Statistical Association

for 2010 (SASA2010), North West University, Potchefstroom, South Africa. 10-12 November.

Verster, A. & De Waal, D.J. 2010. Modeling earthquakes with large magnitudes through a Pareto-Type distribution. Paper delivered at the Workshop on Applications of Statistics and Probability in Energy, Department of Mathematical Statistics and Actuarial Science, University of the Free State, Bloemfontein, South Africa. 4-5 March.

Academic staff

Professors:

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

Senior Lecturers:

Ms Linda van der Merwe, Dr Martin van Zvl. Mr Frans Koning

Lecturers:

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

Part-time Lecturers: Mss Zani Ludick, Ariane Neethling, Elzanne du Plessis; Messrs Jan-Harm Pretorius, Stefan Bekker

Contact details

Prof. Robert Schall

Faculty of Natural and Agricultural Sciences Department of Mathematical Statistics and Actuarial Science University of the Free State PO Box 339 Bloemfontein South Africa 9300

 Telephone:
 +27 (0)51 401 2945

 Fax:
 +27 (0)51 444 2024

 E-mail:
 schallr@ufs.ac.za

 Website:
 www.ufs.ac.za

NATURAL SCIENCES | DEPARTMENT OF MATHEMATICAL STATISTICS AND ACTUARIAL SCIENCE

"We continue to make a difference through basic and applied research, as well as our involvement with Mathematics education in schools."

Prof. Johan Meyer

15 Department of Mathematics and Applied Mathematics



The Department of Mathematics and Applied Mathematics at the University of the Free State (UFS) offers a range of modules for students planning to major in pure and/ or Applied Mathematics, leading to B.Sc., B.Com. and B.A. degrees. Several service modules are taught to Biology, Agriculture and Education students, as well as to those from the Departments of Architecture and Quantity Surveying and Construction Management.

The department had 1548 undergraduate students in 2010. Two Master's students graduated in 2010.

Activities and achievements

Prof. Johan Meyer continued his research efforts by collaborating with some of his co-workers in Scotland and Taiwan. He also acted as co-promoter for a Ph.D. student from Botswana. Furthermore, he continued his involvement in Mathematics Olympiads, both nationally and internationally. Although this puts an additional burden on his normal work load, this involvement is nevertheless regarded as important for developing the general problem solving skills of learners, an aspect that is seriously threatened in current education methods in schools. In this capacity he was appointed as the academic coordinator of a workshop held in Senegal in March/April 2010, where Mathematics Olympiad teams from various countries in North Africa received training



in these skills. Prof. Meyer was contracted as a writer by the Department of Education to develop the new Curriculum and Assessment Policy Statement (CAPS) for Mathematics in the Further Education and Training (FET) Phase. He also acted as reviewer for *Zentralblatt MATH*, published by Springer.





Prof. Thomas Acho was invited and served as a member of a panel of external programme evaluators of the Department of Mathematics of the North-West University, Mafikeng Campus. He also acted as reviewer for the American Mathematical Society MR Database.

Dr Samantha Dorfling continued her research in the area of graph theory. A paper, jointly compiled with Dr Dorfling from the University of Johannesburg, has been accepted for publication.

Ms Larisse Bolton, in collaboration with Profs. Schalk Schoombie and Alain Cloot, worked on a project that deals with developing a fractional order Compertz growth model and its application to tumour growth data.

Prof. Jo Schröder continued to work on various research topics, such as elementary sub-models applied to the cardinality of bitopological spaces; continuous functions on products; eigensequences for Schröder transforms; and diagonal methods applied to Duchon numbers. He is also the Editor of the *Scientiae Mathematicae Japonicae*, and refereed two papers.

research OUTPUTS

Mathematics and Applied Mathematics

Research articles

Howell, K.-T. & Meyer, J.H. 2010. Finite-dimensional near-vector spaces over fields of prime order. *Communications in Algebra* 38: 86-93.

Ke, W.-F., Meyer, J.H. & Wendt, G. 2010. Matrix maps over planar nearrings. *Proceedings of the Royal Society of Edinburgh (Series A)* 140: 83-99.

Conference contribution

Meyer, J.H. 2010. *Matrix near-rings* and *0-primitivity*. Paper delivered at the International Congress of Mathematicians (ICM 2010) of the International Mathematical Union (IMU), Hyderabad, India. 19–27 August.

Academic staff

MAIN CAMPUS

Professors:

Profs. Johan Meyer, Schalk Schoombie, Alain Cloot, Dana Murray

Associate Professor: Prof. Thomas Acho

Senior Lecturers: Dr Hubertus Bargenda, Ms Julia van Niekerk

Lecturers: Dr Samantha Dorfling, Mr Christiaan Venter, Ms Ansa Kleynhans

Part-time Lecturers:

Mss Larisse Bolton, Magrietha Theron, Martie Calitz, Anita Swart, Marina Botha, Mr Jon Smit

QWAQWA CAMPUS

Associate Professor: Prof. Jo Schröder

Lecturer: Mr Patrick Mbambo

Part-time Lecturers: Ms Christa Faber, Mr Nallapan Sebastian

Contact details

Prof. Johan Meyer

Faculty of Natural and Agricultural Sciences Department of Mathematics and Applied Mathematics University of the Free State PO Box 339 Bloemfontein 9300 South Africa

+27 (0)51 401-2428
+27 (0)51 401-3805
meyerjh@ufs.ac.za
www.ufs.ac.za

"Scientists at the University of the Free State made an important breakthrough in the use of nanotechnology in medical and biological research."

Prof. James du Preez

16 Department of Microbial, Biochemical and Food Biotechnology



The year 2010 was an exceptional year for the department, mainly because of initiatives to improve its situation dramatically regarding infrastructure and research equipment. Construction of the new wing for undergraduate Biochemistry and Microbiology laboratories commenced in July 2010 and is scheduled to be completed in the second semester of 2011. Its completion will greatly alleviate the constraints of inadequate laboratories and research laboratory space for undergraduate and postgraduate students respectively, because the current undergraduate laboratories in the department will be converted to postgraduate laboratories during the second phase.

In addition, the department received R7 million from the Department of Higher Education for research equipment purchases during the 2010/2011 financial year. Some of the equipment already purchased include a Biolog Omnilog identification system for microbial species and metabolites worth R1,5 million, two bench-top bioreactors, PCR machines, a high-speed centrifuge, six micro-centrifuges, a spectrophotometer stop-flow kinetics module, a DNA concentrator system, a flash chromatography system, a protein crystallisation robot, a microscope-plus camera, spectrophotometers and electronic balances. This will significantly enhance the training of undergraduate and postgraduate students and will further strengthen the capacity of the department to conduct high-quality research.



The number of postgraduate degrees conferred in 2010 numbered five Ph.D., eight M.Sc. and eight B.Sc. Honours degrees.

Activities and achievements

Ms Charlene Randall, who completed her M.Sc. degree under Profs. Smit and Albertyn in 2010, was awarded the S_2A_3 medal at the annual prize giving ceremony of the Faculty of Natural and Agricultural Sciences for the most original Master's research dissertation. Ms Chantel Swart, a Ph.D. student under the supervision of Prof. Lodewyk Kock, was awarded the prestigious 2011 Claude Leon Foundation Postdoctoral Fellowship. According to the foundation, she is the only applicant from the UFS to receive this award. Three Master's students of the department, Suzanne Litthauer (Biochemistry), Ennet Moholisa (Food Science) and Thabiso Motaung (Biotechnology), were recipients of the prestigious TATA bursary.

A highlight of the year was the BioPAD Metagenomics Platform becoming a National Science & Technology Prof. Lodewyk Kock next to a poster advertising the workshop on edible oil misrepresentation and health hazards at the National Polytechnic School in Quito, Ecuador.

Forum (NSTF) finalist in the category Research for Innovation by a Team or Individual in a Corporate Organisation or Institution. Another highlight for the BioPAD Metagenomics Platform was the hosting of the 22nd Congress of the South African Society for Biochemistry and Molecular Biology in Bloemfontein in January 2010. Approximately 250 scientists attended the congress organised by Profs. Derek Litthauer, Esta van Heerden and Hugh Patterton from the department. Some top researchers from abroad made presentations, including Profs. Ole Jensen (University of Southern Denmark, Denmark); Stephan Schuster (Penn State University, United States); Jennifer Littlechild (Exeter Biocatalysis Centre, University of Exeter, UK); Susan Abmeyr and Jerry Workman (Stowers Institute for Medical Research, Kansas City, United States) and David Landsman (National Centre for Biotechnology Information, National Institutes of Health, United States). The topics covered by this congress included the genomics and metagenomics of extinct species (paleogenomics), the regulation of genes in human cells, high throughput protein structure analyses, bio-informatics and the use of thermostable enzymes for the synthesis of pharmaceuticals. South African graduate students were also afforded the opportunity to present their research work.

In November 2010, Prof. Martie Smit and Dr Dirk Opperman hosted Prof. Frank Hollmann from the Department of Biotechnology from the Delft University of Technology in The Netherlands, who gave a keynote address at the 21st Annual Meeting of the Catalysis Society of South Africa (CATSA 2010) in Bloemfontein in November 2010, organised by the Department of Chemistry of the UFS.

On 9 September 2010, a programme entitled *Olive Oil* was broadcast nationally on the television programme *Carte Blanche*. The aim was to investigate the authenticity



of olive oil served at top South African restaurants and the knowledge of consumers regarding these more expensive edible oils. The main role players were the SA Fryer Oil Initiative (SAFOI) of the department, headed by Prof. Lodewyk Kock, consumers, restaurants, the oliveoil industry and the *Carte Blanche* team. This publicity is of great value to the University of the Free State (UFS). The SAFOI initiative was established in 1994, after extensive edible-oil misrepresentation and unhealthy overuse had been uncovered across South Africa.

In December 2010, Prof. Kock presented a workshop on invitation at the National Polytechnic School in Quito, Ecuador to pioneer the application of his research in South America. The ultimate aim is to apply expertise obtained in South Africa on edible-oil misrepresentation and unhealthy overuse to this continent. The workshop was attended by students, postgraduates, lecturers and government departments as well as Ecuador TV.

Scientists at the UFS made an important breakthrough in the use of nanotechnology in medical and biological research. The research was the result of collaboration between Prof. Kock from the Department of Microbial, Biochemical and Food Biotechnology, the Department of Physics (under the leadership of Prof. Hendrik Swart) and the Centre for Microscopy (under the leadership of Prof. Pieter van Wyk). The UFS team's research has been accepted for publication by the internationally accredited *Canadian Journal of Microbiology*. The UFS study dissected yeast cells exposed to over-used cooking oil, by

169



Third-year Microbiology students at the Alrode Brewery of SAB in Gauteng.



Prof. Bettie Lodolo, Brewing Consultant: Brewing Science and Hygiene of SAB and also an Affiliate Associate Professor in the department, presenting a lecture to third-year Microbiology students at the SAB Training Institute in Kyalami, Gauteng.

peeling off microscopically thin layers through the use of nanotechnology. The yeast cells were enlarged thousands of times to study the internal ultra-structure, while at the same time establishing the chemical elements of which the cells are composed. This groundbreaking research opens up a host of new uses for nanotechnology, as it was the first study ever in which biological cells were surgically manipulated and at the same time elemental analysis performed through nanotechnology. According to Prof. Kock, the study has far-reaching implications for biological and medical research.

Although the processing method of yoghurt has been standardised internationally, Dr Koos Myburgh (Food Science) reinvestigated several of the processing steps. It was found that "fine-tuning" and careful interaction of some steps and parameters resulted in a reduced time span for yoghurt production. New product diversification would also be possible and the design of a "yoghurt kit" for industrial use is envisaged. A patent has been issued in this regard.

Prof. Arno Hugo was appointed as Assistant Editor for the South African Journal of Animal Science. At the UFS Prestige Forum for Teaching held on 28 October 2010, Dr André van Tonder received an award for the best presentation. Prof. James du Preez received an award for Service to the Faculty at the year-end function of the Faculty of Natural and Agricultural Sciences. In September, the third-year Microbiology students undertook an excursion to SA Breweries (SAB) in Gauteng. This was the third such annual excursion, which has now become an annual event. It included lectures by Prof. Bettie Lodolo, Brewing Consultant: Brewing Science and Hygiene of SAB and also an Affiliate Associate Professor of the department. Apart from a visit to the SAB Training Institute at Kyalami, the excursion also included visits to the SAB Alrode brewery and the SAB World of Beer in central Johannesburg.

Several international conferences were attended by staff members. Profs. Arno Hugo, Celia Hugo, Garry Osthoff, Dr Maryna de Wit, Mrs Carina Bothma and Ms Eileen Roodt, together with ten postgraduate students, participated in the International Union of Food Science and Technology (IUFoST) 2010 congress in Cape Town in August 2010, where they presented nine posters. Dr De Wit also participated in the International Congress on Cactus Pears and Cochineal in Morocco in October 2010, where she presented two posters and a lecture.

Profs. James du Preez, Lodewyk Kock, Stephanus Kilian and Ms Chantel Swart (Ph.D. student) attended the 28th International Specialised Symposium on Yeasts in Bangkok, Thailand, in September 2010. Ms Swart presented an excellent paper on the first application of NanoSAM-technology in biology. During the symposium, Profs. Du Preez and Kock represented South Africa at a meeting of the International Commission on Yeasts. Prof. Bennie Viljoen was an invited speaker and chaired a session at the International Dairy Federation Symposium on Science and Technology of Fermented Milk in Tromsø, Norway, in June 2010. Four students accompanied him and the group presented ten posters and oral presentations in total.

Prof. Derek Litthauer attended OZBIO2010, the 12th International Union of Biochemistry and Molecular Biology Conference in Melbourne, Australia, in September 2010. Profs. Litthauer, Koos Albertyn and Esta van Heerden visited Prof. Rolf Daniel from the Georg-August University of Göttingen, Germany, as part of the SA/ Germany exchange programme.

In April 2010, Prof. Esta van Heerden and Dr Dirk Opperman attended the Novel Enzymes 2010 Conference in Exeter, United Kingdom. Prof. Van Heerden presented a talk on metagenomic strategies and the novel deepsubsurface biomes for the discovery of new enzymes. Profs. Litthauer, Van Heerden and Albertyn, together with their Spanish collaborator, Prof. Jose Berenguer from the Universidad Autonoma de Madrid, also visited the world-renowned microbial taxonomist, Prof. Antonio Ventosa, and his co-worker, Dr Christina Sanchez-Porro, to establish a basis for taxonomic description tool development to classify the new microbial discoveries from the deep subsurface. Following this visit, Prof. Van Heerden joined Dr Elsabé Botes in Rimini, Italy, where they attended the 14th International Biotechnology Symposium in September 2010 and presented their research on bioremediation.

Students from the department, Amelie Dukunde (M.Sc.), Abhita Jugdave (Ph.D.) and Suzanne Litthauer (M.Sc.), were invited to spend periods of one to two months at the Institute for Microbiology and Genetics at the Georg-August University of Göttingen in Germany to conduct part of their postgraduate research. The skills and knowledge gained by these students are invaluable and provide the group with expert tools to conduct high-quality research in metagenomics and related fields. Walter Müller, a

Academics of the Department of Microbial, Biochemical & Food Biotechnology who attended the 28th International Specialised Symposium on Yeasts in Bangkok, Thailand from 15-18 September 2010, with the Chao Phraya River in the background. From the left to the right are: Profs. James du Preez (Departmental Chairperson), Mr Stephanus Kilian, Ms Chantel Swart (Ph.D. student) and Prof. Lodewyk Kock. The Extreme Biochemistry group leaders, Profs. Derek Litthauer, Esta van Heerden and Koos Albertyn (back row), who travelled with students Mss Amelie Dukunde, Abby Jugdave (front row) and Suzanne Litthauer (insert, centre) to undertake research in Göttingen in terms of a Germany-South Africa bilateral agreement. Dr Elsabe Botes (insert, right) attended the 14th International Biotechnology Symposium in Italy and Walter Müller (insert, left) attended the International Symposium on Cytochrome P450 in the United States.



Ph.D. student, presented a talk at the 10th International Symposium on Cytochrome P450 Biodiversity and Biotechnology at Woods Hole, Massachusetts, in the United States. He was the only delegate from the African continent invited to give a presentation at this international symposium. Subsequently, he spent two weeks at the laboratory of Prof. Shiladitya DasSarma at the Center of Marine Biotechnology, University of Maryland, Baltimore, in the United States, to perform micro-array experiments.

Research

The department comprises two divisions, namely Microbiology & Biochemistry and Food Science. Within these divisions there are various research groups. Activities of some of these research groups not reported above are indicated below.

The research of Prof. Garry Osthoff of the **Food Science** division on milk of non-dairy animals has provided new ideas for research in dairy technology. Fatty acid composition is largely determined genetically, but may be altered to some extent by nutrition. It was observed that amongst the ruminants, milk of the family Alcelaphinae (blesbok and hartebeest) contain an exceptionally high content of myristic acid compared to other members of the Bovidae family. This prompted an investigation of the milk of the indigenous African cattle breeds. With the nutrition standardised, it was found that the milk of the Afrikaner and its derivatives, the Drakensberger and Bonsmara, differed in some aspects, especially in the fatty acid composition, including myristic acid, from the Sanga types, the Boran, Nguni and Tuli. This might

indicate that it should be possible to alter fatty acid composition of cow's milk genetically. Milk with a specific fatty-acid composition would find application in products for people who suffer from a genetic disorder in their fat metabolism, specifically a defective enzyme acylCoA synthase. Another application would be butter fat with different melting properties, resulting in improved spreadability.

Prof. Arno Hugo started with an extensive new project on the effect of brine injection on poultry meat quality in collaboration with the Department of Agriculture, Forestry and Fisheries (DAFF) and the Agricultural Research Council (ARC). Poultry brine injection started as a method of tenderising poultry meat and for flavour enhancement. Recent customer complaints regarding shrinkage of chicken portions during cooking, jelly cooking out of chicken and large amounts of water seeping out during thawing necessitated an investigation into the effect of brine injection on poultry meat quality. Results from this study clearly indicated that brine injection of individually quick-frozen (IQF) chicken portions, as practised in South Africa, results in excessive moisture loss during thawing and cooking of such meat. The practice also results in nutrient dilution, as demonstrated by the lower fat, protein and energy content of commercially available IQF portions tested, compared to control portions not injected with brine. Brine injection also resulted in elevated salt levels in IQF portions. This resulted in very high sodium levels that may pose a risk for consumers suffering from hypertension and renal failure. It is important that IQF portions be labelled as products containing added salt and sodium. An unexpected finding was the high level of fat oxidation found in some brand names of IQF portions.

171

This may cause rancid tastes in chicken meat when consumed. This will become an even bigger problem if the shelf life of chicken is extended with re-injection and repacking. The Department of Health has set labelling requirements for this technique in their new legislation that will come into effect in March 2012. This regulation requires a declaration of the percentage meat in cases where brine has been injected. Upon completion of this project DAFF will use the results to determine how to regulate this practice.

Dr Maryna de Wit and her students were able to demonstrate the influence of cultivar, season and locality on the food qualities of cactus pears. The research is expanded to the investigation of the lipid and protein quality of seeds from these fruit. A major compound in cactus pear fruit and cladodes is mucilage, which is responsible for the slimy appearance. Technologically, water-binding polysaccharides find application as fat replacers for the textural function that they can exert. The mucilage is currently investigated for its role as fat replacer, water binder and emulsifier in food products such as mayonnaise and polony.

The research of Prof. Celia Hugo is focused on the microbial quality of food. In 2010 a study was completed on the evaluation of natural preservatives as alternatives to the use of sulphur dioxide (SO_2). Chitosan and chitosan in combination with other preservative types had a significant effect on reducing the total bacterial counts, coliforms and *Enterobacteriaceae* counts which were comparable to the results of the SO_2 treatment. Chitosan, however, had a better effect on decreasing yeast and mould counts than SO_2 . The treatment of sausages with rosemary had a positive effect on the sensory taste of the sausages when compared to the chitosan treatment, but the SO_2 treatment was still preferred by the sensory

panel. The reduced level of SO₂ showed good synergistic effects in combination with chitosan as an antimicrobial colour stabiliser and in combination with rosemary as an antioxidant and improving the sensory score of the sausages.

The Extreme Biochemistry group, where the BioPAD Metagenomics Platform is hosted, had a busy year. The group's research was featured in Africa Geographic (http://www.africageographic.com/) with an article on the work done by this research group in the deep subsurface. The article provided a glimpse into the fascinating world and life of extremophiles and how their gene products can potentially be used in several industries. Africa Geographic's Scientific Editor, Dr Tim Jackson, accompanied the team on one of their sampling expeditions and Chesney Bradshaw researched material to compile the article entitled Some like it hot that was published in the May 2010 issue. Some of the research done in the group involved 16S rRNA gene-library construction from metagenomic DNA extracted from deep-mine fissure water and subsequent phylogenetic analysis using ARB software. Another focus area was the isolation of genomic and metagenomic DNA from deep-mine biofilm and fissure water, as well as the subsequent construction of libraries to be used for sequence-based and functional screening for enzymes. The group also acquired a fully automated Robotic Colony Picker (Genetix Qpix II) to complement the highthroughput screening research facility including a Tecan Robotics Liquid Handling System. The system allows the inoculation of micro-organisms in 96-well format, which can then be directly manipulated for various applications on the Liquid Handling System.

In the Food Biotechnology research group led by Prof. Bennie Viljoen, research continued to focus on the fermentation of indigenous milk by micro-organisms found naturally in the milk and which contributes to the production of acid and flavour compounds. The main objectives of the project were to study factors in such milk products that are potentially important for health. To this end, the activities of the project have been to isolate yeasts and lactic acid bacteria from indigenous milk products and to investigate their properties with respect to potential probiotic properties, the production of bacteriocins (antimicrobial substances) and the fermentation patterns in milk, both as pure and cocultures.

The isolated strains have been tested for potential probiotic properties and *in vitro* tests indicated that several strains had the potential to survive the transit to the intestine. Some strains produced bacteriocins, of which some exhibited activity against yeasts. Five strains of bacteriocin-producing strains of lactic-acid bacteria were isolated, namely *Lactobacillus curvatus*, *Leuconostoc paramesenteroides*, *Lactococcus lactis* subsp. *lactis* and two strains of enterococci (*Enterobacter durans*). These isolates were found to be inhibitory (with different profiles of activity) towards bacterial, yeast and mould indicator strains. Two M.Sc. students from the group spent two months in Norway focusing on the above.

Since indigenous fermented products are a result of the growth sequence of different bacteria and yeasts in the milk, strong emphasis was placed on understanding the complex interactions that occur in these products during fermentation. Different combinations of selected isolates were inoculated into milk and the production of metabolites monitored. Two postdoctoral students from Hungary spent three months at the laboratory of the UFS group to help solve the complexity. The potential for using these isolates as commercial starter cultures is being evaluated.

The Lipid Biotechnology research group (including its community service unit, SAFOI) under the leadership of Prof. Lodewyk Kock and Dr Carlien Pohl-Albertyn was very productive in 2010 (See Activities and achievements above). In line with their mission, this group concentrated on the development of novel antifungal compounds. One target identified for these compounds is mitochondria that play important roles in eukaryotic cells. Compounds that affect mitochondria may therefore be of use in the control of many cell functions. So far, their research hypothesises a link between mitochondrial activity, mitochondrial inhibitor sensitivity and reproduction type (sexual or asexual) in respiring and fermentative yeasts (i.e. increased mitochondrial inhibitor concentration leads to decreased mitochondrial activity and decreased sexual reproduction followed by asexual reproduction). This hypothesis implicates mitochondria as an effective target to control fungal reproduction. This should now be explored to assess its conserved status in the fungal domain. Such a model may be used to select specific mitochondrial inhibitors for further applied studies in combating fungal infections, controlling flocculation, or as a starting point for novel physiological and molecular studies to elucidate the mechanisms behind fungal flocculation, pathogenicity and resistance mechanisms developed against mitochondrial inhibitors. Methods utilising scanning electron microscopy, in conjunction with Nano-Scanning Auger Microscopy (NanoSAM) and targeted ion etching have been developed in collaboration with Profs. Hendrik Swart and Pieter van Wyk of the Department of Physics and the Centre for Microscopy respectively, to further explore this phenomenon.

A second research focus is the metabolism of lipids by pathogenic fungi. Some of these fungi are able to produce lipid hormones, a virulence factor important in host pathogen interaction. The metabolic pathways responsible for production of these compounds in yeasts are still unclear. However, we have found that a specific group of enzymes (cytochrome P450) is involved in the pathway and have identified two possible oxylipin exporters in pathogenic yeasts through the use of microarray analyses. A better understanding of this virulence factor will answer basic scientific questions regarding the biology of pathogenic fungi and may provide novel targets for the development of antifungals. In addition, the antifungal properties of many fatty acids have been explored and several have been found to inhibit pathogenic yeasts. The mechanisms of this inhibition are currently being investigated.

In the **Fermentation Biotechnology research group** led by Profs. James du Preez and Stephanus Kilian, research on the physiological role of alcohol dehydrogenases (Adh), in collaboration with Prof. Albertyn, continued. The focus is on the growth characteristics, cellular phenotype and genomic function of each of the five Adh isozymes associated with ethanol metabolism in *Saccharomyces cerevisiae* in glucose and ethanol-limited chemostat cultures. Curiously, the activity of the glyoxylate shunt in strains W303-1A and Adh1 during growth on ethanol differed significantly. Strains lacking Adh1p activity exhibited impaired aerobic growth on glucose with byproduct formation.

An investigation of ethanol production from a novel lignocellulosic biomass source, namely the prickly-pear cactus (*Opuntia ficus-indica*) showed that isolates of *Kluyveromyces marxianus*, thermo-tolerant yeast, produced an ethanol concentration of up to 19.5 g l^{-1}

in the hydrolysate. By using appropriate fermentation conditions, the performance of K. marxianus compared favourably with Saccharomyces cerevisiae, the yeast species used on industrial scale for ethanol production. The ethanol tolerance of K. marxianus as a function of temperature was determined, showing that these isolates could still grow at an ethanol concentration of 8% and exhibited a temperature optimum for growth of 37 to 45 °C. The protein enrichment of the Opuntia biomass hydrolysate was also investigated to determine its potential as an animal feed; a comparative evaluation of K. marxianus and the conventional feed yeast, Candida utilis, is under way. In collaboration with Prof. Albertyn, this research group is pursuing the development of K. marxianus yeast isolates through metabolic engineering for use in the fermentation of especially lignocellulosic hydrolysates. One of the first aims is the transformation of these K. marxianus isolates with foreign xylose isomerase and xylulokinase genes to improve co-factor imbalance during the fermentation of the pentose sugar D-xylose.

Prof. Kilian's research on prebiotic oligosaccharides produced by yeasts was also continued. Prebiotics beneficially modify the intestinal microbial population when ingested, resulting in an improvement of the individual's health. The ability to withstand digestion by enzymes and physical conditions in the intestinal tract is a required property of a functional prebiotic. Tests to determine the effect of these enzymes and conditions on the oligosaccharides were, therefore, carried out. There was no indication that salivary amylase, pancreatic amylase or rat intestinal acetone powder hydrolysed these oligosaccharides, indicating that they comply with this particular prerequisite for prebiosis. The **Biocatalysis research group** of Prof. Martie Smit focuses on the terminal hydroxylation of alkanes, alkylbenzenes, fatty acids and fatty acid derivatives by cytochrome P450 mono-oxygenases as well as benzylic hydroxylation of alkyl phenols by vanillyl alcohol oxidases. A specific goal is to develop excellent wholecell biocatalysts for hydroxylation reactions. With the assistance of Prof. Albertyn, *Escherichia coli* and different yeasts are compared as hosts for heterologous expression of these enzymes to identify the most promising wholecell biocatalysts. This research has led to two provisional South African patents registered in 2010.

The Veterinary Biotechnology research group of Prof. Rob Bragg has been involved in the development and testing of two commercial vaccines against Avibacterium paragallinarum. Both of these vaccines are currently registered in South Africa. With the increasing problems of antibiotic resistance, there is an urgent need for alternatives for the treatment of bacterial diseases in poultry. One possible alternative is to use bacteriophages for the control of E. coli infection in poultry. We need a reliable system to identify virulent E. coli strains. This was done by setting up multiplex PCR for 18 virulence genes, which were then used to investigate the virulence gene profile of 23 South African isolates of E. coli. A collection of bacteriophages was established and a number of these bacteriophages have been studied using electron microscopy, while genome sequencing of two phages has been completed.

The group is also investigating bacterial resistance to disinfectants. A series of PCR tests have been set up to detect resistance genes in bacteria and the relationship between these genes and the minimum inhibitory concentrations of quaternary ammonium compounds have been established. The mechanisms of resistance and the detailed mode of action of the QAC are being studied. The detailed mechanisms of action of the quaternary ammonium compounds are being studied using Nano Scanning Auger Microscopy (NanoSAM). This is the combination of Scanning Auger Microscopy (SAM) and etching with an Argon (Ar⁺) gun. SAM has the ability to perform semi-quantitative elemental analysis on extremely small volumes while visualising the sample with Scanning Electron Microscopy (SEM). Using NanoSAM technology, it was possible to visualise morphological changes caused by the disinfectant that SEM alone could not show.

The Epigenomics research group of Prof. Hugh Patterton continued work on the role of chromatin structure on the regulation of DNA function. This included an important finding that lysine residues K9, K14 and K36 of histone H3 and K12 and K16 of histone H4 lost the acetyl modification with the passage of Saccharomyces cerevisiae cells from the exponential to the stationary phase. This result, generated in the Facility for Genomics and Proteomics (FGAP) located in the department, was interpreted in terms of compaction of chromatin that this group previously demonstrated in the semi-quiescent state in yeast. Work also continued to understand the position of the N-terminal extensions of the core histones in the chromatin fibre better. This included the use of the High-Performance Computing facility at the UFS to model the structure of various modified states of the histone tails using a molecular dynamics approach, as well as the docking of the tail tip to a nucleosomal surface. Software that is needed in an MS3D mapping project of the positions of the tails in chromatin was also developed. An overview of current software programmes available in this area was written by Ms Shannon Mayne, a M.Sc. student in Prof. Patterton's group, and was accepted for



publication in *Briefings in Bioinformatics*, a journal with an impact factor of 7.

Dr Gabré Kemp continued to expand the use of the LC/ MS/MS facility in FGAP, setting up many new collaborative agreements on campus as well as nationally. This facility was also a partner in the successful acquisition of a Water Research Council project to perform a national survey of emerging chemical and biological pollutants in drinking water in South Africa in 2011–2013.

Staff matters

Dr Dirk Opperman, who returned at the end of 2009 from his postdoctoral studies at the Max-Planck Institute in Mülheim an der Ruhr, Germany, where he worked in the research group of Prof. Manfred T. Reetz, took up his post as lecturer in January 2010. Prof. Celia Hugo was promoted to Associate Professor and Profs. Esta van Heerden and Koos Albertyn to Professors.

Dr Olihile Sebolai was appointed as a lecturer in Microbiology in the department as of October 2010. He obtained his Ph.D. in the department under the supervision of Prof. Lodewyk Kock. Subsequently, he worked in the UFS Research Development Directorate A transmission electron micrograph of a bacteriophage (a very small virus that infects bacterial cells). This virus may be used to treat chickens that have been infected with a bacterial pathogen.

for two-and-a-half years, prior to being assigned to the academic position in the department. Ms Charlotte Boucher and Mr Du Toit Schabort joined the department as junior lecturers in Biochemistry on five-year contract appointments.

In September 2010, Drs Sebolai and Opperman were both selected to participate in the Vice-Chancellor's Prestigious Scholars Programme. The aim of this programme is to fast-track promising young staff members towards a senior academic position. Two of our outstanding Ph.D. students were also selected for this programme, namely Ms Chantel Swart and Mr Desmond Ncango.

Ms Mapula Maropola resigned as professional officer and was replaced with Ms Christelle van Rooyen. Mrs Anita van der Westhuizen, secretary in the Food Science division, sadly passed away in November 2010.



Research articles

Bester, P.A., Litthauer, D., Piater, L.A. & Van Heerden, E. 2010. A thioredoxin reductase-like protein from the thermophile, *Thermus scotoductus* SA-01, displaying iron reductase activity. *FEMS Microbiology Letters* 302(2): 182–188.

Boucher, C.E., Bragg, B.B. & Albertyn,

J. 2010. An alternative method for the establishment of virulence of newcastle disease virus isolates. *African Journal of Microbiology Research* 4(19): 2313-2317.

Charimba, G., Hugo, C.J. & Hugo,

A. 2010. The growth, survival and thermal inactivation of *Escherichia coli* 0157:H7 in a traditional South African sausage. *Meat Science* 85(1): 89–95.

De Beer, H. & Hugo, C.J. 2010. Potential sources of *Chryseobacterium* contamination during poultry processing: a pilot study. *Journal for New Generation Sciences* 8(3): 20–28.

De Wit, M., Nel, P., Osthoff, G. & Labuschagne, M.T. 2010. The effect of variety and location on cactus pear (*Opuntia ficus-indica*) fruit quality. *Plant Foods for Human Nutrition* 65(2): 136-145.

Kock, J.L.F. 2010. The effective management of unhealthy fat waste in South Africa: A case study. The International Journal of Environmental, Cultural, Economic and Social Sustainability 6(1): 177-186.

Labuschagne, M.T. & Hugo, A. 2010. Oil content and fatty acid composition of cactus pear seed compared with cotton and grape seed. *Journal of Food Biochemistry* 34(1): 93-100.

researchOUTPUTS

Microbial, Biochemical and Food Biotechnoloav

Leeuw, N.J., Swart, C.W., Joseph, M., Pohl, C.H., Van Wyk, P.W.J., Coetsee, E., Swart, H.C., Hugo, A. & Kock, J.L.F. 2010. The effects of palm oil breakdown products on lipid turnover and morphology of fungi. *Canadian Journal of Microbiology* 56(11): 883-889.

Litthauer, D., Abbai, N.S., Piater, L.A. & Van Heerden, E. 2010. Pitfalls using tributyrin agar screening to detect lipolytic activity in metagenomic studies. *African Journal of Biotechnology* 9(27): 4282–4285.

Ncango, D.M., Swart, C.W., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F. 2010. Mitochondrion activity and dispersal of Aspergillus fumigatus and Rhizopus oryzae. African Journal of Microbiology Research 4(9): 830-835.

Onstott, T.C., Van Heerden, E. & Murdoch, L. 2010. Microbial life in the depths of the earth. *Geosciences* 11: 52-59.

Opperman, D.J., Sewell, B.T., Litthauer, D., Isupov, M.N., Littlechild, J.A. & Van Heerden, E. 2010. Crystal structure of a thermostable Old Yellow Enzyme from Thermus scotoductus SA-01. Biochemical and Biophysical Research Communications 393(3): 426-431.

Osthoff, G., Hugo, A., Bouwman, H., Buss, P., Govender, D., Joubert, C.C. & Swarts, J.C. 2010. Comparison of the lipid properties of captive, healthy wild, and pansteatitis-affected wild Nile crocodiles (*Crocodylus niloticus*). *Comparative Biochemistry and* Physiology - Part A: Molecular and Integrative Physiology 155(1): 64-69.

Osthoff, G., Hugo, A., Van Wyk, P., De Wit, M. & Meyer, S. 2010. Characterization of a spray-dried soymilk powder and changes observed during storage. *Food Science and Technology International* 16(2): 169– 178.

Reetz, M.T. & Opperman, D.J. 2010. Towards practical Baeyer-Villiger monooxygenases: Design of cyclohexanone monooxygenase mutants with enhanced oxidative stability. *ChemBioChem* 11: 2589-2596.

Swart, C.W., Swart, H.C., Coetsee, E., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F. 2010. 3–D architecture and elemental composition of fluconazole treated yeast asci. *Scientific Research and Essays* 5(22): 3411–3417.

Swart, C.W., Van Wyk, P.W.J., Pohl, C.H. & Kock, J.L.F. 2010. Variation in mitochondrial activity over the life cycle of *Nadsonia fulvescens*. *African Journal of Microbiology Research* 4(16): 1727-1732.

Thibane, V.S., Kock, J.L.F., Ells, R., Van Wyk, P.W.J. & Pohl, C.H. 2010. Effect of marine polyunsaturated fatty acids on biofilm formation of *Candida albicans* and *Candida dubliniensis*. *Marine Drugs* (Special Edition: *Marine Lipids*) 8(10): 2597–2604.

Workneh, T.S. & Osthoff, G. 2010. A review on integrated agro-technology of vegetables. *African Journal of Biotechnology* 9(54): 9307–9327.

179

Patents

Cason, E.D., Van Heerden, E., Piater, L.A., Jugdave, A.G. & Van Marwijk, J. 2010. Isolation of a protein responsible for uranium microbial reduction and transformation. South African Patent Application Number 2009/06569.

Jordan, R., Van Heerden, E. & Botes, E. 2010. A process for the removal of chromium (VI). South African Patent Application Number 2009/02378.

Conferences contributions

Bekker, A., Hugo, C., Bragg, R. & Albertyn, J. 2010. Pathogenic Grampositive cocci in South African rainbow trout. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22-26 August.

Bester, P.A., Litthauer, D., Piater, L.A. & Van Heerden, E. 2010. Functional and structural analysis of a ferric reductase. Paper delivered at the 22nd Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17-20 January.

Botes, E., Jordan, R., De Flaun, M.F., Howell, J., Borch, R., Liebenberg, F.C. & Van Heerden, E. 2010. Bioremediation of hexavalent chromium contaminated water in fixed-film upflow reactors: A South African first. Poster presented at the 14th International Biotechnology Symposium and Exhibition (IBS2010): Biotechnology for the Sustainability of Human Society, Rimini, Italy. 14-18 September.

Botes, E., Jordan, R., De Flaun, M.F., Howell, J., Borch, R., Price, P.D. & Van Heerden, E. 2010. *Bioremediation using a two-phase bio/abiotic approach to treat acid mine drainage in South Africa*. Poster presented at the 14th International Biotechnology Symposium and Exhibition (IBS2010): Biotechnology for the Sustainability of Human Society, Rimini, Italy. 14-18 September.

Bothma, C., Frey, R., De Wit, M. & Hugo, A. 2010. Evaluation of the

Hugo, A. 2010. Evaluation of the suitability of cactus pear fruit for jelly making. Poster presented at the Combined Congress 2010: Combined Congress of the South African Society of Crop Production (SASCP), the Soil Science Society of South Africa (SSSSA), the Southern African Society for Horticultural Sciences (SASHS) and the Southern African Weed Science Society (SAWSS), University of the Free State, Bloemfontein, South Africa. 19-21 January.

Bothma. C., De Wet, A., Hugo, A. & Osthoff, G. Descriptive sensory analysis of cheddar cheeses in South Africa, using free choice profiling. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22-26 August.

Bouwman, H., Dixon, R., Govender, D., Pienaar, D., Kylin, H., Pieters, R., Minie, J. & Osthoff, G. 2010. Crocodile mortalities in the Kruger National Park: An update. Poster presented at the 20th Annual Meeting of the Society for Environmental Toxicology and Chemistry (SETAC), Seville, Spain. 23-27 May.

Burger, T-J. & Myburgh, J. 2010. The significance of fat in dairy products. Paper delivered at the 44th Annual General Meeting and Symposium of the South African Society of Dairy Technology (SASDT), Stellenbosch, South Africa. 21-23 April.

Cason, E.D., Piater, L.A. & Van Heerden, E. 2010. Thermophilic microbial interaction and reduction of uranium(VI) by Thermus scotoductus SA-01. Poster presented at the 22nd Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17-20 January.

Charimba, G., Hugo, C. & Hugo, A.

2010. The incidence of diarrhoeagenic Escherichia coli in minced beef and boerewors. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22-26 August.

Coetzer, S.M., Kebede, A., Viljoen, B.C., Gadaga, H. & Narvhus, J.A. 2010. The effect of fermentation temperature on the survival and growth of yeasts in fermented milk. Poster presented at the 4th International Dairy Federation (IDF) Symposium on the Science and Technology of Fermented Milk, Tromsø, Norway. 7-9 June.

De Wit, M., De Beer, J.P. &

Osthoff, G. 2010. Extraction and characterization of mucilage and pectin polysaccharides from Cactus pear fruit. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22–26 August.

De Wit, M., De Beer, J.P. & Osthoff, G. 2010. Extraction and characterization of mucilage and pectin polysaccharides from Cactus pear fruit. Poster presented at the 7th International Combined Congress on Cactus Pear and Cochineal, Agadir, Morocco. 18–24 October.

De Wit, M., Rothman, M., Bothma, C. & Hugo, A. 2010. The influence of variety and season on cactus pear fruit juice: a sensory quality evaluation. Poster presented at the Combined Congress 2010: Combined Congress of the South African Society of Crop Production (SASCP), the Soil Science Society of South Africa (SSSSA), the Southern African Society for Horticultural Sciences (SASHS) and the Southern African Weed Science Society (SAWSS), University of the Free State, Bloemfontein, South Africa. 19–21 January.

De Wit, M., Rothman, M., Bothma, C. & Hugo, A. 2010. The influence of variety and season on Cactus pear fruit quality. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22-26 August.

De Wit, M., Rothman, M., Bothma, C.

& Hugo, A. 2010. The influence of variety and season on Cactus pear fruit quality. Poster presented at the 7th International Combined Congress on Cactus Pear and Cochineal, Agadir, Morocco. 18-24 October.

De Wit, M., Shongwe, N., Nel, P.,

Osthoff, G. & Labuschagne, M.T. 2010. *The influence of locality, variety and season on Cactus pear fruit quality.* Paper delivered at the 7th International Combined Congress on Cactus Pear and Cochineal, Agadir, Morocco. 18-24 October.

Dixon, R., Bouwman, H., Osthoff, G., Govender, D. & Pienaar, D. 2010. Crocodile deaths in the Kruger National Park. Paper delivered at the 8th Annual Savanna Science Network Meeting, Gold Fields Auditorium, Skukuza, South Africa. 7-12 March.

Du Preez, J.C. & Kuloyo, O.O. 2010. Opuntia ficus-indica *as lignocellulosic substrate for the production of bioethanol.* Poster presented at the 28th Specialised Symposium on Yeasts: Metabolic and Bioprocess Engineering for Sustainable Development, Momtien Riverside Hotel, Bangkok, Thailand. 15-18 September.

Dukunde, A., Litthauer, D., Van

Heerden, E. & Albertyn, J. 2010. Improving heterologous protein expression with thermophilic bacterial chaperones. Poster presented at the 22nd Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17-20 January.

Enstad, B., Evenstad, I., Smith, C., Viljoen, B.C. & Narvhus, J.A. 2010. Probiotic properties of lactic acid bacteria isolated from Amasi, a spontaneously fermented milk in Swaziland. Poster presented at the 4th International Dairy Federation (IDF) Symposium on the Science and Technology of Fermented Milk, Tromsø, Norway. 7-9 June.

Erasmus, M., Albertyn, J., Berenguer, J. & Van Heerden, E. 2010.

Characterization and expression of a protein involved in gold nanoparticle formations by Thermus scotoductus SA-01. Poster presented at the 22^{nd} Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17–20 January.

Gadaga, T.H., Viljoen, B.C. & Narvhus, J.A. 2010. Volatile organic compounds

I.A. 2010. Volutile organic compounds in naturally fermented milk and milk fermented using yeasts and lactic acid bacteria as starter cultures. Poster presented at the 4th International Dairy Federation (IDF) Symposium on the Science and Technology of Fermented Milk, Tromsø, Norway. 7-9 June.

Gouvea, P., Viljoen, B.C., Lefoka, M. & Narvhus, J.A. 2010. The survival of presumptive foodborne pathogens during the production of Semethi, an indigenous fermented milk. Poster presented at the 4th International Dairy Federation (IDF) Symposium on the Science and Technology of Fermented Milk, Tromsø, Norway, 7-9 June.

Hollmann, F., Bernard, J., Mifsud Grau, M., Opperman, D.J., Van Heerden, E. & Arends, I.W.C.E. 2010. Photobiocatalytic reduction reactions. Poster presented at the Gordon Research Conference (GRC) on Biocatalysis, Bryant University, Smithfield, USA. 11–16 July.

Hugo, A., Ferreira, J.P., Liebenberg, B.E., Bothma, C., Els, S.P., De Witt, F.H. & Van der Merwe, H.J. 2010. Effect of dietary lipid source on fatty acid profile, lipid oxidation and sensory acceptability of broiler breast meat. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22–26 August.

Jordan, J., Botes, E., DeFlaun, M., Howel, J., Borch, R. & Van Heerden, E.

2010. Hexavalent chromium reduction in fixed-film up-flow bioreactors. Paper delivered at the 22nd Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17-20 January.

Jordan, R., Viljoen, B.C. & Narvhus,

J.A. 2010. Microbial interaction between lactic acid bacteria and other microorganisms in Madila, a traditional indigenous fermented milk of Botswana. Poster presented at the 4th International Dairy Federation (IDF) Symposium on the Science and Technology of Fermented Milk, Tromsø, Norway. 7-9 June.

Jugdave, A., Litthauer, D., Albertyn, J. & Van Heerden, E. 2010. *Microbial biodiversity and the biome's abilities*. Paper delivered at the 22nd Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17-20 January.

Kemp, G., Janse van Vuuren, L.C., Janse van Rensburg, R., Visser, B. & Pretorius, J.C. 2010. Using shotgun proteomics to elucidate the activation reaction by a novel plant activator in wheat. Poster presented at the 4th European Proteomics Association (EuPA) Meeting: 2010 – A Proteomics Odyssey Towards Next Decades, Estoril, Portugal. 23-27 October.

Kock, J.L.F. 2010. The effective management of unhealthy fat waste in South Africa. Paper delivered at the 6th International Conference on Environmental, Cultural, Economic and Social Sustainability, University of Cuenca, Cuenca, Ecuador. 5-7 January.

Kock, J.L.F., Pohl, C.H., Sebolai, O.M., Swart, C.W. & Van Wyk, P.W.J. 2010. Yeast metabolite studies lead to antifungals with dual action. Poster presented at the 28th Specialised Symposium on Yeasts: Metabolic and Bioprocess Engineering for Sustainable
Development, Momtien Riverside Hotel, Bangkok, Thailand. 15-18 September.

Litthauer, S., Litthauer, D., Albertyn, J. & Van Heerden, E. 2010. Identification of Old Yellow Enzyme homologues from subsurface thermophilic cultures. Poster presented at the 22nd Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17-20 January.

Mathenjwa, S.A., Hugo, C. & Hugo, A. 2010. Microbial quality of boerewors in Bloemfontein, South Africa. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22-26 August.

Meyer, W., Piater, L.A., Van Heerden, E. & Albertyn, J. 2010. Isolation and characterization of cyanide degrading microorganisms. Poster presented at the 22nd Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17-20 January.

Moholisa, E., Hugo, A., Roodt, E. & Bothma, C. 2010. Enhancement of broiler meat by brine injection: implications to the consumer. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22-26 August.

Möller, C., Litthauer, D., Albertyn, J. & Van Heerden, E. 2010. Microbial diversity of the deep mines in South Africa. Poster presented at the 22nd Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17-20 January.

Müller, W.J., Piater, L.A., Albertyn, J., Van Heerden, E. & Smit, M.S. 2010. Cytochrome P450 monooxygenases from the genus Thermus. Poster presented at the 22nd Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17-20 January.

Müller, W.J., Piater, L.A., Albertyn, J., Van Heerden, E. & Smit, M.S. 2010. *Carotenoid metabolizing cytochrome P450 monooxygenases from extremophiles*. Paper delivered at the 10th International Symposium on Cytochrome P450 Biodiversity and Biotechnology, Woods Hole, Massachusetts, USA. 3-7 October.

Myburgh, J. & Smith, E-A. 2010. Production of a fermented foodstuff – Patent P41266ZAPO. Poster presented at the 44th Annual General Meeting and Symposium of the South African Society of Dairy Technology (SASDT), Stellenbosch, South Africa. 21-23 April.

Narvhus, J.A., Ouren, S., Warholm, T. & Viljoen, B.C. 2010. Interactions between yeasts and lactic acid bacteria isolated from Amasi, a spontaneously fermented milk in Swaziland. Poster presented at the 4th International Dairy Federation (IDF) Symposium on the Science and Technology of Fermented Milk, Tromsø, Norway. 7-9 June.

Ojo, E., Van Heerden, E. & Piater, L.A. 2010. Investigation of the copper resistance mechanism(s) in acidophilic bacteria. Poster presented at the 22nd Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17-20 January.

Opperman, D.J. & Reetz, M.T. 2010. Practical Baeyer-Villiger monooxygenases. Paper delivered at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Osthoff, G., Amos, L., Nguyen, M.T.P. & De Wit, M. 2010. Yeasts as enzyme source for accelerated ripening of Cheddar cheese. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22-26 August.

Osthoff, G., Hugo, A., Joubert, C. & Swarts, J. 2010. Differential scanning calorimetry of milk fat from dairy and non-dairy animals that contain high levels of medium chain, unsaturated and polyunsaturated fatty acids. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22-26 August.

Sebolai, O.M., Davis, H. & Kock, J.L.F. 2010. Acetylsalicylic acid: A possible prophylactic agent against Mycobacterium tuberculosis? Poster presented at the 2nd South African TB Conference: Forging Strategic Partnerships to Fight TB and HIV, Durban, South Africa. 1-4 June.

Shongwe, N., De Witt, M., Nel, P., Osthoff, G. & Labuschagne, M.T. 2010. The influence of locality, variety and season on Cactus pear fruit quality. Poster presented at the 15th World Congress of Food Science & Technology (IUFoST2010): Food Science in an Evolving World, Cape Town, South Africa. 22-26 August.

Smit, M.S., Gudiminchi, R.K., Randall, C. & Opperman, D.J. 2010. *Terminal hydroxylation of octane by a bacterial cytochrome P450 monooxygenase*. Paper delivered at the 21st Annual Conference of the Catalysis Society of South Africa (CATSA 2010), Bains Game Lodge, Bloemfontein, South Africa. 7-10 November.

Smith, E-A. & Myburgh, J. 2010. Optimisation of yogurt fermentation. Paper delivered at the 44th Annual General Meeting and Symposium of the South African Society of Dairy Technology (SASDT), Stellenbosch, South Africa. 21-23 April.

Swart, C.W., Swart, H.C., Coetsee, E., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F. 2010. *NanoSAM: a*

first application to yeast. Paper delivered at the 28th Specialised Symposium on Yeasts: Metabolic and Bioprocess Engineering for Sustainable Development, Momtien Riverside Hotel, Bangkok, Thailand. 15-18 September.

Tlou, G., Piater, L.A. & Van Heerden,

E. 2010. Geobacillus thermoleovorans *GE-7 lipase production profile – two lipase activity peaks, one enzyme?* Poster presented at the 22nd Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17-20 January.

Van der Merwe, R., Herselman, L. & Hugo, A. 2010. Development of molecular markers linked to the high-oleic acid trait in sunflower (Helianthus annuus L). Paper delivered at the 8th South African Plant Breeders Association (SAPBA) Symposium, Stellenbosch, South Africa. 15-17 March.

Van Heerden, E. & Opperman, D.J.

2010. The terrestrial subsurface – A source for novel catalysts. Paper delivered at the Novel Enzymes Conference, University of Exeter, Exeter, UK. 14-17 April.

Van Jaarsveld, H., Viljoen, B.C. & Narvhus, J.A. 2010. Isolation, characterisation of LAB associated with Amasi, fermented milk. Poster presented at the 4th International Dairy Federation (IDF) Symposium on the Science and Technology of Fermented Milk, Tromsø, Norway, 7-9 June.

Van Marwijk, J., Opperman, D.J., Gericke, M. & Van Heerden, E. 2010. Purification of a gold(III) reducing and nanoparticle producing protein from Thermus scotoductus SA-01. Poster presented at the 22nd Congress of the South African Society for Biochemistry and Molecular Biology (SASBMB), Bloemfontein, South Africa. 17-20 January.

Viljoen, B.C. 2010. Yeasts as spoilage organisms in fermented milk products: A growing concern. Paper delivered at the 4th International Dairy Federation (IDF) Symposium on the Science and Technology of Fermented Milk, Tromsø, Norway. 7-9 June.

Viljoen, B.C., Kebede, A., Gadaga, T.H. & Narvhus, J.A. 2010. Diversity of yeasts in Semethi, a South African fermented milk and the changes in microbial load during fermentation. Poster presented at the 4th International Dairy Federation (IDF) Symposium on the Science and Technology of Fermented Milk, Tromsø, Norway. 7-9 June.

Contact details

Prof. James du Preez

Faculty of Natural and Agricultural Sciences Department of Microbial, Biochemical and Food Biotechnology University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone:	+27 (0)51 401 2679
Fax:	+27 (0)51 401 9376
E-mail:	dpreezjc@ufs.ac.za
Website:	www.ufs.ac.za/biotech

Academic staff

DIVISION OF MICROBIOLOGY AND BIOCHEMISTRY

Professors:

Profs. James du Preez (Chairperson), Koos Albertyn, Rob Bragg, Stephanus Kilian, Lodewyk Kock, Derek Litthauer, Hugh Patterton (part-time; research cluster director), Martie Smit, Esta van Heerden, Bennie Viljoen

Senior Lecturers: Drs André van Tonder, Carlien Pohl-Albertyn

Lecturers: Drs Dirk Opperman, Olihile Sebolai

Junior lecturers: Ms Charlotte Boucher, Mr Du Toit Schabort

Researchers:

Dr Gabré Kemp (research cluster appointment), Ms Laurinda Steyn

Professor Extraordinary: Prof. Bärbel Hahn-Hägerdal

Affiliate Associate Professor: Prof. Bettie Lodolo

DIVISION OF FOOD SCIENCE

Professor: Prof. Garry Osthoff

Associate Professors: Profs. Arno Hugo, Celia Hugo

Senior Lecturers: Dr Koos Myburgh, Mr Neels Bezuidenhout (part-time)

Lecturers: Dr Maryna de Wit, Ms Carina Bothma



"The department was nominated as the Bloemfontein Institution of the Year for its excellence in community service at the Boyden Observatory, the highquality research outputs, the national and international awards that students and staff obtained during the last few years, as well as the establishment of the new nano-surface characterisation facility at the department."

Prof. Hendrik Swart

NATURAL SCIENCES | DEPARTMENT OF PHYSICS

17 Department of Physics

Overview

Solid State Physics and Astrophysics are the department's two main research fields for which the department received a considerable number of awards during 2010. The department offers a number of study programmes at undergraduate and postgraduate level that are relevant to many career choices.

Special achievements

The highlight of the year was the nomination of the department for the Bloemfontein Institution of the Year award. The department was nominated for its excellence in community service at the Boyden Observatory, the high-quality research outputs, the national and



international awards that students and staff obtained during the last few years, as well as the establishment of the new nano-surface characterisation facility at the department.

Postgraduate students from the Department of Physics won several prizes in the Solid State and Astrophysics categories at the 2010 South African Institute of Physics



The prize winners at the SAIP conference (from the left to the right): Mr Brian van Soelen (best oral presentation in Astrophysics), Mr Charl Jafta (best M.Sc. poster in Solid State Physics), Ms Mart-Mari Duvenhage (best M.Sc. publication in Solid State Physics) and Dr Lisa Coetsee (best Ph.D. publication in Solid State Physics). Insert: Dr Richard Harris (best Ph.D. oral presentation in Solid State Physics).



(SAIP) conference held in Pretoria during the spring of 2010. Mr Richard Harris received the award for the best Ph.D. paper in Solid State Physics. His promoters are Profs. Hendrik Swart and Koos Terblans. Mr Brian van Soelen delivered the best Ph.D. paper in Astrophysics. His promoter is Prof. Pieter Meintjes. Mr Charl Jafta presented the best M.Sc. poster in Solid State Physics with his promoters being Profs. Wiets Roos and Koos Terblans. Ms Mart-Mari Duvenhage was acknowledged for the best publication resulting from a M.Sc. dissertation. Her promoters are Profs. Hendrik Swart and Martin Ntwaeaborwa. Furthermore, Dr Lisa Coetsee received the award for the best publication resulting from a Ph.D. thesis. Her promoters are Profs. Hendrik Swart and Koos Terblans.

The Thin Film Division of the American Vacuum Society (AVS) selected Prof. Martin Ntwaeaborwa as the 2010 awardee of the Paul Holloway Young Investigator Award. Prof. Ntwaeaborwa received the award for novel work in the field of nano-structured luminescent materials, the optical properties of nano-particles and photovoltaic applications. The award is named after Prof. Paul H Holloway of the University of Florida, who is recognised for his distinguished and continuing career of scholarship and service to the AVS. The award goes to a young scientist or engineer who has contributed outstanding theoretical and experimental work in an area important to the Thin Film Division of the AVS. Prof. Martin Ntwaeaborwa and Prof. Paul Holloway from the University of Florida at the AVS prize-giving ceremony.

Activities and achievements

Collaboration among the Departments of Microbiology, Plant Science and Physics led to the unique research method in which nano-equipment was used for biological applications for the first time. Through the use of nanotechnology, the chemical composition of the surface of yeast cells could be established by making a surgical incision into the surface. The cells could be peeled off in layers of approximately three (3) nanometres at a time in order to establish the effect of the oil on the veast cells' composition. Each cell was enlarged between 40 000 and 50 000 times. This was done by using the Department of Physics' PHI700 Scanning Auger Nanoprobe linked to a Scanning Electron Microscope and Argon-etching. Under the guidance of Prof. Swart, Mss Swart and Leeuw could dissect the surfaces of yeast cells exposed to over-used cooking oil. The University of the Free State (UFS) team's research has been accepted for publication by the internationally accredited Canadian Journal of Microbiology.



From the left to the right: Prof. Hendrik Swart, Drs Richard Harris, Heinrich Joubert and Prof. Koos Terblans at the Chancellor's meal function at the May 2010 graduation ceremony.





Dr Ted Kroon in front of one of the systems at the Hamburg Synchrotron Radiation Laboratory (HASYLAB) in Germany.

From the left to the right: Profs. Koos Terblans and Hendrik Swart (Physics); Ms Louise Mostert and Werner Jordaan (former M.Sc. students); Dr Wynand Louw (former Ph.D. student and CEO of NMISA); and Mr Shaun Cronje (current Ph.D. student) in front of the SAM 595 equipment.

The Department of Physics was in the fortunate position to receive apparatus from the National Metrology Institute of South Africa (NMISA). The Scanning Auger Microscope (SAM) apparatus will be used primarily for training students to use the new NanoSAM apparatus. The donation was made possible by one of our former students, Dr Wynand Louw, who is currently the CEO of NMISA.

In August 2010, Dr Ted Kroon was privileged to visit the Hamburg Synchrotron Radiation Laboratory (HASYLAB) in Germany, together with the postdoctoral student Dr Marek Gusowski. Synchrotron radiation is very intense short wavelength light produced as a by-product in



Prof. Wiets Roos and Mr Charl Jafta won a second price in the provincial Innovation Fund competition.

particle accelerators and this was used to study the excitation characteristics of wide band-gap phosphors $(SiO_2 \text{ and } NaYF_4)$ doped with the lanthanide elements. Visible light has wavelengths between 400–700 nm, but by using the synchrotron radiation, measurements in the ultraviolet region of as low as 50 nm could be performed. Since air absorbs ultraviolet light with a wavelength below 190 nm, experiments had to be performed under ultrahigh vacuum and samples could be cooled with liquid helium down to 10 K (-263°C).

Mr Charl Jafta, under the guidance of Prof. Wiets Roos, won a second prize in the provincial Innovation Fund competition coordinated by the Division of Research and Development at the UFS. The fund is managed by the National Research Foundation (NRF). His project qualified for the national phase of the competition that was held at the Moses Mabhida Stadium in Durban during April 2010. His idea is a low-cost analogue hearing aid called the *i*-Hear. At the national competition he presented a poster and prototype of his idea. The body of the prototype was designed and built by the Centre for Rapid Prototyping and Manufacturing at the Central University of Technology. The production was funded by Prof. De Beer from the Vaal University of Technology in Vereeniging. The electronic components and poster was funded by Prof. Roos. Unfortunately the idea did not reach the top ten in the national competition.



An idea of the Physics team of the UFS that won a second prize in the local competition made it to the top ten. The national winner was from the Nelson Mandela Metropolitan University (NMMU), presenting a new idea on preparing "greener" and safer drill bits. The second prize was awarded to a student from the University of Cape Town who presented a micro-chip that is able to determine the time of death of humans within minutes.

The Faculty of Natural and Agricultural Sciences management is based on a committee system. Most of the committees in the faculty are chaired by the Vice-Dean. During the second semester in 2010, the position of Vice-Dean became vacant. Subsequently, two of our colleagues in the department were appointed by the faculty as Chairpersons of two different committees. Prof. Matie Hoffman was appointed as Chairperson of the Community Service Committee and Prof. Wiets Roos as Chairperson of the Buildings Committee.

A very positive report was received from the two external evaluators, Prof. Japie Engelbrecht from the NMMU and Prof. Andre Strydom from the University of Johannesburg (UJ), following the external evaluation of the department during the second semester.

Several staff members and students attended and made presentations at international conferences during 2010. Drs Francis Dejene, Ted Kroon, Marek Guskowski and Ms Gugu Mhlongo attended the Excited States of Transition Elements (ESTE) 2010 Conference and Workshop on Luminescence in Wrocław and Piechowice, Poland, in September 2010. Dr Vinay Kumar, Prof. Martin Ntwaeaborwa and Dr Shreyas Pitaleattend attended the 2010 International Conference on Nanomaterials (ICN) in Kottayam, Kerala, in India during April 2010. Prof. Hendrik Swart attended and presented a lecture at the 24th International Symposium on Luminescence Spectrometry (ISLS 2010) that was held in Prague in the Czech Republic in July 2010. Dr Moses Mothudi attended the Seventh International Conference on Inorganic Materials in Biarritz, France, in September 2010 and the First International Conference on New Trends in Luminescence and Phosphor Materials (LUMIPHOM 2010) in Hermosillo, Mexico, in October 2010. Mr Japie Dolo presented two posters at the 3rd Joint International Conference on Hyperfine Interactions and International Symposium on Nuclear Quadrupole Interactions in Genève, Switzerland, in September 2010. Prof. Martin Ntwaeaborwa presented a talk at the 15th International Workshop on Inorganic and Organic Electroluminescence, and the International Conference on the Science and Technology of Emissive Displays and Lighting, and the XVIII Advanced Display Technologies International Symposium in St. Petersburg, Russia, in September 2010, and gave an invited talk at the AVS conference in America. Mr Patrick Nsimama and Dr Marek Guskowski presented talks at the 3rd African Laser Centre (ALC) Student Workshop 2010 held in Stellenbosch in September 2010. Prof. Matie Hoffman presented two posters at the Nanotech Conference and Expo in Anaheim in the United States during June 2010.



research OUTPUTS

Research articles

Abdallah, H.M.I., Moyo, T. & Msomi, J.Z. 2010. Structural and Mössbauer studies of $Mn_{0.5}Co_{0.5}Fe_2O_4$ ferrites prepared by high energy ball milling and glycolthermal methods. *Journal* of *Physics: Conference Series* 217(1) (International Conference on the Applications of the Mössbauer Effect, ICAME 2009): 012141.

Bem, D.B., Swart, H.C., Luyt, A.S., Coetzee, E. & Dejene, F.B. 2010. Properties of Green SrAl₂O₄ Phosphor in LDPE and PMMA Polymers. *Journal of Applied Polymer Science* 117(5): 2635-2640.

Biggs, M.M., Ntwaeaborwa, O.M. & Swart, H.C. 2010. 'n Oorsig van verskillende tipes luminessensie en verskillende tipes fosfors: Gebruike en karakterisering. SA Journal for Natural Science and Technology 29(3): 145-146.

Biggs, M.M., Ntwaeaborwa, O.M., Swart, H.C. & Hoffman, M.J.H. 2010. Luminescent mechanism of bulk and nano ZnS:Mn²⁺ phosphors. *NSTI-Nanotech 2010, Nanotechnology 2010: Advanced Materials, CNTs, Particles, Films and Composites* 1: 543–546.

Coetsee, E., Terblans, J.J. & Swart, H.C. 2010. The growth of Y_2SiO_5 :Ce thin films with pulsed laser deposition. *Applied Physics A: Materials Science and Processing* 101: 633–638.

Coetsee, E., Terblans, J.J. & Swart,

H.C. 2010. XPS analysis for degraded Y_2SiO_5 :Ce phosphor thin films. *Applied Surface Science* 256(22): 6641-6648.

Cronje, S., Kroon, R.E., Roos, W.D. & Neethling, J.H. 2010. Korrelgroottes en tweelingstrukture in vervormde koper. SA Journal for Natural Science and Technology 29(3): 148–149.

Dejene, F.B. 2010. Material and device properties of Cu(In,Ga)Se2 absorber films prepared by thermal reaction of InSe/Cu/GaSe alloys to elemental Se vapor. *Current Applied Physics* 10: 36-40.

Dejene, F.B. & Ocaya, R.O. 2010. Influence of Thin Gold Films and Temperature on the Electrical and Optical Properties of VO₂ on Quartz Substrate. *Current Applied Physics* 10: 508–512.

Dejene, F.B., Bem, D.B. & Swart, H.C. 2010. Synthesis and Characterization of CaAl_xO_y:Eu²⁺ Phosphors Prepared Using Solution – Combustion Method. *Rare Earth Metals (Specials Issue)* 28: 272–276.

Dhlamini, M.S., Mhlongo, G.H. & Hillie, K.T. 2010. Effects of accelerating beam voltage on luminescence of Er³⁺ and Tm³⁺ doped SiO₂ phosphor prepared by sol-gel process. *Optical Materials* 33: 79-83.

Dolo, J.J., Swart, H.C., Coetsee, E., Terblans, J.J., Ntwaeaborwa, O.M. & Dejene, B.F. 2010. XPS analysis and luminescence properties on the deposited thin films obtained by using Pulsed Laser Deposition. *Hyperfine Interactions* 197: 129–134.

Dolo, J.J., Swart, H.C., Terblans, J.J., Coetsee, E., Ntwaeaborwa, O.M. & Dejene, B.F. 2010. Effect of oxygen pressure on the structural properties of pulsed laser deposition Gd.O.S:Tb thin films. *Applied Physics A: Materials Science and Processing* 101: 655–659.

Gould, A., Dong, S., Gaudi, B.S., Udalski, A., Bond, I.A., Greenhill, J., Street, R.A., Dominik, M., Sumi, T., Szymanski, M.K., Han, C., Allen, W., Bolt, G., Bos, M., Christie, G.W., DePoy, D.L., Drummond, J., Eastman, J.D., Gal-Yam, A., Higgins, D., Janczak, J., Kaspi, S., Kozlowski, S., Lee, C.-U., Mallia, F., Maury, A., Maoz, D., McCormick, J., Monard, L.A.G., Moorhouse, D., Morgan, N., Natusch, T., Ofek, E.O., Park, B.-G., Pogge, R.W., Polishook, D., Santallo, R., Shporer, A., Spector, O., Thornley, G., Yee, J.C., Kubiak, M., Pietrzynski, G., Soszynski, I., Szewczyk, O., Wyrzykowski, E., Ulaczyk, K., Poleski, R., Abe, F., Bennett, D.P., Botzler, C.S., Douchin, D., Freeman, M., Fukui, A., Furusawa, K., Hearnshaw, J.B., Hosaka, S., Itow, Y., Kamiya, K., Kilmartin, P.M., Korpela, A., Lin, W., Ling, C.H., Makita, S., Masuda, K., Matsubara, Y., Miyake, N., Muraki, Y., Nagaya, M., Nishimoto, K., Ohnishi, K., Okumura, T., Perrott, Y.C., Philpott, L., Rattenbury, N., Saito, T., Sako, T., Sullivan, D.J., Sweatman, W.L., Tristram, P.J., Von Seggern, E., Yock, P.C.M., Albrow, M., Batista, V., Beaulieu, J.P., Brillant, S., Caldwell, J., Calitz, J.J., Cassan, A., Cole, A., Cook, K., Coutures, C., Dieters, S., Prester, D., Donatowicz, J., Fouque, P., Hill, K., Hoffman, M., Jablonski, F., Kane, S.R., Kains, N., Kubas, D., Marquette, J.-B., Martin, R., Martioli, E., Meintjes, P.J., Menzies, J., Pedretti, E., Pollard, K., Sahu, K.C., Vinter, C., Wambsganss, J., Watson, R., Williams, A., Zub, M., Allan, A., Bode, M.F., Bramich, D.M., Burgdorf, M.J., Clay, N., Fraser, S., Hawkins, E., Horne, K., Kerins, E., Lister, T.A, Mottram, C., Saunders, E.S., Snodgrass,

C., Steele, I.A., Tsapras, Y., Jorgensen, U.G., Anguita, T., Bozza, V., Novati, S.C., Harpsoe, K., Hinse, T.C., Hundertmark, M., Kjaergaard, P., Liebig, C., Mancini, L., Masi, G., Mathiasen, M., Rahvar, S., Ricci, D., Scarpetta, G., Southworth, J., Surdej, J. & Thone, C.C. 2010. Frequency of solar-like systems and of ice and gas giants beyond the snow line from high-magnification microlensing events in 2005-2008. Astrophysical Journal 720(2): 1073-1089.

Han, C., Hwang, K.H., Kim, D., Udalski, A., Abe, F., Monard, L.A.B., McCormick, J., Szymanski, M.K., Kubiak, M., Pietrzynski, G., Soszynski, I., Szewczyk, O., Wyrzykowski, L., Ulaczyk, K., Bond, I.A., Botzler, C.S., Fukui, A., Furusawa, K., Hearnshaw, J.B., Itow, Y., Kamiya, K., Kilmartin, P.M., Korpela, A., Lin, W., Ling, C.H., Masuda, K., Matsubara, Y., Miyake, N., Muraki, Y., Nagaya, M., Ohnishi, K., Tokumura, T., Perrott, Y.C., Rattenbury, N., Saito, T., Sako, T., Skuljan, L., Sullivan, D.S., Sumi, T., Sweatman, W.L., Tristram, P.J., Yock, P.C.M., Allen, W., Christie, G.W., Depoy, D.L., Dong, S., Gaudi, B.S., Gould, A., Lee, C.U., Natusch, T., Park, B.G., Pogge, R.W., Albrow, M.D., Allan, A., Batista, V., Beaulieu, J.P., Bennett, D.P., Brillant, S., Bode, M., Bramich, D.M., Burgdorf, M., Caldwell, J.A.R., Calitz, H., Cassan, A., Corrales, E., Dieters, S., Prester, D.D., Dominik, M., Donatowicz, J., Fouque, P., Greenhill, J., Hill, K., Hoffman, M.J.H., Horne, K., Jorgensen, U.G., Kains, N., Kubas, D., Marquette, J.B., Martin, R., Meintjes, P.J., Menzies, J., Pollard, K.R., Sahu, K.C., Snodgrass, C., Steele, I., Street, R., Tsapras, Y., Wambsganss, J., Williams, A. & Zub, M. 2010. Interpretation of strong shortterm central perturbations in the light curves of moderate-magnification microlensing events. Astrophysical Journal 705(2): 1116-1121.

Harris, R.A., Van der Lingen, E., Paul, D.F., Swart, H.C. & Terblans, J.J. 2010. Monte Carlo Simulation and AES characterization of phase formation in Pt-Al thin films. Surface and Interface Analysis 42(6-7): 1180-1183.

Hwang, K.H., Udalski, A., Han, C., Ryu, Y.H., Bond, I.A., Beaulieu, J.P., Dominik, M., Horne, K., Gould, A., Gaudi, B.S., Kubiak, M., Szymanski, M.K., Pietrzynski, G., Soszynski, I., Szewczyk, O., Ulaczyk, K., Wyrzykowski, L., Abe, F., Botzler, C.S., Hearnshaw, J.B., Itow, Y., Kamiya, K., Kilmartin, P.M., Masuda, K., Matsubara, Y., Motomura, M., Muraki, Y., Nakamura, S., Ohnishi, K., Okada, C., Rattenbury, N., Saito, T., Sako, T., Sasaki, M., Sullivan, D.J., Sumi, T., Tristram, P.J., Wood, J.N., Yock. P.C.M., Yoshioka, T., Albrow, M., Bennett, D.P., Bramich, D.M., Brillant, S., Caldwell, J.A.R., Calitz, J.J., Cassan, A., Cook, K.H., Corrales, E., Coutures, C., Desort, M., Dieters, S., Dominis, D., Donatowicz, J., Fouque, P., Greenhill, J., Harpsoe, K., Hill, K., Hoffman, M., Jorgensen, U.G., Kane, S., Kubas, D., Martin, R., Marquette, J.B., Meintjes, P., Menzies, J., Pollard, K., Sahu, K., Steele, I., Vinter, C., Wambsganss, J., Williams, A., Woller, K., Burgdorf, M., Snodgrass, C., Bode, M., Depoy, D.L., Lee, C.-U., Park, B.-G. & Pogge, R.W. 2010. MOA collaboration; Planet RoboNet collaboration; FUN collaboration. Astrophysical Journal 723(1): 797-802.

Jafta, C.J., Roos, W.D., Terblans, J.J. & Hugo, A.B. 2010. A pressurized Ar-Filled annealing system. Instrumentation Science and Technology 38(4): 261-267.

Joubert, H.D., Terblans, J.J. & Swart, H.C. 2010. Determining the diffusion coefficient of Ni in Cu from a Ni/Cu thin film using linear heating, scanning Auger microscopy and a numerical solution of Fick's second law. Surface and Interface Analysis 42(6-7): 1213-1216.

Joubert, H.D., Terblans, J.J. & Swart, H.C. 2010. Extracting inter-diffusion parameters from Ni/Cu thin films by means of profile reconstruction with the MRI model. Surface and Interface Analysis 42(6-7): 1281-1283.

Koao, L.F., Swart, H.C. & Dejene, F.B. 2010. The effects of the aluminum co-doping on the photoluminescence properties of Ce³⁺ doped SiO₂ glasses. Rare earth metals (Special Issue) 28: 206-210.

Kumar, V., Mishra, V., Biggs, M.M., Nagpure, I.M., Ntwaeaborwa, O.M., Terblans, J.J. & Swart, H.C. 2010. Electron beam induced green luminescence and degradation study of CaS:Ce nanocrystalline phosphors for FED applications. Applied Surface Science 256: 1720-1724.

Kumar, V., Mishra, V., Pitale, S.S., Nagpure, I.M., Coetsee, E., Ntwaeaborwa. O.M. & Swart. H.C. 2010. Surface chemical reactions during electron beam irradiation of nanocrystalline CaS:Ce³⁺ phosphor. Journal of Applied Physics 107(12): 123533(1-6).

Kumar, V., Nagpure, I.M., Ntwaeaborwa, O.M. & Swart, H.C. 2010. Synthesis of Ce³⁺ doped SrS nanocrystalline phosphors using a simple aqueous method. Materials Letters 64: 752-754.

Kumar, V., Pitale, S.S., Mishra, V., Nagpure, I.M., Biggs, M.M., Ntwaeaborwa. O.M. & Swart. H.C. 2010. Luminescence investigation in Ce³⁺ doped CaS nanophosphors. Journal of Alloys and Compounds 492: L8-L12.

Kumar, V., Pitale, S.S., Nagpure, I., Terblans, J.J., Ntwaeaborwa, O.M. & Swart, H.C. 2010. A surface chemical behaviour investigation on a promising low voltage cathodoluminescent LiSrBO₃:Sm³⁺ phosphor. *Luminescence* 25: 274-275.

Leeuw, N.J., Swart, C.W., Joseph, M., Pohl, C.H., Van Wyk, P.W.J., Coetsee, E., Swart, H.C., Hugo, A. & Kock, J.L.F. 2010. The effects of palm oil breakdown products on lipid turnover and morphology of fungi. Canadian Journal of Microbiology 56(11): 883-889.

Mhlongo, G.H., Ntwaeaborwa, O.M., Dhlamini, M.S., Swart, H.C. & Hillie, K.T. 2010. Cathodoluminescence properties of SiO₂:Pr³⁺and ZnO.SiO₂:Pr³⁺ AGRICULTURAL SCIENCES | DEPARTMENT OF PHYSICS

191

phosphor nanopowders. *Journal of Material Science* 45: 5228-5236.

Mishra, S.B., Mishra, A.K., Luyt, A.S., Revaprasadu, N., Hillie, K.T., Steyn, W.J.VdM., Coetsee, E. & Swart, H.C. 2010. Ethyl vinyl acetate copolymer – SrAl₂O₄:Eu,Dy and Sr₄Al₁₄O₂₅:Eu,Dy phosphor based composites: Preparation and material properties. *Journal of Applied Polymer Science* 115(1): 579–587.

Mothudi, B.M., Ntwaeaborwa, O.M., Pitale, S.S. & Swart, H.C.

2010. Luminescent properties of $Ca_{0.97}Al_2O_4$: $Eu^{2+}_{0.01}$, $Dy_{3+0.02}$ phosphors prepared by the combustion method at different initiating temperatures, in preparation. *Journal of Alloys and Compounds* 508: 262–265.

Msomi, J.Z. & Dolo, J.J. 2010. Synthesis and Mössbauer studies of $Zn_x Ni_{1-x} Fe_2 O_4$ and $Mn Fe_2 O_4$ nanoferrites. Hyperfine Interactions 197: 59-64.

Msomi, J.Z. & Moyo, T. 2010. Effect of synthesis route on the magnetic properties of $(Cd, Cu)_{0.5}Ni_{0.5}Fe_2O_4$ oxides. *Journal of Physics: Conference Series* 200(7) (International Conference on Magnetism, ICM 2009): 072067

Msomi, J.Z. & Moyo, T. 2010. Magnetic properties of CuxCo1-xFe2-xAlxO4 oxides. *Journal of Physics: Conference Series* 217(1) (International Conference on the Applications of the Mössbauer Effect, ICAME 2009): 012127.

Nagpure, I.M., Shinde, K.N., Kumar, V., Ntwaeaborwa, O.M., Dhoble, S.J. & Swart, H.C. 2010. Combustion synthesis and luminescence investigation of $Na_3Al_2(PO_4)_3$;RE (RE = Ce³⁺, Eu³⁺ and Mn²⁺) phosphor. *Journal* of Alloys and Compounds 492: 384– 388.

Nsimama, P.D., Ntwaeaborwa,

O.M. & Swart, H.C. 2010. Auger electron/X-ray photoelectron and Cathodoluminescent Spectroscopic Studies of Pulsed Laser Ablated SrAl₂O₄:Eu²⁺,Dy³⁺ Thin Films. *Applied Surface Science* 257: 512–517. Ntwaeaborwa, O.M., Nsimama, P.D., Pitale, S., Nagpure, I., Kumar, V., Coetsee, E., Terblans, J.J., Swart, H.C. & Sechogela, P.T. 2010. Photoluminescence properties of $SrAl_2O_4$:Eu²⁺,Dy³⁺ thin phosphor films grown by pulsed laser deposition. *Journal of Vacuum Science & Technology A.* 28(4): 901-905.

Ocaya, R.O. & Minny, J. 2010. A TCP/IP framework for ethernetbased measurement, control and experiment data distribution. *Journal* of Instrumentation 5: T11001.

Rodriguez-Lopez, C., Lynas-Gray, A.E., Kilkenny, D., Macdonald, J., Moya, A., Koen, C., Woudt, P.A., Wium, D.J., Oruru, B. & Zietsman, E. 2010. The rapidly pulsating sd0 star, SDSS J160043.6 + 074802.9. *Monthly Notices of the Royal Astronomical Society* (MNRAS) 401: 23-34.

Sumi, T., Bennett, D.P., Bond, I.A., Udalski, A., Batista, V., Dominik, M., Fouque, P., Kubas, D., Gould, A., Macintosh, B., Cook, K., Dong, S., Skuljan, L., Cassan, A., Abe, F., Botzler, C.S., Fukui, A., Furusawa, K., Hearnshaw, J.B., Itow, Y., Kamiya, K., Kilmartin, P.M., Korpela, A., Lin, W., Ling, C.H., Masuda, K., Matsubara, Y., Miyake, N., Muraki, Y., Nagaya, M., Nagayama, T., Ohnishi, K., Okumura, T., Perrott, Y.C., Rattenbury, N., Saito, T., Sako, T., Sullivan, D.J., Sweatman, W.L., Tristram, P.J., Yock, P.C.M., Beaulieu, J.P., Cole, A., Coutures, C., Duran, M.F., Greenhill, J., Jablonski, F., Marboeuf, U., Martioli, E., Pedretti, E., Pejcha, O., Rojo, P., Albrow, M.D., Brillant, S., Bode, M., Bramich, D.M., Burgdorf, M.J., Caldwell, J.A.R., Calitz, H., Corrales, E., Dieters, S., Prester, D.D., Donatowicz, J., Hill, K., Hoffman, M., Horne, K., Jorgensen, U.G., Kains, N., Kane, S., Marguette, J.B., Martin, R., Meintjes, P.J., Menzies, J., Pollard, K.R., Sahu, K.C., Snodgrass, C., Steele, I., Street, R., Tsapras, Y., Wambsganss, J., Williams, A., Zub, M., Szymanski, M.K., Kubiak, M., Pietrzynski, G., Soszynski, I., Szewczyk, O., Wyrzykowski, L.,

Ulaczyk, K., Allen, W., Christie, G.W., DePoy, D.L., Gaudi, B.S., Han, C., Janczak, J., Lee, C.U., McCormick, J., Mallia, F., Monard, B., Natusch, T., Park, B.G., Pogge, R.W. & Santallo, R. 2010. A Cold Neptune-mass planet OGLE-2007-BLG-368Lb: Cold Neptunes are common. Astrophysical Journal 710(2): 1641-1653.

Swart, C.W., Swart, H.C., Coetsee, E., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F. 2010. 3–D architecture and elemental composition of fluconazole treated yeast asci. *Scientific Research and Essay* 5(22): 3411–3417.

Swart, H.C., Coetzee, E., Terblans, J.J., Ntwaeaborwa, O.M., Nsimama, P.D., Dejene, F.B. & Dolo, J.J. 2010. Cathodoluminescence degradation of PLD thin films. *Applied Physics A: Materials Science and Processing* 101: 645–650.

Swart, H.C., Terblans, J.J., Coetsee, E., Kumar, V., Ntwaeaborwa, O.M., Dhlamini, M.S. & Dolo, J.J. 2010. Auger Electron Spectroscopy and X-ray Photoelectron Spectroscopy study of the electron stimulated surface chemical reaction mechanism for phosphor degradation. *Surface and Interface Analysis* 42(6-7): 922-926.

Conferences contributions

Ahmed, H.S., Kroon, R.E., Ntwaeaborwa, O.M. & Duvenhage, M.M. 2010. Luminescence from rare-earth doped silica prepared by the sol-gel method. Poster presented at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September - 1 October.

Barnard, P.E., Swart, H.C., Hoffman, M.J.H. & Terblans, J.J. 2010. *Fe/S* sample preparation: A method for the calculation of the S concentration required for doping Fe crystals. Poster presented at the 55th Annual Conference of the South African

Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September - 1 October.

Biggs, M.M., Ntwaeaborwa, O.M., Swart, H.C. & Hoffman, M.J.H. 2010. Luminescent mechanism of bulk and nano ZnS:Mn²⁺ phosphors. Poster presented at the Nanotech Conference and Expo, Anaheim Convention Centre, Anaheim, California, USA. 21-24 June.

Dejene, F.B., Wako, A.H., Kebede, M.A., Ahmed, A.S., Duvenhage, M.M., Cronje, S., Coetzee, E. & Swart, H.C. 2010. Synthesis and characterization of structural and Luminescence Properties of green SrAl₂O₂:Eu²⁺ nanophosphors by Solution – Combustion Method, Excited States of Transition Elements. Paper delivered at the Excited States of Transitions Elements (ESTE 2010) Conference and the Workshop on Luminescence, Wrocław & Piechowice, Poland. 4-9 September.

Dolo, J.J., Swart, H.C., Coetsee, E., Terblans, J.J. & Ntwaeaborwa, O.M. 2010. Effect of deposition conditions on the characteristics of the thin films grownobtained by using Pulsed Laser Deposition. Poster presented at the 3rd Joint International Conference on Hyperfine Interactions and International Symposium on Nuclear Quadrupole Interactions (HFI/NQI), CERN, Genève, Switzerland. 13–17 September.

Gusowski, M.A. & Swart, H.C. 2010. Luminescence of colloidal $NaYF_4$ doped with Dy^{3*} synthesized via thermal decomposition of fluoracetates precursors. Paper delivered at the 3rd African Laser Centre (ALC) Student Workshop 2010, Stellenbosch, South Africa. 24-25 September.

Gusowski, M.A. & Swart, H.C. 2010. Spectrocscopic studies of nano NaYF4 doped with RE³⁺ synthesized via thermal decomposition of organic precursors. Poster presented at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September - 1 October.

Gusowski, M.A., Ryba-Romanowski, W. & Swart, H.C. 2010. The lowest $4f^{n}$ -to- $4f^{n-1}5d$ transitions of trivalent lanthanides ions in K_3YF_6 cryolitetype host. Paper delivered at the 4th International Conference on Optical, Optoelectronic and Photonic Materials and Applications (ICOOPMA10), Budapest, Hungary. 15-20 August.

Harris, R.A., Terblans, J.J., Swart, H.C. & Van der Lingen, E. 2010. Monte Carlo simulation of Pt-Al binary alloy thin films. Paper delivered at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September - 1 October.

Hoffman, M.J.H. 2010. A density matrix based electronic structure method applied to nanoparticles: treatment of the idempotency. Paper delivered at the Nanotech Conference and Expo, Anaheim Convention Centre, Anaheim, California, USA. 21-24 June.

Hoffman, M.J.H. 2010. Assessment of the Expected Impact on Observing Conditions at Boyden Observatory of light pollution associated with new developments in the area. Paper delivered at the 9th Biennial Symposium of the Astronomical Society of Southern Africa (ASSA), Silverton Campus of the Council for Geoscience, Pretoria, South Africa. 7-8 October.

Hoffman, M.J.H. 2010. How multimedia technologies can be used to reveal the beauty of the cosmos and communicate astrophysical and cosmological concepts. Paper delivered at the SACIA (Southern African Communications Industries Association) ProAV Forum Conference and Exhibition, Misty Hills Conference and Exhibition Centre, Muldersdrift, South Africa. 20-21 October.

Jafta, C.J., Roos, W.D., Cronjé, S. & Asante, J.K.O. 2010. Influence of Sb doping on grain growth of polycrystalline Cu. Poster presented at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September – 1 October.

Kumar, V., Pitale, S.S., Nagpure, I.M., Ntwaeaborwa, O.M. & Swart, H.C. 2010. Luminescence and electron beam induced degradation of alkaline earth sulfide based nanophosphors. Paper delivered at the International Conference on Nanomaterials (ICN 2010), Kottayam, Kerala, India. 27-29 April.

Madito, M.J., Swart, H.C. & Terblans,

J.J. 2010. Quantitative investigation of Cu/In thin Films Deposited onto SiO₂ by Electron Beam Evaporation. Poster presented at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September - 1 October.

Mbule, P.S., Kroon, R.E., Swart, H.C. & Ntwaeaborwa, O.M. 2010. *Ex situ synthesis and optical properties of ZnO-PbS nanocomposites*. Paper delivered at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September - 1 October.

Mhlongo, G.H., Ntwaeaborwa, O.M., Dhlamini, M.S., Swart, H.C. & Hillie, T.K. 2010. Cathodoluminescence degradation of $SiO_2:Pr^{3*}-Eu^{3*}$ nanophosphor and quenching of Pr^{3*} (3H6 \rightarrow 3PO) emission due to Eu^{3*} codoping. Paper delivered at the Excited States of Transitions Elements (ESTE 2010) Conference and the Workshop on Luminescence, Wrocław & Piechowice, Poland. 4–9 September.

Moleme, P.A., Swart, H.C. & Ntwaeaborwa, O.M. 2010.

Cathodoluminescence degradation of SrGa₂S₄:Ce³⁺ powder phosphor. Poster presented at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September - 1 October. Mothudi, B.M., Ntwaeaborwa, O.M. & Swart, H.C. 2010. Luminescent properties of BaAl₂O₄:Eu²⁺,Gd³⁺ phosphors prepared with the combustion method at different initiating combustion temperatures (400 – 1000 °C). Paper delivered at the 1st International Conference on New Trends in Luminescence and Phosphor Materials (LUMIPHOM 2010), Hermosillo. Mexico. 4–8 October.

Mothudi, B.M., Ntwaeaborwa, O.M. & Swart, H.C. 2010. The influence of the initiaiting and the annealing temparature on the luminescent and structural properties of $BaAl_2O_4:Eu^2, Nd^{3*}, Gd^{3*}$ phosphors prepared by combustion method. Paper delivered at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September - 1 October.

Mothudi, B.M., Ntwaeaborwa, O.M.

& Swart, H.C. 2010. Luminescent properties of BaAl₂O₄:Eu²⁺,Gd³⁺ phosphors prepared by combustion method at different initianting combustion temperatures (400-1000°C). Poster presented at the 7th International Conference on Inorganic Materials, Biarritz, France. 12-14 September.

Murape, D.M., Venter, A., Botha, J.R. & Swart, H.C. 2010. The effect of sulphur-based treatment on the quality of GaSb surfaces. Paper delivered at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September - 1 October.

Nagpure, I.M., Ntwaeaborwa, O.M., Pitale, S.S., Kumar, V. & Swart,

H.C. 2010. Luminescence studies of CaQ2 organic phosphor for OLED applications. Paper delivered at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September – 1 October. Ndlovu, G.F., Malwela, T., Roos, W.D. & Hillie, K.T. 2010. Atomic resolved Ag nano clusters on HOPG: a VT-STM study. Poster presented at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September – 1 October.

Nkundabakura, P. & Meintjes, P.J. 2010. Unidentified EGRET Blazar candidates. Paper delivered at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September – 1 October.

Noto, L.L., Terblans, J.J., Pitale, S.S. & Swart, H.C. 2010. Luminescent properties of nanoparticle CaTiO₃ phosphor. Poster presented at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September – 1 October.

Nsimama, P.D., Ntwaeaborwa, O.M. & Swart, H.C. 2010. Characterization of laser ablated SrAl₂O₄:Eu²⁺,Dy³⁺ thin films. Poster presented at the 3rd African Laser Centre (ALC) Student Workshop 2010, Stellenbosch, South Africa. 24–25 September.

Nsimama, P.D., Ntwaeaborwa, O.M. & Swart, H.C. 2010. Elemental composition analysis, morphological, and photoluminescence properties of pulsed laser ablated SrAl₂O₄:Eu²⁺,Dy³⁺ thin films. Paper delivered at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September – 1 October.

Ntwaeaborwa, O.M., Kumar, V., Pitale, S.S., Mhlongo, G.H., Kroon, R.E. & Swart, H.C. 2010. Enhanced photoluminescence of rare-earth activators in sol-gel derived SiO₂ by energy transfer from ZnO nanoparticles and co-activators. Paper delivered at the International Conference on Nanomaterials (ICN 2010), Kottayam, Kerala, India. 27-29 April. Ntwaeaborwa, O.M., Tshabalala, K.G., Cho, S., Park, J.K., Pitale, S.S., Nagpure, I.M., Kroon, R.E. & Swart, H.C. 2010. Optical properties of UV down-converting ZnAl204:Ce3+,Tb3+ phosphor. Paper delivered at the 15th International Workshop on Inorganic and Organic Electroluminescence, and the International Conference on the Science and Technology of Emissive Displays and Lighting, and the XVIII Advanced Display Technologies International Symposium, St. Petersburg, Russia. 27 September - 1 October.

Odendaal, A. 2010. A multiwavelenght study of supersoft X-ray sources. Paper delivered at the South African Square Kilometer Array Project 2010 Postgraduate Bursary Conference, Wallenberg Centre, Stellenbosch Institute for Advanced Study, Stellenbosch, South Africa. 29 November - 3 December.

Odendaal, A. & Meintjes, P.J. 2010. Multi-wavelength study of Super Soft X-ray sources in the Magellanic clouds. Paper delivered at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September – 1 October.

Oruru, B. 2010. Analysis of the binary radio pulsar AE AQUARII from Chandra and Swift data. Paper delivered at the South African Square Kilometer Array Project 2010 Postgraduate Bursary Conference, Wallenberg Centre, Stellenbosch Institute for Advanced Study, Stellenbosch, South Africa. 29 November - 3 December.

Oruru, B. & Meintjes, P.J. 2010. A signature of non-thermal X-ray emission in AE Aquarii. Paper delivered at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September – 1 October.

Pitale, S.S., Kumar, V., Nagpure, I., Ntwaeaborwa, O.M. & Swart, H.C. 2010. *CL stability and surface* chemical changes of ZnAl2O4:Mn nanocrystalline phosphor. Paper delivered at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September - 1 October.

Pitale, S.S., Kumar, V., Nagpure, I., Ntwearborwa, O.M. & Swart,

H.C. 2010. Investigations on the electron stimulated surface chemical behaviour and cathodoluminescence of zinc aluminate nanophosphors for field emission display applications. Paper delivered at the International Conference on Nanomaterials (ICN 2010), Kottayam, Kerala, India. 27-29 April.

Swart, C.W., Swart, H.C., Coetsee, E., Pohl, C.H., Van Wyk, P.W.J. &

Kock, J.L.F. 2010. NanoSAM: A first application to yeasts. Invited paper delivered at the 28th International Specialised Symposium on Yeast: Metabolic and Bioprocess Engineering for Sustainable Development (ISSY28), Montien Riverside Hotel, Bangkok, Thailand. 15-18 September.

Swart, H.C., Kumar, V., Pitale, S.S., Nagpure, I., Ntwaeaborwa, O.M. & Terblans, J.J. 2010. A surface chemical behaviour investigation of a promising low voltage cathodoluminescent LiSrBO₃·Sm³⁺ phosphor. Poster presented at the 24th International Symposium on Plasma Physics and Technology: Luminescence Spectrometry – Recent Advances Of Luminescence Techniques In Research And Modern Technology (ISLS 2010), Prague, Czech Republic. 14–17 July.

Tshabalala, K.G., Swart, H.C., Cho,

S., Park, J.K. & Ntwaeaborwa, O.M. 2010. Luminescence properties of Ce³⁺ and Tb³⁺ – doped ZnAl204 phosphors prepared by combustion reaction. Paper delivered at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September – 1 October.

Van Heerden, H.J., Van Jaarsveldt, D.P. & Hoffman, M.J.H. 2010. The Observatories Museum Project. Paper delivered at the 9th Biennial Symposium of the Astronomical Society of Southern Africa (ASSA), Silverton Campus of the Council for Geoscience, Pretoria, South Africa. 7-8 October.

Van Heerden, P. & Meintjes, P.J. 2010. Spica: Custom data acquisition and control software for the Boyden research telescopes. Poster presented at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September – 1 October.

Van Soelen, B. 2010. Inverse Compton Scattering in Be-XPBs. Paper delivered at the South African Square Kilometer Array Project 2010 Postgraduate Bursary Conference, Wallenberg Centre, Stellenbosch Institute for Advanced Study, Stellenbosch, South Africa. 29 November - 3 December.

Van Soelen, B. & Meintjes, P.J.

2010. Inverse Compton gammaray production in Be-pulsar binary systems. Paper delivered at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September - 1 October.

Wium, D., Van der Linde, A. &

Meintjes, P.J. 2010. Data reduction pipeline for optical photometric data. Poster presented at the 55th Annual Conference of the South African Institute of Physics (SAIP 2010), CSIR, Pretoria, South Africa. 28 September - 1 October.

Academic staff

MAIN CAMPUS

Professors: Profs. Hendrik Swart; Koos Terblans, Pieter Meintjes

Associate Professors: Profs. Wiets Roos; Matie Hoffman; Martin Ntwaeaborwa

Senior Lecturer: Dr Ted Kroon

Researcher: Ms Lisa Coetsee

QWAQWA CAMPUS

Associate Professor: Prof. Francis Dejene

Senior Lecturers: Dr Justice Msomi; Mr Richard Ocaya

Lecturers: Dr Moses Mothudi; Mr Jappie Dolo

Contact details

Prof. Hendrik Swart

Faculty of Natural and Agricultural Sciences Department of Physics University of the Free State PO Box 339 Bloemfontein South Africa 9300

 Telephone:
 +27 (0)51 401 2926

 Fax:
 +27 (0)51 401 3507

 E-mail:
 swarthc@ufs.ac.za

 Website:
 www.ufs.ac.za/physics

195

"We prepare students for a career in adventure."

Prof. Jo van As

18 Department of Zoology and Entomology



Overview

The University of the Free State (UFS) Department of Zoology and Entomology consists of two sub-disciplines, namely Zoology and Entomology.

Our undergraduate courses in both these sub-disciplines cover a wide field. Our philosophy is that a student's first year is an introductory year and from the second year onwards we specialise in various aspects.

The department is organised into different research groups, each with its own specific area of study and objectives. There is also a satellite department at the Qwaqwa Campus. The groups share common goals within the strategic priorities of the Faculty of Natural and Agricultural Sciences and the UFS.

The vision of the department is to be a nucleus of broadbased Zoological and Entomological learning, training and research in South Africa (in particular) and continental Africa (in general).

We therefore aim to create, integrate, apply, transmit and coordinate knowledge in Zoology and Entomology by providing academic tuition and establishing and expanding pure and applied research that is relevant in a South African context.

Special achievements

The Parasitological Society of Southern Africa (PARSA) awards the Elsdon-Dew medal of merit for contributions to parasitology in Africa. This award is named after Ronald Elsdon-Dew, who was one of the founders of the society. The first medal awarded went to GS Nelson for his work on malaria in 1973. In 2010, the 24th medal was awarded to Prof. Jo van As during the 2010 PARSA conference held in the Drakensberg, South Africa, in October for his enormous contribution to specifically fish parasitology in Africa.



Prof. Jo van As received the Elsdon-Dew medal of merit at the 2010 PARSA conference for his contribution to fish parasitology in Africa. Here are, from the left to the right: Profs. Nico Smit (University of Johannesburg), Barney Penzhorn (Onderstepoort) and Jo Van As.

NATURAL SCIENCES | DEPARTMENT OF ZOOLOGY AND ENTOMOLOGY



Activities and achievements Aquatic Ecology (Parasitology, Wetland and Conservation Ecology)

The group consists of Profs. Jo van As, Linda Basson and Liesl van As. In 2010, one Ph.D. student, Ms Deidre West, and three M.Sc. students, Mss Hanlie Groenewald, Andri Grobbelaar and Mr Josef-Heinrich Möller, were registered. Mr Möller completed his Master's studies at the end of 2010 and will receive his degree with distinction at the autumn graduation ceremony. Two Honours students, Mss Mia Otto and Ayesha Mobara, were also part of the group. Three third-year students were also appointed as undergraduate assistants. Ms Sylvia Teele still manages the very extensive collection of parasitology papers.

Ms Andri Grobbelaar received the prize for the best senior student presentation at the 2010 PARSA conference held in the Drakensberg, South Africa, in October 2010.

The Aquatic Ecology group spent the April 2010 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 17 years and since 2004 it has become a combined excursion with Zoology and Botany The Aquatic Ecology group at the De Hoop Nature Reserve. On the photo are students working in the laboratory tent, following their fieldwork for the day.

students majoring in these subjects. During 2010, we had the pleasure of camping with a group of 50 students, occupying the entire camping site at De Hoop, forming a tented town.

During August 2010, Profs. Jo and Liesl van As, as well as two postgraduate students (Messrs Josef-Heinrich Möller and Ruaan Schlebusch) joined their colleagues from Botswana and travelled the entire distance of the Okavango River, from Shakawe in the north to Maun in the south. The nine-day journey was just over 900 km. During 1999 and 2008, surveys were conducted in the panhandle section of the Okavango, and in 2001 surveys were carried out in the delta. The 2010 trip covered the entire area and along the way fish was collected and new possible research sites were explored for future followup surveys. It was also possible to compare some of the areas surveyed during the previous trips, as the water level of the system had increased over the last decade, due to higher rainfall in the catchment areas.

In December 2010, Profs. Jo and Liesl van As visited the Kamutjonga Inland Fisheries Institute (KIFI) in the Mukwe Constituency of Namibia's Kavango Region. Research is the institute's core function and the institute seeks to encourage scientists to focus on diversification of Messrs Ruaan Sclebusch and Josef-Heinrich Möller on *Synodontis*, with the other boats in front of them, in the delta section of the Okavango System.



fish species and to determine the current status of fish in both the Kavango and Zambezi Rivers. The KIFI also serves as a centre for capacity building where students and staff from tertiary institutions are sent to carry out fieldwork. During the visit, Prof. Jo van As presented a talk on fish parasites in Africa. There will be collaboration with staff from KIFI on the fish parasites of the Kavango



Profs. Liesl and Jo van As (UFS), Ms Victoria Mumba (KIFI), Dr Edosa Omoregie (University of Namibia) and Dr Clinton Hay (KIFI).



Our departmental vehicle and *Synodontis* on the trailer at the entrance to Krokovango and Leseding Camp, after the river trip.

and Namibian part of the Okavango Delta. One of the researchers (Ms Mumba) will start on a fish parasite M.Sc. with the Aquatic Ecology research group in 2011.

Arachnology

Mr Charles Haddad currently forms the Arachnology research group.

Several biodiversity and taxonomic projects were completed during the course of 2010 in the Arachnology study group. At Ndumo Game Reserve, the last canopyfogging samples were taken from deciduous broadleaf woodland, bringing the total to 65 samples taken from forest and woodland tree species, one of the most comprehensive sampling efforts on the continent. The collected material is presently being sorted, and although the focus will be on the arachnid biodiversity, several taxonomic specialists have expressed an interest in working on material of various insect orders that would greatly enhance our knowledge of Maputaland's invertebrate fauna.

Ongoing undergraduate projects at the Free State National Botanical Gardens to determine spider biodiversity in several habitat strata have continued, with the first ever year-long study of the leaf-litter spider assemblages completed and accepted for publication. Studies such as these highlight the importance of year-long projects for final-year Entomology students as part of their training, as well as the contribution that such studies can make to the knowledge of invertebrate biodiversity in the grassland biome.

In July 2010, Mr Charles Haddad attended the 18th International Congress of Arachnology in Siedlce, Poland, where he presented a paper on his research on the cryptic castianeirine sac spiders in the Afrotropical region. Some of the revisionary papers forming the basis of this work were published in 2010, in addition to a molecularbased phylogeny and revision of the new spider family, *Penestomidae*.

Eco-ethology

Two members of the academic staff, Mr Hennie Butler and Ms Lindi Heyns, work within the Eco-ethology research group, actively combining teaching and research. Together with eight postgraduate students, they form the Eco-ethology study group that encourages interdisciplinary research through a combination of laboratory and field science.

The Eco-ethology group pursues basic research in the field of behavioural biology and ecology, but also includes diverse areas such as the anatomy, physiology, natural and evolutionary history, taxonomy, conservation, management and economics of animals. During 2010, projects by group members mainly focused on applied questions in wildlife management of various antelope species, but studies were also carried out utilising fish, felines, extinct mammals and birds as study animals.

Mr Hennie Butler (Ph.D.) focused on the soil-eating behaviour (geophagy) of antelopes in semi-arid regions. Ms Elilyia Shardelow (M.Sc.) and Ms Nadine Jacobs (M.Sc.) investigated behavioural aspects of blue wildebeest and sable antelope, respectively. Research carried out by Mr Savvas Vrahimis (Ph.D.) and Ms Lindi Heyns (M.Sc.) entailed a combination of behavioural biology and conservation genetics. Mr Vrahimis, in association with the Free State Department of Tourism, Environmental and Economic Affairs, researched aspects of the ecology, behaviour and genetic status of black wildebeest, whereas Ms Heyns continued to investigate behavioural and genetic aspects of blesbok and bontebok in the Free State.

Ms Andri Erasmus (M.Sc.) conducted fieldwork in Botswana where fish was collected from the Okavango River and examined for parasitic flukes that occur in the eyes and brain. Through behavioural experiments she aims to determine how the parasites influence the behaviour of the host. Concerning carnivores, Mrs Michelle van As (M.Sc.) continued to investigate the activity patterns of leopard at Lydenburg.

Mr Dewald du Plessis (M.Sc.) attained his Master's degree on the topic of *cranial endocasts of non-mammalian cynodonts to explore brain evolution with the goal of correlating brain size with the physiology and behaviour of these animals.* Mr Johan van Niekerk was awarded his doctorate on a long-term behavioural study of avifauna in the grassland biome.

Mr Roe Wiid commenced with a project on population control of rock hyraxes in suburban areas in the Southern Free State, while Ms Elsabé Coetzee investigated the functionality of luminosity of scorpions.

The annual Honours excursion to Tussen-die-Riviere Game Reserve took place during mid-winter 2010. This was an excellent opportunity to discuss nearly every topic on animal behaviour around a warm campfire. The students, under supervision of Mr Hennie Butler and Ms

Lindi Heyns, gained hands-on experience into the varied means of performing animal behaviour research in the field, e.g. instantaneous scan sampling methodology and setting camera traps.

A popular article by Mr Hennie Butler was published in the *Getaway*, highlighting a trip to the Moremi Game Reserve in Botswana.

Environmental Entomology

The research group consists of Mr Vaughn Swart and M.Sc. students Messrs Jaco Saaiman and Andre van Rooyen.

During 2010, research involved Mr Saaiman investigating the dissemination of fungi by insects on pecan nut trees, Mr Van Rooyen testing the penetration ability of a pesticide adjuvant to increase the penetration ability of pesticides and Mr Robert Ferguson comparing arthropod biodiversity of organic and non-organic pecan nut orchards. All these projects were in partial fulfilment of the aforementioned students' Honours degrees.

Mr Saaiman's aim was to collect a species of insect from different nut crops (i.e. pecan nuts, pistachio nuts and walnuts) with the intention to isolate fungi from them. The fungi isolated were then quantitatively and qualitatively analysed and assessed to determine whether the fungi are a disease-causing organism. Insects were shown to harbour harmful fungal genera and are thus potential disseminators of disease-causing organisms. Future research will be conducted to determine whether it is possible to use insects as indicators of what species of fungi are present in an orchard. This work forms part of an ongoing research project that is part of Mr Saaiman's research for his Master's degree. Mr Van Rooyen proceeded with trials to ascertain whether a specific adjuvant is capable of shortening the penetration time of pesticides. Funding in the amount of R30 000 was received from Nelesco for research pertaining to trials related to this adjuvant. After isolated trials, the adjuvant improvement remained constant, providing evidence that under controlled conditions the vesicle can accelerate the penetration of pesticides. Further trials, which will form part of Mr Van Rooyen's Master's degree, are planned for 2011.

In November 2008, Mr Swart became associated with the South African Pecan Producers Association (SAPPA). SAPPA donated R10 000 for research purposes for 2009 and 2010. Further discussions around the establishment of a potential statutory levy for research are taking place. Trials for the bio-control of the false codling moth are planned for future research, since this has become a major problem within the pecan nut industry.

In March 2010, Mr Swart was approached by Erwee Boerdery, Hertzogville, South Africa, to investigate stemborer resistance on Bt maize. Mr Swart was accompanied by Dr Léan van der Westhuizen of the Lengau Agricultural Development Centre of the UFS to investigate the stemborer problem at Hertzogville. It was reported that the stem borer was found to be causing significant damage to maize, which results in decreased yield. Based on the results, we recommended that the client claimed excess damage expenses.

In September 2010, Mr Swart and a few postgraduate students accompanied second- and third-year Entomology students on a career excursion to Pretoria. Institutions such as the Ditsong Museum, Agricultural Research Council (ARC) Institutes, the South African Bureau of Standards (SABS) and Syngenta were visited.



Students were surprised at the number of career opportunities that exist when following a career in Entomology.

Insects on New Crops Programme (INCroP)

The INCroP research group consists of Prof. Schalk Louw, Messrs Charles Haddad and Vaughn Swart and six postgraduate students, namely Mr De Villiers Fourie (Ph.D.), Mss Joan Adendorff (M.Sc.), Anél Grobler (M.Sc.), Louise Theron (M.Sc.), Messrs Josè Parau (M.Sc.) and Burgert Muller (M.Sc.).

Throughout the year the group participated in the activities of the UFS Research Cluster 4: Technologies for Sustainable Crop Industries in Semi-arid Regions. Specific expertise was contributed to the cluster regarding pest management on new crops and soil health management. Several lectures were presented and workshops attended in this regard. New research planning was done within the cluster that included the role of arthropod mesofauna in soil health analysis. This research was expanded in 2010 to include compost analysis and soil enrichment. This forms part of the larger holistic plant health management research thrust of the Centre for Plant Health Management (CePHMa).

During the course of 2010, Prof. Schalk Louw gave lectures at three different occasions on biodiversity. He also attended the 20th Interdisciplinary Symposium on Soilborne Plant Diseases hosted at the ARC Vredenburg Research Centre in Stellenbosch in September 2010. The topic of the symposium was *Compost and Soilborne Plant Diseases*.



Prof. Louw was also an invited guest speaker at the annual meeting of the Arid Zone Ecology Forum (AZEF) held at the Gariep Dam in October 2010, during which he was elected to the management committee of AZEF.

In December 2010, Prof. Louw formed part of the UFS delegation to Windhoek, Namibia for the planning and signing of an extensive cooperative agreement with the Polytechnic of Namibia. He also serves as external examiner for M.Sc. and Ph.D. Entomology students at the North-West University.

Messrs Charles Haddad, Vaughn Swart, Ashley Kirk-Spriggs (research associate in Entomology) and Prof. Louw accompanied the third-year Entomology students on an excursion to Hogsback in the Eastern Cape.

INCroP is proud of the following postgraduate research achievements:

An M.Sc. Entomology degree was awarded to Ms Joan Adendorff. Messrs Ruan du Preez and Wayne van Rensburg completed their Honours projects on soil health and compost analysis based on surveys at Green Valley Nuts (Prieska), Proud Plants (Petrusburg) and Krugersdriftdam (Bloemfontein). Prof. Louw is discussing future soil analysis cooperation with Prof. Ian Bell from the University of Wisconsin in the United States, Prof. Steven Chown, Director of the Centre of Excellence for Invasion Biology (CIB) at Stellenbosch University, Advanced Nutrients SA (Western Cape) and Madumbi – BCP (KwaZulu-Natal).

Medical, Veterinary, Forensic Entomology and Agricultural Entomology

This group consists of Prof. Theuns van der Linde and three Ph.D. students, Ms Sonja Brink, Mr Kobus Kolver and Ms Ansie Scholtz, who was registered at the Centre for Sustainable Agriculture, Rural Development and Extension at the UFS, but did her research at the Department of Entomology and the Department of Animal Science. All three students mentioned obtained their Ph.D. degrees during the September 2010 graduation ceremony. Six students are registered for their M.Sc. degrees, namely Messrs Shaun Hoffman, Julien Liebenberg, Theo Viljoen, Jan Richter, Mss Carmen Luwes and Elaine Allemann.

In terms of undergraduate modules, Prof. Van der Linde was responsible for the following modules:

Entomology 114: This module is a service course for Agricultural students. The course mainly deals with insect morphology and anatomy, insect pests of agricultural crops and insects of veterinary importance. Mr De Villiers Fourie was responsible for the practical classes. 27 students were enrolled for this course during 2010.

Entomology 334: This module deals with aspects of Medical, Veterinary and Forensic Entomology. Nine students were enrolled for this module during 2010.

Entomology 354: Agricultural Entomology. Two students were registered for this module during 2010.

Veterinary Entomology

Ms Ansie Scholtz is an employee of the Department of Agriculture at Elsenburg in the Western Cape Province. Her project dealt with various aspects and causes of blowfly strike on sheep. She submitted her thesis for assessment in May 2010 and it was accepted by all three assessors (one internal and two external). She is currently writing papers for a publication based on her thesis. Two papers from her research had already been accepted for publication early in 2010 and appeared in a subject-related journal. A third publication from her thesis appeared late in 2010.

Mr Julien Liebenberg, who is employed by a private company, Clinvet International, is doing a M.Sc. project on the bio-ecology of the *Culicoides* in the Free State. Aspects of the bio-ecology and vector potential of these biting and blood-feeding midges have not been researched extensively in the Free State.

Ms Carmen Luwes registered for her M.Sc. project on the bio-ecology of stable flies (*Stomoxys calcitrans*) in 2010. The title of her project is *The suitability of larval breeding media regarding oviposition preference and larval* rearing success in the stable fly Stomoxys calcitrans (Diptera Muscidae).

Forensic Entomology

During 2010, the students did research in various aspects of Forensic Entomology.

Mr Shaun Hoffman is doing a project in the sub-discipline of Entomotoxicology. This project is done in collaboration with Dr Piet van der Merwe from the Department of Pharmacology at the UFS.

Mr Theo Viljoen is conducting his research project in collaboration with Ms Karin Ehlers from the Department of Genetics. His project deals with the possible differences/ similarities between closely related blowfly species viz. *Lucilia cuprina* and *Lucilia sericata*. These two species are morphologically almost identical and difficult to distinguish from each other. They are very important in criminal investigations. He is also planning to determine possible cross-breeding between *Chrysomya marginalis* and *Chrysomya albiceps*.

Ms Elaine Allemann is registered for her M.Sc. project entitled Influence of feeding media and varying temperatures on the development of some forensically important blow flies in South Africa.

During 2010, Prof. Theuns van der Linde, Mr Theo Viljoen and Ms Elaine Allemann were requested by the South African Police Service (SAPS) to attend a few autopsies of victims killed in cases of violent crime. Their expertise was needed to help determine the post-mortem interval (PMI) of the deceased/victims.

Prof. Van der Linde was requested by the Head of the Forensic Science Laboratories in Pretoria to help with the



Dr Jansen van Rensburg (middle, back) with lecturers and fellow classmates at the Ghent University graduation ceremony.

PMI calculations of bodies due to unnatural death. More than ten cases have been investigated to date.

Agricultural Entomology

Mr Jan Richter is conducting a M.Sc. study on the biocontrol of the Russian Wheat Aphid, using natural plant extracts. He is employed by the Department of Agriculture at Glen Agricultural College in Bloemfontein. He is currently writing his thesis.

Nematology

This research group consists of Dr Candice Jansen van Rensburg, Mrs Henda Prinsloo (M.Sc.) and Ms Ayesha Mobara (M.Sc.).

After a two-year study period at Ghent University, Belgium (2008-2010), Dr Jansen van Rensburg obtained her Master's degree in Nematology with distinction. She returned to the UFS in August 2010.

Current research in this group focuses on plant parasitic nematodes occurring in the Free State Province, as well as free-living nematodes from the Bakwena Cave at Irene, South Africa.

The Bakwena Cave forms part of South Africa's karst system. South Africa holds 12% of the world's karst

systems, with the Gauteng Province having one of the largest single repositories of karst in the world. In South Africa, karst systems are facing immense pressure from unsustainable over-exploitation. With this in mind, the Bakwena Cave Project was initiated by the South African Karst Ecology Study Group of the University of Johannesburg and the Biosystematics Programme of the Plant Protection Research Institute (PPRI) of the ARC in Pretoria. Dr Jansen van Rensburg was asked to assist with the Bakwena Cave Project. She is working in collaboration with Profs. Wilfrida Decraemer and Wim Bert of Ghent University, as well as with Dr Antoinette Swart of the Biosystematics Programme of the PPRI. This project aims to contribute to the Bakwena Cave biodiversity study, as well as to increase the current knowledge on free-living nematodes from South Africa.

In October 2010, Dr Jansen van Rensburg attended the Annual Congress of the Biological Sciences Division of the South African Academy for Science and Art in Pretoria where she presented a paper based on the work she did for her Master's dissertation at Ghent University.

Mrs Prinsloo attended a short course on the identification of entomopathogenic nematodes in Stellenbosch in January 2010. She is currently residing in America where she is writing up her Master's project entitled *Review of the genus Histotylenchus Siddiqi*, 1971 in South Africa.

Ms Mobara joined the research group at the end of 2010. She will also be working on the Bakwena Cave, but focusing more on using nematodes as bio-indicators. In December 2010, Dr Jansen van Rensburg, Ms Mobara and



Dr Jansen van Rensburg climbing down a sinkhole into the Bakwena Cave.

Mr Ruaan Schlebusch undertook their first field trip to the Bakwena Cave, with monthly trips being planned for the next year-and-a-half.

Pesticide Resistance Testing and Research Facility

This group consists of Mss Ellie van Dalen (lecturer & researcher) Christa du Rand (professional officer), Annemarie van Heerden (full-time student assistant), Mss Sharon Terry, Octavia Motlogeloa and Mr Adri Jordaan (part-time M.Sc. students).

During 2010, the challenge of tick resistance and the urgency for tick resistance testing and research were again our main priority. Tick collections from all over South Africa were collected for testing. A project on the reliability of one of the testing methods, Adult Immersion testing, was launched to re-evaluate the collection en testing criteria, as well as the practical problems around the time lapse from collection until receipt of the collections by the laboratory.



Ruaan Schlebusch on his way into one of the small side-chambers of the Bakwena Cave.

Trade visits during February and November 2010 were undertaken by Ms Ellie van Dalen to re-establish and extend collaboration with our clients in the pharmaceutical arena. Meetings were held with Messrs Corne Mostert and Erich Walters from Virbac SA, Centurion concerning possible research projects in respect of new aspects of chemical control and tick resistance.

A practical short course on Essential PCR (polymerase chain reaction), presented by DNAbiotech (Pty) Ltd, was attended by Mss Ellie van Dalen and Christa du Rand in Pretoria from 3–5 November 2010, to gain knowledge on this technique for implementation at the facility during 2011.

Ms Octavia Motlogeloa left the group to start her career as a Clinical Data Coordinator at Quintiles South Africa while completing her M.Sc. dissertation entitled *Management strategies and development of resistance to chemical control by the blue tick Rhipicephalus decoloratus, in the Grahams town (South Africa) Area.* Mr Adri Jordaan and Ms Sharon Terry both work at ClinVet International. They plan to complete their respective M.Sc. dissertations early in 2011 entitled Geographic distribution of Ixodes (*Acari: Ixodidae*) *ticks in the Free State Province and seasonality of those associated with African Buffalo,* and A taxonomic description of all stages of four Ixodes (*Acari: Ixodidae*) *ticks.*



research **OUTPUTS** Zoology and Entomology

Research articles

Basson, L. 2010. First record of trichodinid ectoparasites (Ciliophora: Peritricha) from introduced freshwater fishes in Tasmania, Australia, with comments on pathogenicity. *Acta Protozoologica* 49(3): 253–265.

Basson, L. & Van As, J.G. 2010. Hypotheses on mobiline peritrich (Ciliophora: Peritrichia) transmission. *Journal of the South African Veterinary Association* 81(3): 178.

Buschke, F.T., Kemp, M.E., Seaman, M.T. & Louw, S.vdM. 2010. Intraannual variation of arthropod/plant interactions and arthropod trophic structure in an endangered grassland. *African Range and Forage Science* (In press).

Erasmus, A., Van As, J.G. & Butler, H.J.B. 2010. Fish eye flukes: Not large but possibly in charge? *Journal of the South African Veterinary Association* 81(3): 179.

Groenewald, H., Basson, L. & Van As, J.G. 2010. Mobiline peritrich transmission between fish and tadpoles. *Journal of the South African Veterinary Association* 81(3): 181.

Haddad, C.R. 2010. A new species of *Poachelas* from Maputaland, South Africa (Araneae: Corinnidae), with considerable range extension for *Poachelas striatus. African Invertebrates* 51(2): 313–319.

Haddad, C.R. & Bosselaers, J. 2010. A revision of the genus *Medmassa* Simon, 1887 (Araneae: Corinnidae) in the Afrotropical Region. *Zootaxa* 2361: 1-12.

Haddad, C.R. & Russell-Smith, A. 2010. A comparison of spider diversity patterns in the Mkomazi Game Reserve, Tanzania and the Ndumo Game Reserve, South Africa (Arachnida: Araneae). African Journal of Ecology 48(2): 418-427.

Haddad, C.R., Honiball, A.S., Dippenaar-Schoeman, A.S., Slotow, R. & Van Rensburg, B.J. 2010. Spiders (Arachnida: Araneae) as indicators of elephant-induced habitat changes in the Maputaland Centre of Endemism, South Africa. African Journal of Ecology 48(2): 446-460.

Louw, S.vdM. 2010. Book review: Ecology of insects - Concepts and applications by M.R. Speight, M.D. Hunter & A.D. Watt (2nd edition). African Entomology 18(1): 215-217.

Lyle, R. & Haddad, C.R. 2010. A revision of the tracheline sac spider genus *Cetonana* Strand, 1929 in the Afrotropical region, with descriptions of two new genera (Araneae: Corinnidae). *African Invertebrates* 51(2): 321-384.

Miller, J.A., Carmichael, A., Ramirez, M.J., Haddad, C.R., Řezáč, M., Johannesen, J., Kral, J., Wang, X.P., Spagna, J.C. & Griswold, C.E. 2010. Phylogeny of entelegyne spiders: Affinities of the family Penestomidae (NEW RANK), generic phylogeny of Eresidae, and asymmetric rates of change in spinning organ evolution (Araneae, Araneoidea, Entelegynae). *Molecular Phylogenetics and Evolution* 55(3): 786-804.

Miller, J.A., Griswold, C.E. & Haddad, C.R. 2010. Taxonomic revision of the spider family Penestomidae (Araneae, Entelegynae). *Zootaxa* 2534: 1–36.

Möller, J-H., Van As, J.G. & Van As, L.L. 2010. Siamese monogeneans of southern Africa. *Journal of the South African Veterinary Association* 81(3): 182.

Peters, H., Van As, L.L. & Basson, L. 2010. Binary fission, teletroch formation and conjugation in *Mantoscyphidia* Jankowski, 1980 (Ciliophora: Peritrichia). *Acta Protozoologica* 49(1): 61-74.

Pretorius, R.J., Louw, S.vdM. & Venter, P. 2010. New record of Aphididae (Hemiptera) and Coccinellidae (Coleoptera) species associated with shadehouse-cultivated lettuce on a South African Highveld farm. *African Entomology* 18(2): 365-368.

Reed, C.C., Basson, L. & Van As, L.L. 2010. New myxosporeans (Myxozoa: Bivalvulida) from the Okavango Delta, Botswana. Bulletin of European Association of Fish Pathology 30: 137-145.

Scholtz, A.J., Cloete, S.W.P., Van Wyk, J.B., Kruger, A.C.M., Van der Linde, T.C.deK. 2010. The influence of divergent selection for reproduction on the occurrence of breech strike in mature Merino ewes. *Animal Production Sci*-

ence 50(3): 210-218.

Scholtz, A.J., Cloete, S.W.P., Van Wyk, J.B., Misztal, I., Du Toit, E., Van der Linde, T.C.deK. 2010. Genetic (co) variances between wrinkle score and absence of breech strike in mulesed and unmulesed Merino sheep, using a threshold model. *Animal Production Science* 50(3): 203–209.

Scholtz, A.J., Cloete,S.W.P., Van Wyk, J.H. & Van der Linde, T.C.deK. 2010. The assessment of crystals derived from Aloe spp for potential use as a herbal anthelmintic thereby indirectly controlling blowfly strike. South African Journal of Animal Science 40(5): 476-479.

Van As, J.G. 2010. Charles Darwin 200 and Symbiosis. *Journal of the South African Veterinary Association* 81(3): 178.

Van As, L.L. & Basson, L. 2010. Mobiline peritrichs found on African limpets. *Journal of the South African Veterinary Association* 81(3): 184.

Reports

Swart, V.R. & Van der Westhuizen, M.C. 2010. The situation analysis of the maize stem borer (Busseola fusca, Lepidoptera: Noctuidae) on Bt maize at Erwee Boerdery, Hertzogville. Report to Mr. Marius Erwee, Hertzogville, South Africa.

Van der Linde, T.C.deK., Viljoen, T. & Allemann, E. 2010. Seven forensic entomological reports for the South African Police Services. (Unpublished and confidential).

Conference contributions

Forman, M., Kral, J. & Haddad, C.R. 2010. The cytogenetic approach reveals speciation events in social spiders Stegodyphus (Araneae: Eresidae). Poster presented at the 18th International Congress of Arachnology, Siedlce, Poland. 11-17 July.

Grobbelaar, A., Van As, L.L. & Butler, H.J.B. 2010. Behavioural influences of eye flukes (Diplostomidae) on fish hosts. Paper delivered at the 39th Annual Conference of the Parasitological Society of Southern Africa (PARSA2010), ATKV Drakensville, Drakensberg, South Africa. 10–13 October.

Groenewald, H., Basson, L. & Van As, J.G. 2010. Delicate versus robust: a comparative study on Trichodina heterodentata found on fish and tadpoles in southern Africa. Paper delivered at the 39th Annual Conference of the Parasitological Society of Southern Africa (PARSA2010), ATKV Drakensville, Drakensberg, South Africa. 10-13 October.

Haddad, C.R. 2010. Revisions of the cryptic Castianeirinae (Araneae: Corinnidae) of the Afrotropical region: Exceptional species diversity, unusual biogeographical patterns and evolutionary novelties. Paper delivered at the 18th International Congress of Arachnology, Siedlce, Poland. 11-17 July. Jansen van Rensburg, C., Decraemer, W., Swart, A., Bert, W. & Durand, F. 2010. *Nematodes from the Bakwena Cave in Irene, South Africa*. Paper delivered at the Annual Congress of the Biological Sciences Division of the South African Academy for Science and Art, ARC-Plant Protection Research Institute, Roodeplaat, Pretoria, South Africa. 1 October.

Korinkova, T., Kral, J., Pekar, S. & Haddad, C.R. 2010. Cytogenetic data do not support a close relationship between the families Mimetidae and Palpimanidae (Araneae: Araneomorphae). Paper delivered at the 18th International Congress of Arachnology, Siedlce, Poland. 11-17 July.

Kral, J., Dulikova, L., Korinkova, T., Musilova, J., Vitkova, M., Hedin, M., Henriques, S.S. & Haddad, C.R. 2010. Evolution of the karyotype and sex chromosome systems in mesothelid and mygalomorph spiders. Paper delivered at the 18th International Congress of Arachnology, Siedlce, Poland. 11-17 July.

Kral, J., Pastuchova, M., Musilova, J., Korinkova, T., Rezac, M., Vitkova, M., Huber, B.A. & Haddad, C.R. 2010. Evolution of holocentric chromosomes and X1X2Y system: Two karyotype traits found in basal clades of araneomorph spiders (Araneae: Araneomorphae). Paper delivered at the 18th International Congress of Arachnology, Siedlce, Poland. 11-17 July.

Louw, S.vdM. 2010. More is better: The essence of biodiversity. Introductory lecture delivered at the 2010 International Year of Biodiversity Lecture Series, National Museum, Bloemfontein, South Africa. 11 March. Louw, S.vdM. 2010. The importance of biodiversity. Paper delivered at the GroenKern Environmental Biodiversity Expo, Oliewenhuis Art Museum, Bloemfontein, South Africa. 22 May.

Louw, S.vdM. 2010. What is biodiversity? Invited lecture delivered at the South African Retired Persons Association, Bloemfontein, South Africa. 26 May.

Louw, S.vdM., Du Preez, R. & Van

Rensburg, W. 2010. Endogeic arthropods in soils and composts from selected sites in central South Africa. Paper delivered at the UFS Strategic Academic Cluster 4 Annual Seminar, University of the Free State, Bloemfontein, South Africa. 16 November.

Louw, S.vdM., Poller, R.G. & Irish, J. 2010. Using insects to evaluate the biogeographic status of isolated dune patches in southern Namibia. Proceedings of the 2nd Arid Zone Ecology Forum: Change and stasis in the Arid Zone, Gariep Dam, South Africa. 4-7 October. pp. 16-17. Möller, J-H. & Van As, J.G. 2010. A comparative study between the diplozoids (Monogenea, Diplozoinae) of southern Africa. Paper delivered at the 39th Annual Conference of the Parasitological Society of Southern Africa (PARSA2010), ATKV Drakensville, Drakensberg, South Africa. 10-13 October.

Swart, V.R. 2010. Insect - fungal ecology of nut crops in semi-arid regions of South Africa. Invited lecture delivered at the International Soil Health Workshop hosted by the University of the Free State Strategic Research Cluster 4: Technologies for Sustainable Crop Industries in Semi-arid Regions, University of the Free State, Bloemfontein, South Africa. 25 November.

Van As, J.G. 2010. *Charles Darwin 200 and symbiosis.* Keynote address delivered at the 39th Annual Conference of the Parasitological Society of Southern Africa (PARSA2010), ATKV Drakensville, Drakensberg, South Africa. 10–13 October. Van As, L.L. & Van As, J.G. 2010. A symbiotic copepod collected from the blue coral worm Pomatoleios kraussii (Polychaeta). Paper delivered at the 39th Annual Conference of the Parasitological Society of Southern Africa (PARSA2010), ATKV Drakensville, Drakensberg, South Africa. 10-13 October.

Van Dalen E.M.S.P. 2010. Pesticide resistance: Be green of be damned. Paper delivered at the GroenKern Environmental Biodiversity Expo, Oliewenhuis Art Museum, Bloemfontein, South Africa. 22 May.

Contact details

Prof. Jo van As

Faculty of Natural and Agricultural Sciences Department of Zoology and Entomology University of the Free State PO Box 339 Bloemfontein South Africa 9300

 Telephone:
 +27 (0)51 401 2427

 Fax:
 +27 (0)51 444 5943

 E-mail:
 vanasjg@ufs.ac.za

 Website:
 www.ufs.ac.za

Academic staff

MAIN CAMPUS

Professors:

Profs. Jo van As, Linda Basson, Schalk Louw, Theuns van der Linde, Liesl van As

Extraordinary Professors: Profs. Leon Fourie, Gerhard Prinsloc

Lecturers:

Dr Candice Jansen van Rensburg, Messrs Hennie Butler, Charles Haddad, Ms Ellie van Dalen

Junior Lecturers: Ms Lindie Heyns, Mr Vaughn Swart

Affiliate Researchers:

Profs. Dawie Kok, Ivan Horak, Jacob den Heyer, Dr Jennifer Botha Brink, Mr Johan van Niekerk, Mr Ashley Kirk-Spriggs

QWAQWA CAMPUS

Subject Head and Senior Lecturer: Dr Oriel Thekisoe

Lecturers:

Dr Michael Cunningham, Messrs Johann van As, Emille Bredenhand, Ms Hafeleni Matete

CENTRES

"Our student numbers have grown to such an extent that we have to reduce the student intake from 2011 on wards. This is required in order to place more emphasis on research in line with the strategic direction of the University of the Free State."

Mr Andries Jordaan

19 Disaster Management Training and Education Centre for Africa (DiMTEC)

Overview

DiMTEC's Master's Degree in Disaster Management remains very popular. Students from all over Africa are being trained by the DiMTEC winning team. Our course structure makes it possible for professionals in the work environment to complete the course in two years. DiMTEC is proud of its achievement over the past ten years. Our student numbers have grown constantly over this period.



Our student numbers have grown to such an extent that we have to reduce the student intake from 2011 onwards. This is required in order to place more emphasis on research in line with the strategic direction of the University of the Free State (UFS).



DiMTEC accommodates a very diverse group of students from various occupations and from many different countries, including:

Disaster Management Officer for the City of Tshwane, Humanitarian Affairs Officer of the United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA) in The Sudan, Food Aid Management Project Officer for World Vision International in The Sudan, Finance and Administration Officer at the Reserve Bank of Zimbabwe, Immunisation Officer for the United Nations Children's Fund (UNICEF) in Mozambique, Fire Prevention Officer at the Eskom Koeberg Nuclear Power Station, Hospitality Service Officer for the South African National Defence Force (SANDF), Emergency Country Officer for UNICEF in South Africa, teachers and attorneys.

Countries being represented here include South Africa, Congo Brazzaville, Zimbabwe, Zambia, Cameroon, Lesotho, Swaziland, Kenya, The Sudan, Mozambique, etc. This underlines the fact that the training provided by DiMTEC cuts across occupations and can be applied everywhere.

Vision

Our vision is to be an internationally recognised Centre of Excellence in Disaster Management training, education and research in Africa.

Mission

To develop professionals in Disaster Management in order for them to contribute actively to disaster risk reduction efforts as constituted in the United Nations' Hyogo Declaration of January 2005.

Main Objective

To provide training to postgraduate students and to undertake research in Disaster Management in order to contribute actively to the disaster risk-reduction efforts as constituted in the United Nations' Hyogo Declaration of January 2005.

Activities and achievements

The 4th International United Nations Educational, Scientific and Cultural Organization (UNESCO) Conference on



Staff members of DiMTEC attended the 4th International UNESCO Conference on Geoparks 2010 that was held at the Langkawi Global Geopark in Malaysia from 12–15 April 2010.

Geoparks 2010 was held at the Langkawi Global Geopark in Malaysia from 12–15 April 2010. Langkawi is Southeast Asia's very first global geopark, comprising 99 islands and possessing the region's oldest rocks and the most complete Palaeozoic geological history.

Mr Andries Jordaan presented a paper at the conference with the title *Geoparks as a tool for sustainable development in rural South Africa: The case of Ukhahlamba.* The conference motivated him to submit a proposal to have the Ukhahlamba Drakensberg Park declared as the first geopark in Africa. There is currently only 56 geoparks in the world.

The UNESCO Global Geopark initiative is concentrating its efforts on the protection and promotion of geological sites. The last decade has seen an increasing role played by geosciences in supporting sustainable development at local and global level. Today, this role is becoming increasingly important as issues related to holistic environmental sustainability, climate change and natural hazard are even more frequently debated.

Mr Andries Jordaan was invited as a specialist on the challenges and opportunities in Africa to the 1^{st}



Mr Andries Jordaan at the 1st International Scoping Workshop on the establishment of the UNU-FLORES that was held in Dresden, Germany, from 11–12 November 2010.





International Scoping Workshop on the establishment of the United Nations University Institute for Integrated Management of Material Fluxes and Resources (UNU-FLORES) that was held in Dresden, Germany, from 11–12 November 2010. The workshop addressed specific issues and questions concerning the establishment of UNU-FLORES and its envisaged twin institute for Africa in Mozambique.

UNU-FLORES is dedicated to research, postgraduate education and training of professionals. This will contribute to integrated management and capacity development for material flow and resource management, dealing first and foremost with the environment resources soil, water and waste with the perspective to address other geo- and energy resource flows as the institute develops. The institute will be closely working with the Dresden University of Technology and other Dresden- and Saxony-based relevant research institutions.

The UN-SPIDER Regional Workshop with the theme Building upon Regional Space-based Solutions for Disaster Management and Emergency Response for Africa was hosted in Addis Ababa, Ethiopia, from 6-9 July 2010. Here Mr Jordaan delivered an invited presentation entitled Education and training in disaster risk reduction.

The 7th African Development Forum was held in Addis Ababa, Ethiopia from 10-15 October 2010 with the theme Acting on Climate Change for Sustainable Development in Africa. Mr Jordaan was a member of a number of working groups discussing the theme. Mr Jordaan and Mr Kobus de Jager (Vice-President of Agri-SA) visited farms in Ethiopia and inspected the agriculture in the district for more insight on their agricultural farms.

Mss Alice Ncube and Olivia Kunguma attended a short course with the title *Gender Mainstreaming and Gender Responsive Budgeting in Integrated Water Resources Management (IWRM)* in Dar es Salaam, Tanzania from 21–25 June 2010.

The course was organised by the University of Dar es Salaam with support from WaterNet, CapNet and the Gender and Water Alliance. The course was used to build teams of experts that can support the growing demand



Mss Alice Ncube and Olivia Kunguma attended a short course with the title *Gender Mainstreaming and Gender Responsive Budgeting in Integrated Water Resources Management (IWRM)* in Dar es Salaam, Tanzania, from 21–25 June 2010.



from national partners for capacity building in Gender Mainstreaming and Gender Responsive Budgeting in the context of Integrated Water Resources Management.

DiMTEC presented the following short courses during 2010:

- Sphere Course at the UFS from 1–3 February 2010
- Geographical Information System (GIS) Course at the UFS from 8–12 March 2010
- Introduction to Disaster Management Course at the UFS from 23–25 March 2010
- Introduction to Disaster Management Course in Kuruman on 2 September 2010

For information on short courses, contact Ms Ncube at +27 (0)51 401 2721.

National and international collaboration

The UFS was the first university in Africa to sign a Memorandum of Understanding (MOU) with the United Nations University (UNU). The MOU between DiMTEC and the UNU Institute for Environment and Human Security (UNU-EHS) was signed on 25 September 2009. This MOU opened doors for both parties and we are working hand-in-hand on various projects, courses and forming linkages at conferences.

DIMTEC hosted the fourth Ph.D. Block Course in partnership with the UNU at the UFS from 26 May until

A student receiving a certificate from Mr Andries Jordaan after successfully completing one of the short courses presented by DiMTEC during 2010.

2 June 2010. The course with the theme *Vulnerability and Disaster Management* is a short course for Ph.D. candidates starting their Ph.D. studies. The focus of the course is on social, environmental and economical vulnerability, global warming and early warning systems. 16 participants from different countries like Cameroon, Kenya, Nigeria, South Africa, Zambia and Zimbabwe attended the course.



Left: Students in action during the Ph.D. Block Course on hosted by DiMTEC, in partnership with the UNU at the UFS, from 26 May until 2 June 2010.

Right: Ms Kehinde Balogun receiving a certificate from Prof. Jonathan Jansen after successfully completing the short course on *Vulnerability and Disaster Management*.

The fifth course was presented by the University of Novi Sad in Serbia. The course took place from 20-29 September 2010. Two of our DiMTEC staff members, Mr AD Jordaan and Ms Kehinde Balogun attended this course. Apart from the universities already mentioned, the course is also presented at the UNU in Germany to accommodate students from different regions.
217

Disaster Management Training and Education Centre for Africa (DiMTEC)

Reports

Jordaan, A.J. 2010. Disaster risk assessment for Northern Cape Province (Drought, flood, groundwater, animal diseases, plant diseases, extreme weather events). Report to the Northern Cape Province, South Africa.

Jordaan, A.J. 2010. Environmental management framework and strategic environmental management. Report to the Pixley ka Seme Local Municipality, South Africa.

Jordaan, A.J. & Jordaan, A.D. 2010. Environmental management framework and strategic environmental management. Plan for the Pixley Ka Seme Local Municipality Agricultural Specialist Study. Report to the Northern Cape, South Africa.

Jordaan, A.J. & Van Niekerk, W. 2010. Socio economic impact assessment of irrigation farming. Report to the Paul Steyn Boerdery (Pty) Ltd, Eastern Free State, South Africa.

Jordaan, A.J., Luttig, P.G., Sissons, D. & Jordaan, A.D. 2010. *Agricultural sector plan*. Report to the Joe Gqabi District Municipality, Barkley East, Eastern Cape Province, South Africa.

Conference contributions

Jordaan, A.J. 2010. Education and training in disaster risk reduction. Paper delivered at the United Nations SPIDER African Regional Workshop: Building upon Regional Space-Based Solutions for Disaster Management and Emergency Response for Africa, Addis Ababa, Ethiopia. 13–16 September.

Jordaan, A.J. 2010. The Agricultural Extensions Officer and drought risk reduction. Paper delivered at the Free State Conference for Agricultural Extensions Officers, Free State Department Agriculture, Thaba Nchu, South Africa. 13-16 September.

Jordaan, A.J. 2010. Geoparks as a tool for sustainable development in rural South Africa: The case of Ukhahlamba. Paper delivered at the 4th International UNESCO Conference on Geoparks 2010, Langkawi Geopark, Langkawi, Malaysia. 9-15 April.

Jordaan, A.J. 2010. The use of new technology in Agricultural Extensions. Paper delivered at the Free State Conference for Agricultural Extensions Officers, Free State Department Agriculture, Thaba Nchu, South Africa. 13-16 September.

Jordaan, A.J. & Eckhardt, C. 2010. The global geopark concept: Tool for enhancement of sustainable land use and community resilience in rural areas of South Africa. Paper delivered at the 4th International UNESCO Conference on Geoparks 2010, Langkawi, Malaysia. 9–16 April.

Academic staff

Director: Mr Andries Jordaan

Research Assistant: Ms Kehinde Balogun

Lecturer and Short Course Coordinator: Ms Alice Ncube

Master's Course Coordinator: Ms Olivia Kunguma Our new slogan

... because we can

Contact details

Mrs Annelene Schröder

Faculty of Natural and Agricultural Sciences Disaster Management Training and Education Centre for Africa (DiMTEC) University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone: Fax: E-mail: Website: +27 (0)51 401 2721 +27 (0)51 401 9336 dimtec@ufs.ac.za www.ufs.ac.za/dimtec "Graduates are in demand by large companies, government and nature conservation bodies."

Prof. Maitland Seaman

20 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 interlinked components, namely the Master's and Doctoral programmes, short courses and a research and contract component.

The Master's programme developed gradually and strongly around Sustainable Development, Project Management, Environmental Assessment and Environmental Management Systems. A number of special skills and disciplines are woven into the programme.

38 students from 110 applicants were enrolled for the Master's programme in 2010. The intake increases in diversity every year. In 2010, about 30% of the students were from the Southern African Development Community (SADC) and a few were from the rest of Africa, making this a truly continental programme. The programme stretches across 37 full days of contact time at the Main Campus of the University of the Free State (UFS) in Bloemfontein, consisting of one session per semester.

The programme is an integrated one. As the environment presents a very wide field of study, there is a perceived need to produce graduates with a healthy overview of the South African environment. Graduates are in demand by



large companies, government and nature conservation bodies.

The centre is an established centre of expertise in Aquatic Ecology that 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 aspect of the centre's work. The BloemWater Chair in Water Environmental Management came into being on 1 July 2003 and Prof. Maitland Seaman, Director of the centre, is also the incumbent of the BloemWater Chair in Water Environmental Management.

A number of interesting trends have developed over the past few years as far as environmental management is concerned. Circumstances have changed. There is the growing importance of water; conservation is no longer the domain of environmentalists; environmental assessment has become more sophisticated; environmental management systems are required in even the smallest of businesses; sustainability science has become established as a discipline in its own right; and Africa needs to move beyond irrational exploitation towards cultural maturity in respect of the environment.

Approximately 50 lecturers are involved in the programme, half of whom are contracted from the government and the private sector for their specific competencies.

In 2010, four students were registered for their Ph.D. degrees. During the April 2010 graduation ceremony, Mr Ian Johnson received the BloemWater Prize for the Best Master's Student in Environmental Management for 2009 and 21 students graduated in 2010.

Activities and achievements

Dr Anthony Turton, Affiliate Professor at the Centre for Environmental Management, has been named *SAB Environmentalist of the Year* and received the Nick Steele Memorial Award for his inspiring work. The award is given in honour of the late legendary game ranger, Nick Steele, an environmentalist who has promoted the cause of conservation and whose work will leave a legacy for many years to come.

Staff involvement in projects and conferences in 2010:

Prof. Maitland Seaman, Ms Marie Watson, Mr Frank Sokolic and Mr Falko Buschke were involved in two specialist assessments that were carried out as part of an environmental impact assessment for a proposed mining extension near Kathu in the Northern Cape Province. They were also involved in a bio-monitoring proposal for Synergistics Environmental Services for the development of an Invertebrate Monitoring Protocol for Kolomela Mine, Northern Cape. Mr Falko Buschke is involved in the monitoring of the Loch Logan urban impoundment in Bloemfontein with regard to physical, chemical and biological elements of water quality. The study includes the regular assessment of water quality and depth profiles for temperature and oxygen levels in order to determine the vertical stratification (and therefore the mixing) of water, as well as the effect of this on algal blooms.

Dr Limpho Letsela's postdoctoral research formed part of the baseline assessment contract that was awarded to the Centre for Environmental Management by the Millennium Challenge Account (MCA). The contract forms part of the Wetlands Restoration and Conservation Project (WRCP) of the Department of Water Affairs in the Ministry of Natural Resources of Lesotho. The WRCP counts among the vital interventions being implemented as part of the Millennium Challenge Account-Lesotho (MCA-L) in order to enhance poverty reduction through economic growth within the Lesotho Water Sector. The MCA-L has been established under the auspices of the Millennium Challenge Corporation (MCC), an institution administering the assistance from the Government of the United States to the Government of Lesotho on a variety of developmental interventions. A team of UFS researchers and researchers in Lesotho took part in this study.

Prof. Seaman and Ms Marinda Avenant were part of the organising committee of the 2nd Arid Zone Ecology Forum (AZEF) annual meeting that took place at the Gariep Dam during October 2010.

Here, Dr Daan Toerien and Ms Marthie Kemp made oral presentations.

Prof. Seaman delivered the keynote addresses at the Wetlands Indaba held in Kimberley, South Africa from 26-29 October 2010 and at the 2^{nd} AZEF annual

CENTRES | ENVIRONMENTAL MANAGEMEN

221

meeting mentioned above. He also presented a paper at the Free State Provincial Government Waste Summit in Bloemfontein on the *Provincial State of Readiness in Waste Management, Pollution Control and Climate Change* in February 2010.

Ms Marthie Kemp attended the course, Integrated Land Management towards Sustainable Land Use: Rehabilitation and Monitoring, at the Centre for Environmental Management at the North-West University. The programme included a practical session where participants had a chance to apply Landscape Function Analysis (LFA) practically on a rehabilitated mining site.

Ms Marinda Avenant attended the International Symposium on Flood Pulsed Wetlands in Maun, Botswana, during February 2010 and delivered a paper on Southern African non-perennial rivers: Proposing a new prototype methodology for assessing environmental water requirements.

Mss Marinda Avenant, Marthie Kemp, Messrs Frank Sokolic and Falko Buschke delivered papers at the 45th Annual Congress of the Grassland Society of Southern Africa held in Kimberly, South Africa, from 19–23 July 2010.

Dr Anthony Turton presented a paper on *The sustainability approach: Managing water as a flux* at the Sustainable Water Resource Conference and Exhibition in Pretoria during July 2010.

Ms Tascha Vos did an oral presentation on *The impact* of water quality on informally declared heritage sites: A preliminary study at the 1st Regional Conference of the Southern African Young Water Professionals (YWP) in Pretoria from 19–20 January 2010.





Mr Falko Buschke busy with flow measurements at the Mokolo River.

National and international collaboration

The centre has a cooperative agreement with the Katholieke Universiteit of Leuven in Belgium to conduct research on temporary water ecology. As a result of this cooperation, a Ph.D. student, Mr Bram Vanschoenwinkel from Leuven, and a number of graduate students have spent time working at the centre on studies initiated by the centre in 2009.

The centre is developing a methodology to assess the environmental water requirements of non-perennial rivers. The project is funded by the Water Research Commission (WRC) and consists of three phases of which the first two have been completed. The project has now reached its third phase (WRC K5/1798). It is a continuation of the first WRC K5/1414 project that focused on developing a communication strategy for the project, identifying knowledge gaps in understanding non-perennial rivers, as well as conducting an evaluation

of desktop rapid-reserve determinations for the Kuiseb, Limpopo and Nile Rivers.

Following that, the WRC K5/1587 project dealt mainly with developing a prototype methodology for determining environmental water requirements for non-perennial rivers. The methodology was then tested on the Seekoei River in the Northern Cape. The outcomes of the trial were promising in that the project team was able to gather a deeper understanding of non-perennial rivers and was able to identify challenges. This contributed to the progress of the project, particularly to the further testing of the method.

The third part of the project (WRC K5/1798) is now in progress with its aim to test the prototype methodology in a range of non-perennial rivers for general applicability. Given that considerable hydrological data exists for the Mokolo River, it was decided to start the trial there. Accordingly, in preparation for site selection, a GIS-based catchment delineation study, a macro-reach analysis, as well as a habitat integrity assessment were carried out for the river. After the team (consisting of 16 members from the UFS, Rhodes University and private consultants) had identified the sampling sites, as well as what and how to sample during a workshop in March 2010, the first



field sampling on the Mokolo catchment was conducted between 26 April and 2 May 2010.

The specialists collected samples of soil, vegetation, groundwater, channel geomorphology, water quality, macro-invertebrates and fish. Consultations with stakeholders near sampling sites, mostly farmers, were also carried out. This was in addition to the socioeconomic analysis component of the project that was carried out in May 2010. This research has been interdisciplinary, with a range of experts from the field, providing a major input into each stage of the process. Important contributions in this regard have come from team members at Rhodes University, the University of Cape Town, the Council for Scientific and Industrial Research (CSIR) and the UFS.

Crucial to the success of the project is the capacity building of local experts at the university. Experts from various departments are involved in the third phase of the project, namely Dr Ingrid Dennis (Institute for Groundwater Studies), Dr Piet le Roux, Prof. Leon van Rensburg and Mr Johan van Tol (all from the Department of Soil, Crop and Climate Sciences), Dr Charles Barker (Department of Geography), Prof. Johann du Preez (Department of Plant Sciences), Ms Nola Redelinghuys (Department of Sociology) and several experts from the centre, namely Ms Marinda Avenant, Mrs Mahlet Bekele, Ms Marthie Kemp, Ms Linda Rossouw, Prof. Maitland Seaman, Mr Frank Sokolic, Ms Tascha Vos and Ms Marie Watson.

The centre also continued its long-term bio-monitoring of the Modder River and associated rivers, including its

Ms Marie Watson introducing the South African Scoring System (SASS) to school children at Upington.

tributaries, as well as the Riet- and Caledon Rivers, for BloemWater for the 11th consecutive year. This is probably the most comprehensive and thorough bio-monitoring study of rivers in the country and has provided a firm base for further research and management.

Staff members, Mss Marie Watson, Marinda Avenant, Marthie Kemp and Mr Falko Buschke from the Centre for Environmental Management were appointed to undertake a once-off baseline monitoring of the aquatic ecosystem health in the Lower Orange River as part of the Orange-Senqu River basin survey. This project falls under the Orange-Senqu River Commission (ORASECOM) and is essentially funded by the European Union (EU).

As the ORASECOM agreement is between Lesotho, Namibia, Botswana and South Africa, public relations events linked to the sampling programme were held in Upington and Rosh Pinah to inform the delegates from



Ms Tascha Vos in the laboratory doing phosphate analysis for the National Heritage Council (NHC) Project.



Ms Marinda Avenant (right) and Mr Falko Buschke (left) with a cameraman (middle) catching fish for identification at Sendelingsdrift, Orange River, for the ORASECOM Survey.

these countries about the programme. Representatives of the member states, the press, school children and the general public were present at these events. The sites were surveyed for fish and macro-invertebrates during the events and questions from school children and delegates who attended were answered.

The National Heritage Council (NHC) project is a multidisciplinary project funded by the NHC regarding heritage resources at sacred sites in the Free State. The project ran from 2008 until December 2010, when the project report was officially published. The project was specifically concerned with the documenting of oral histories associated with particular sacred sites in the Eastern Free State, as well as the cultural use of clay at these sites. Ms Stephanie Cawood from the Centre for Africa Studies was the project leader, while numerous UFS departments, colleagues and postgraduate students contributed. Ms Tascha Vos from the Centre for Environmental Management collaborated on aspects relating to water quality and its impact on the sacred sites.

The Centre for Environmental Management, in conjunction with Chris Swartz Engineering, presented a short course in Water Process Control. The short course was presented three times in 2010 and was attended mostly by employees of BloemWater and various municipalities in the Free State region. The purpose of the course was to convey knowledge to the delegates about water treatment, the operation of water treatment processes and water quality aspects of drinking water. The delegates visited Rustfontein Dam and received practical training.

Community service

The Centre for Environmental Management serves the environmental community and the general public with numerous workshops each year. All the students are employed in Environmental Management positions, thus ensuring direct contact with the community and its needs.

researchOUTPUTS Environmental Management

Besearch articles

Avenant. M.F. 2010. Challenges in using fish communities for assessing the ecological integrity of nonperennial rivers. Water SA 36(4): 397-406.

Buschke, F., Watson, M. & Seaman, M.T. 2010. The partitioning of macroinvertebrate diversity across multiple spatial scales in the upper Modder River System, South Africa. African Journal of Ecology 49: 81-90.

Curnoe, D. & Brink, J.S. 2010. Palaeopathology of the Florisbad Cranium. Journal of Human Evolution 59(5): 504-513.

Dollar, E.S.J., Nicolson, C.R., Brown, C.A., Turpie, J.K., Joubert, A.R., Turton, A.R., Grobler, D.F., Pienaar, H.H., Ewart-Smith, J. & Manyaka, S.M. 2010. Development of South African Water Resource Classification System (WRCS): A tool towards the sustainable, equitable and efficient use of water resources in a developing country. Water Policy 12: 479-499.

Fernandes-Jalvo, Y., Scott, L., Carrion, J.S., Gil-Romera, G., Brink, J.S., Neumann, F. & Rossouw, L. 2010. Pollen taphonomy of hyaena coprolites: An experimental approach. Zona Arqueologica 13: 148-156.

Letsela, L., Pelser, A. & Seaman, M.T. 2010. A participatory Sustainability Assessment process for biodiversity conservation in Lesotho. Journal of Environmental Assessment Policy and Management 12(2): 107-129.

O'Connor, T.G., Kuyler, P., Kirkman, K.P. & Corcoran, B. 2010. Which grazing management practices are

most appropriate for maintaining biodiversity in South African Grassland? African Journal of Range and Forage Science 27(2): 67-76.

Toerien, D.F. & Seaman, M.T. 2010. The enterprise ecology of towns in the Karoo, South Africa. South African Journal of Science 106(5/6): 24-33.

Vanschoenwinkel, B., Seaman, M.T. & Brendonck, L. 2010. Hatching phenology, life history and egg bank size of fairy shrimp Branchipodopsis spp. (Branchiopoda, Crustacea) in relation to the ephemerality of their rock pool habitat. Aquatic Ecology 44(4): 771-780.

Vanschoenwinkel, B., Waterkeyn, A., Jocque, M., Boven, L., Seaman, M.T. & Brendonck, L. 2010. Species sorting in space and time - the impact of disturbance regime on community assembly in temporary pool metacommunity. Journal of the North American Benthological Society 29(4): 1267-1278.

Vos, A.T. & Cawood, S. 2010. The impact of water quality on informally declared heritage sites: a preliminary study. Water SA 36(2): 185-192.

Book

Turton, A. 2010. The politics of water and mining in South Africa. In: The politics of water: A survey. Edited by K. Wegerich & J. Warner. Printed and bound in Great Britain by MPG Books Ltd: Routledge Taylor and Francis Group. pp. 142-160.

Reports

Buschke, F., Seaman, M.T. & Watson,

M. 2010. Invertebrate diversity survey of the proposed mine extension site. Lyleveld (545) south farm (Kathu, Northern Cape). Report to AGES Environmental Consultants by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa.

Buschke, F., Sokolic, F. & Seaman, M.T. 2010. Wetland delineation of the proposed mine extension site, Lyleveld (545) south farm (Kathu, Northern Cape). Report to AGES Environmental Consultants by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa.

Buschke, F.T., Sokolic, F. & Seaman, M.T. 2010. An invertebrate diversity monitorina protocol for Kolomela Mine Property. Biomonitoring Protocol proposal for Synergistics Environmental Services by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa.

Buschke, F.T., Van Tol, J.J. & Seaman, M.T. 2010. Basic ecological survey of Proposed Portion 1 of Erf 4752, Bethlehem, Free State. Report for Spatial Solutions Inc. Town Planners and Environmental Consultants by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa.

Cawood, S. & Vos, A.T. 2010. Section 2: Site descriptions. In: NHC Project Report – Oral histories and the cultural uses of clay at sacred sites in the Free State, edited by S. Cawood. Centre for

225

226

Africa Studies, University of the Free State, Bloemfontein, South Africa.

Cawood, S., Vos, A.T. & Fwero, P. 2010. Section 10: Risks and Challenges. In: *NHC Project Report – Oral histories and the cultural uses of clay at sacred sites in the Free State*, edited by S. Cawood. Centre for Africa Studies, University of the Free State, Bloemfontein, South Africa.

Centre for Environmental

Management. 2010. Integrated Baseline Assessment of the Wetland Catchments/Watersheds Khalong-La-Lithunya, Koti-Sephola and Lets'eng-La-Letsie Areas: Biophysical characterization final task report, edited by L. Letsela. Report by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa, for the Wetlands Project Implementation Unit, Department of Water Affairs, Millennium Challenge Account, Lesotho.

Centre for Environmental

Management. 2010. Integrated Baseline Assessment of the Wetland Catchments/Watersheds Khalong-La-Lithunya, Koti-Sephola and Lets'eng-La-Letsie Areas: Integrated report, edited by L. Letsela. Report by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa, for the Wetlands Project Implementation Unit, Department of Water Affairs, Millennium Challenge Account, Lesotho.

Centre for Environmental

Management. 2010. Integrated Baseline Assessment of the Wetland Catchments/Watersheds Khalong-La-Lithunya, Koti-Sephola and Lets'eng-La-Letsie Areas: Socioeconomic characterization final task report, edited by L. Letsela. Report by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa, for the Wetlands Project Implementation Unit, Department of Water Affairs, Millennium Challenge Account, Lesotho.

Seaman, M.T. & Van der Merwe, A.

2010. Facilitation of a proposal for a biodiversity program to operate in tandem with a tourism program at the University of the Free State's Qwa Qwa Branch. Report to the Dean of the Natural and Agricultural Sciences Faculty by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa.

Seaman, M.T., Avenant, M.F., Watson, M., King, J., Armour, J., Barker, C.H., Dollar, E., Du Preez, P.J., Hughes, D., Rossouw, L. & Van Tonder, G. 2010. Developing a method for determining the environmental water requirements for non-perennial systems. WRC Report no. TT 459/10 to the Water Research Commission, Pretoria, South Africa.

Seaman, M.T., Watson, M. & Vos. A.T. 2010. State of the Modder River, First term 2010 – A biomonitoring report. Report to Bloem Water by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa.

Seaman, M.T., Watson, M. & Vos. A.T. 2010. State of the Modder River, Second term 2010 – A biomonitoring report. Report to Bloem Water by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa.

Seaman, M.T., Watson, M. & Vos. A.T. 2010. State of the Modder River, Third term 2010 – A biomonitoring report. Report to Bloem Water by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. Seaman, M.T., Watson, M. & Vos. A.T. 2010. State of the Modder River 2008 to 2010 – A biomonitoring report. Report to Bloem Water by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa.

Seaman, M.T., Watson, M., Avenant, M.F., Barker, C.H., Buschke, F., Dennis, I., Esterhuyse, S., Joubert, A., Kemp, M., King, J., Le Roux, P., Redelinghuys, N., Rossouw, L., Rowntree, K., Sokolic, F., Van der Waal, B., Van Rensburg, L., Van Tol, J. & Vos, A.T. 2010. Deliverable 8: Report on catchment delineation, site selection and fieldwork for the Mokolo *River case study*. Testing a prototype methodology for Environmental Water Assessments in Non-perennial Rivers. Water Research Commission contract K5/1798. Report by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa.

Turton, A. 2010. New thinking on the Governance of Water and River Basins in Africa: Lessons from the SADC Region. Research Report 6 for the Governance of Africa's Resources Programme, The South African Institute of International Affairs, Johannesburg, South Africa.

Watson, M., Avenant, M.F. & Kemp, M. 2010. Specialist (Macroinvertebrate, Habitat Integrity, Fish and Riparian Vegetation) reports for Lower Orange River, Joint Basin Survey (ORASECOM). Report compiled by the Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa, for Koekemoer Aquatic Services, Pretoria, South Africa.

Conference contributions

Avenant, M.F., Seaman, M.T., Armour, J., Barker, C.H., Du Preez, P.J., Hughes, D., King, J.M., Rossouw, L., Van Tonder, G. & Watson, M. 2010. Southern African nonperennial rivers: Proposing a new prototype methodology for assessing environmental water requirements. Paper delivered at the Flood Pulsed Wetlands International Symposium, Harry Oppenheimer Okavango Research Centre, Maun, Botswana. 1-5 February.

Avenant, M.F., Seaman, M.T., Barker, C.H., Dollar, E.S., Du Preez, P.J., Hughes, D.S., King, J.M., Rossouw, L., Van Tonder, G. & Watson, M. 2010. Southern African nonperennial rivers: Proposing a new prototype methodology for assessing environmental water requirements. Oral presentation delivered at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19–23 July.

Avenant, N.L. 2010. Small mammal communities as indicators of biological integrity. Keynote address delivered at the Kimberley Biodiversity Research Symposium, Kimberley, South Africa. 12 October.

Avenant, N.L. 2010. The value of rodent indicators in determining the habitat integrity of South African grasslands. Paper delivered at the 4th International Conference on Rodent Biology and Management (ICRBM 4), Bloemfontein, South Africa. 12-16 April.

Brink, J.S. 2010. Oldowan-Early Acheulean Macro-Fauna from the Basal Layers of Wonderwerk Cave, South Africa: Taxonomy, paleoecology and taphonomy. Paper delivered at the 13th Panafrican Archaeological Association (PAA) for Prehistory and Related Studies Congress, University Cheikh Anta Diop, Dakar, Senegal. 1-6 November.

Brink, J.S. 2010. The evolution of biogeographic distinctiveness in the southern African mammal record. Poster presented at the 13th Panafrican Archaeological Association (PAA) for Prehistory and Related Studies Congress, University Cheikh Anta Diop, Dakar, Senegal. 1–6 November.

Brink, J.S. 2010. The osteology and body plan of Damalacra neanica (Alcelaphini, Bovidae) in an evolutionary context. Poster presented at the Langebaanweg Symposium 2010: Changing landscapes and biotas of the Cape West Coast, West Coast Fossil Park, Cape Town, South Africa. 15-17 November.

Brink, J.S. 2010. The temporal range of the Cornelian Land Mammal Age in southern Africa and its bearing on the age of the Elandsfontein hominine. Paper delivered at the Langebaanweg Symposium 2010: Changing landscapes and biotas of the Cape West Coast, West Coast Fossil Park, Cape Town, South Africa. 15-17 November.

Buschke, F.T. 2010. The South African Grassland Scoring System (SAGraSS); A rapid, insect-based bioassessment index for grassland ecological integrity. Paper delivered at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19-23 July.

Buschke, F.T. & Kemp, M.E. 2010. What drives the intra-annual variation of an invertebrate assemblage in a grassland habitat? Poster presented at the 2nd Arid Zone Ecology Forum (AZEF): Change and stasis in the Arid Zone, Gariep Dam, South Africa. 4-7 October.

Deacon, F., Avenant, N.L. & Barker,

C. 2010. Spatial ecology of damage causing black-backed jackal (Canis mesomelas) in the southern Free State. Poster presented at the Southern African Wildlife Management Association (SAWMA) 40th Anniversary Symposium: Biodiversity Conservation in a Changing World, Buffelspoort, South Africa. 19-22 September.

Hugo-Coetzee, L. & Avenant, N.L. 2010. The effect of fire on soil mites (Acari Oribatida) in South African grasslands. Paper delivered at the XIII International Congress of Acarology, Recife, Brazil. 23-27 August.

Kemp, M.E., Van Rensburg, L. & Sokolic, F. 2010. A methodology to estimate the minimum water requirements for shallow rooted plants in the riparian zone: A case study of the Mokolo River. Paper delivered at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19-23 July.

Kemp, M.E., Van Rensburg, L., Dennis, I. & Le Roux, P.A.L. 2010. A conceptual model for predicting the minimum water requirements for shallow-rooted plants in the riparian zone: A case study of the Mokolo River. Paper delivered at the 2nd Arid Zone Ecology Forum (AZEF): Change and stasis in the Arid Zone, Gariep Dam, South Africa. 4-7 October.

Milne, B. & Kemp, M.E. 2010. Reseeding topsoil-deprived alluvial diamond mines in the Nama Karoo Biome of South Africa. Poster presented at the 2nd Arid Zone Ecology 227

228

Forum (AZEF): Change and stasis in the Arid Zone, Gariep Dam, South Africa. 4-7 October.

Rossouw, L. & Vos, A.T. 2010. The Challenges of interpreting water quality in non-perennial rivers. Paper delivered at the Southern African Society of Aquatic Scientists Conference (SASAqS 2010): Aquatic biodiversity and climate change – an arid region perspective, Augrabies Falls National Park, Zimbabwe. 13-16 June.

Seaman, M.T. 2010. *Climate variability on wetlands of the dry west*. Keynote address delivered at the Wetlands Indaba, Horseshoe Motel, Kimberley, South Africa. 26-29 October.

Seaman, M.T. 2010. Provincial state of readiness in Waste Management Pollution Control and Climate Change. Paper delivered at the Free State Provincial Waste Summit, Bloemfontein, South Africa. 4-5 February. Seaman, M.T. 2010. Water in Arid Regions. Keynote address delivered at the 2nd Arid Zone Ecology Forum (AZEF): Change and stasis in the Arid Zone, Gariep Dam, South Africa. 4-7 October.

Shaw, N., Avenant, N.L. & Butler, H.J.B. 2010. Sampling Rodent community structure in the Central South African Grasslands: Removal vs. non-removal trapping. Poster presented at the 4th International Conference on Rodent Biology and Management (ICRBM 4), Bloemfontein, South Africa. 12-16 April.

Toerien, D. 2010. Prince Albert, a fourth economic bubble or sustainable development? Paper delivered at the 2nd Arid Zone Ecology Forum (AZEF): Change and stasis in the Arid Zone, Gariep Dam, South Africa. 4-7 October.

Turton, A. 2010. The sustainability approach: Managing water as a flux.

Paper delivered at the Sustainable Water Resource Conference and Exhibition, CSIR International Convention Centre, Pretoria, South Africa. 27-28 July.

Vos, A.T. & Cawood, S. 2010. The impact of water quality on informally declared heritage sites: a preliminary study. Paper delivered at the 1st Regional Conference of the Southern African Young Water Professionals (YWP), CSIR International Convention Centre, Pretoria, South Africa. 19-20 January.

Vos, M., Smit, G.N. & Pienaar, F.C. 2010. An assessment to quantify the impacts of Acacia mellifera subsp, dentinens on the natural habitat of Rolfontein Nature Reserve. Paper delivered at the Kimberley Biodiversity Research Symposium, Kimberley, South Africa. 12 October.

Contact details

Prof. Maitland Seaman

Faculty of Natural and Agricultural Sciencere Centre for Environmental Management University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone:	+27 (0)51 401 2863
Fax:	+27 (0)51 401 2629
E-mail:	cem@ufs.ac.za
Website:	www.ufs.ac.za/cem

Academic staff

Director and BloemWater Chair: Prof. Maitland Seaman

Lecturer: Ms Marinda Avenant

Associate Researchers: Drs Ziets Zietsman, James Brink Nico Avenant, Daan Toerien

Affiliate Professor: Dr Anthony Turton

Course Coordinator: Ms Marthie Kemp

Senior Professional Officer: Ms Marie Watson (Macro-Invertebrates

Professional Officers:

Dr Limpho Letsela (Sociology), Ms Surina Esterhuyse (Hydrology), Ms Joan Adendorff (Entomology), Mrs Mahlet Bekele (Biodiversity Conservation), Ms Tascha Vos (Water Quality and Algae), Ms Ansophi van der Merwe (Ecology), Ms Betty Phillips (Finance), Ms Sanet Neethling (Marketing), Ms Donné Kolesky (Administration), Ms Marthie Kemp (Riparian vegetation) and Messrs Frank Sokolic (GIS) and Falko Buschke (Research Ecology)



"The Agricultural Skills Development, Training and Mentorship Programme of the Lengau Agricultural Development Centre underlines the fact that the Faculty of Natural and Agricultural Sciences of the University of the Free State is a faculty deeply engaged in the broader community it serves."

Dr Léan van der Westhuizen

21 Lengau Agricultural Development Centre

Overview

The Agricultural Skills Development, Training and Mentorship Programme of the Lengau Agricultural Development Centre underlines the fact that the Faculty of Natural and Agricultural Sciences of the University of the Free State (UFS) is a faculty deeply engaged in the broader community it serves. It utilises its academic capacity and facilities in order to face the challenges of sustainable agriculture in the region, country and continent.

Human resource development is being realised in all sectors of the economy, but a particular need exists within the agricultural sector, since black farmers had been excluded from participating in mainstream agriculture for many decades. Most prospective black farmers used to engage in subsistence farming on communal land and had limited access to the commercial sector. The development and growth from subsistence to commercial farming are difficult in a highly competitive sector. It requires innovative skills and knowledge and diverse inputs to be successful.

One of the three experimental farms of the UFS is earmarked for agricultural skills development and training of emerging farmers, farm workers and entrepreneurs in agricultural business. The buildings, facilities and a portion of the land of the Sydenham Experimental Farm are being used for animal and crop production and for the



development of alternative, natural and agricultural skills in marketing and value-adding practices.

The UFS, Mangaung Local Municipality, Free State Provincial Department of Agriculture and the National African Farmers Union embraced the programme as partners in agricultural transformation. A Memorandum of Understanding was signed by the mentioned parties in December 2004. The UFS agreed to compile a cooperative agreement for local and provincial governance and funding of the initiative. The facilities at the centre are utilised extensively to address the needs of newly settled and prospective emerging and commercial black farmers. Services range from livestock auctioneering, herd improvement, branding, dehorning, castration, primary herd, ordinary and advanced food gardening. The centre also serves as a centre for education of under- and postgraduates, mentors, farmers and black entrepreneurs in many aspects of livestock, crop farming and agri-business. Almost R6 million was invested by the UFS to upgrade and manage the facility over the past six years.



A Sussex bull sold at the Lengau Agricultural Development Centre auction for more than R600 000.

The centre aims to undertake systematic small-farmer training, address local development issues and enrich the curriculum in terms of research and training at the UFS simultaneously. Some of the agricultural know-how and skills training are in the form of:

- using the facilities as an apprenticeship programme for prospective farmers, with a mentorship and support system in place to facilitate "learning by doing" before moving to a commercial farm. Prospective trainee farmers will select a programme in beef cattle farming, dairy farming, small-stock farming, pig farming, poultry farming and vegetable production;
- providing skills training for agricultural entrepreneurs, farm workers and young people wanting to make a livelihood in the agricultural sector, farmers in the farmer trainee programme and recently settled farmers. This is done through short courses at the centre, a mobile training facility to serve municipalities in the Free State Province, educational tours to key centres relevant to ongoing projects and

designing and soliciting accreditation of appropriate learnership courses;

- supporting emergent farmers/entrepreneurs through livestock auctions at the centre every Friday, linkages to input suppliers and markets, aftercare of newly settled farmers and start-up entrepreneurs. The centre provides appropriate infrastructure on municipal land for small-scale farming entrepreneurs. The centre enhances lobbying capacity by establishing commodity groups with linkages to regional and national farmer organisations. Assistance is also given to process applications to the Land Redistribution for Agricultural Development (LRAD) programme;
- an outreach programme through partnerships to extend the clientele through a "hub-and-spokes" framework to different parts of the country; and
- establishing an HIV/AIDS prevention, care and support initiative among farmers, farm workers and associated communities.

An agreement was concluded with BKB Louwid Auctioneers during 2008 to conduct weekly livestock auctions for the Bloemfontein area at the Lengau Agricultural Development Centre. This brings together





Mr Johnny Molomo of the Paradys Experimental Farm introducing farmers of the Kopano African Farmers' Association and members of the Free State Provincial Department of Agriculture to pasture and crop farming practices at the centre.

commercial and small-scale farmers and makes the latter aware of the commercial value of their livestock. Two of the trainee farmers canvass livestock from the commonage farmers on a regular basis. Another trainee has become a real entrepreneur, making good profit out of buying and selling animals from and at the auctions. The auctioneering activities resulted in an average turnover of more than R1 600 000 per month. The trainee, commonage, small-holder and emergent farmers also take note of the price-determining factors and are in the process of changing their type of stock and management accordingly.

In conjunction with the Mangaung Local Municipality and the Free State Provincial Department of Agriculture, two farmers' days were held at the centre and two elsewhere in the country where farmers were skilled in vaccination, branding, dehorning, castration and tick control. They also received training and advice in breeding and bull selection for the improvement of livestock. More than 2000 head of cattle were handled and 11 farmers attended the sessions.



A farmers' day on a farm near Hobhouse in the Free State Province.

Six hydroponic units have been erected at the centre since 2007 with financial support from the Mangaung Local Municipality and the Free State Provincial Department of Agriculture. The hydroponic units and approximately half a hectare of open garden space are being used to train eight trainees in vegetable production skills at the centre.

Two people were trained in broiler production skills at the centre. Two trainees made a success of the trials in broiler production of 250 birds per cycle, achieving a mortality rate of less than 5% and a slaughter mass of more than



2 kg per bird on average. The production cost per dressed broiler was R11.52 per kg on average.

One trainee stock farmer was successfully allocated land and another one was granted funding for land in 2010. These farmers are mentored on a regular basis and sell and buy livestock at the Lengau auctions.

Furthermore, two entrepreneurs are utilising the eucalyptus (bloekom) trees at the Lengau Agricultural Development Centre as an opportunity to provide firewood to the local community. The first samples of firebricks were produced from wastepaper and the marketing of the products is currently being investigated by the Students in Free Enterprise (SIFE) of the Faculty of Economic and Management Sciences.

An audit of sustainability and a gap analysis of the projects at the centre were done early in 2010. Subsequently, a decision was taken to change the service fee at the centre from a previously 100% subsidised fee to a minimal service fee for electricity and water supply in respect of the projects. A number of beneficiaries indicated that the project was not sustainable. It was therefore also Ladies participating in the sewing project of the Department of Consumer Sciences at the UFS.

decided that the beneficiaries will sign a contract with the university in future and that their retraining, as well as weekly reports of each project would be compulsory. The new dispensation will be implemented from 1 January 2011.

Forty-six Pest Control Operators wrote their qualifying examination papers of the South African Animal Health Association and CropLife SA at the centre during 2010.

Ms Doretha Jacobs from the Department of Microbial, Biochemistry and Food Biotechnology trained 12 beneficiaries in sewing skills. The Mangaung Local Municipality funded the equipment. A variety of products were produced and marketed at the Langenhoven Park market. Consumer Science students apply their knowledge and skills in this project for community service learning purposes.

Staff members

PERMANENT

Senior Lecturer: Dr Léan van der Westhuizen

Farm Assistant: Mr Albert Khumalo

Farm Guards: Mr Alfred Mxhaka, Mr Esau Selepe

TEMPORARY

Manager: Project Enhancement: Rev. Kiepie Jaftha

Contact details

Dr Léan van der Westhuizen

Faculty of Natural and Agricultural Sciences Lengau Agricultural Development Centre University of the Free State PO Box 12544 Brandhof Bloemfontein South Africa 9324

Telephone: Fax: E-mail: Website: +27 (0)51 443 8859 +27 (0)51 443 8092 mcvdw@telkomsa.net www.ufs.ac.za

"Internal researchers and students of the Faculty of Natural and Agricultural Sciences form the core of users."

Prof. Pieter van Wyk

22 Centre for Microscopy

Overview

The Centre for Microscopy renders a service to departments in the Faculty of Natural and Agricultural Sciences at the University of the Free State (UFS) and outside institutions. Research and training outputs at the centre are determined by the hours of usage of the apparatus and laboratories by researchers.

In 2010, the total usage of the Scanning Electron Microscope (SEM) amounted to 384 hours; for the Transmission Electron Microscope (TEM) 56 hours; and for the Confocal Laser Scanning Microscope (CLSM) 65 hours. The average usage of the respective microscopes over the past four years (2007-2010) amounted to 569 hours for the SEM, 81 hours for the TEM and 66 hours for the CLSM. The total time of usage expressed as days, including material preparation and the usage of all other apparatus, is 145 days for 2010, in comparison to 172 days for 2009 of the 240 potential university work days per annum. The decline may be addressed by changing the current approach to user support.

Market research was done among current and potential new users. 74% of the respondents indicated that they did not prefer to work with equipment and microscopes themselves for fear of damaging expensive apparatus. They prefer the full-time presence and support of an operator. They also believe that an operator will increase the efficiency of their time spent at the microscopes



with a positive effect on the costs involved for the department. The centre also experienced unnecessarily high maintenance expenditure, due to inappropriate handling of expensive equipment. Improved technical support during handling of especially the microscopes will prevent such damages. The purchase of expensive chemicals by users for small or single projects also deters potential users and feasible projects are then discarded. The research also indicated that 42% of users require a "pay-as-you-go" approach at the centre. These recommendations will be implemented without delay in 2011.

Activities and achievements

A research breakthrough was achieved in the application of nanotechnology on the chemical composition of surface structure of biological organisms (yeast cells) by two Ph.D. students of the UFS, Mss Chantel Swart and Ntsoaki Leeuw, under the supervision of Profs. Lodewyk Kock (Lipid Biotechnology, Department of Microbial, Biochemical and Food Biotechnology) and Pieter van Wyk 237



A research breakthrough was achieved in the application of nanotechnology on the chemical composition of the surface structure of biological organisms (yeast cells), using the PHI700 Scanning Auger Nanoprobe linked to a Scanning Electron Microscope and Argon-etching.

At the back are: Profs. Hendrik Swart (Physics) and Pieter van Wyk (Centre for Microscopy)

In front: Prof. Lodewyk Kock (Lipid Biotechnology), Drs Carlien Pohl, Chantel Swart, (Lipid Biotechnology) and Lisa Coetsee (Physics).

(Centre for Microscopy). This was done in collaboration with the Department of Physics (under the leadership of Prof. Hendrik Swart) on the PHI700 Auger NanoSAM. The research is the result of examinations initially done on yeast cells (grown in the presence of over-used cooking oil) with confocal and electron microscopy.

A micrograph from a publication of Ph.D. student, Mr Desmond Ncango, supervised by Profs. Kock and Van Wyk, was used on the front page of the *Canadian Journal* of *Microbiology*.

During a visit to Prof. Louis Scott (Department of Plant Sciences) and Dr James Brink (National Museum, Bloemfontein), Dr Liora Horwitz of the Hebrew University of Israel, who is undertaking palaeontology research (in an archaeology context) at Wonderwerk Caves (Kuruman), examined important aspects of the ultrastructure of fossil bones, using the Shimadzu SEM.

Micrographs of pollen morphology obtained with the Jeol SEM at the centre was used for a public presentation *Ornitophily and biodiversity: A South African perspective,* by Prof. Johann du Preez, in collaboration with the National Museum and the Department of Plant Sciences.

Representatives of South African Breweries (SAB) visited the centre with Prof. Lodewyk Kock to illustrate research collaboration at the centre. The Vice-Rector: Research and Commercialisation, Prof. Teuns Verschoor, attended an information event at the centre regarding nano- and ultra-structure research at the faculty. Grade 12 learners from a Lesotho High School, a student group of the Central University of Technology (CUT), and several other learners attended demonstrations of the laboratory and microscopes at several occasions throughout the year. The lecturer of the student group, Mr Moosa Sedibe, did research with the Jeol SEM for his Ph.D. studies under the supervision of Dr James Alleman of the Department of Soil, Crop and Climate Sciences.

The usual courses in material preparation and handling of equipment were presented to the Honours students of the Departments of Zoology and Entomology (DRK/ ANDT614); Geology (GLG636); Microbial, Biochemical and Food Biotechnology (MKB/BOC614) and Plant Sciences (PWS614). These courses, lasting two to three days each, were presented to each group separately. A one-day demonstration was presented to the Honours students of the Departments of Genetics (GEN 686) and Medical Microbiology and Virology (MKM601).

The second-year students of the Departments of Zoology and Entomology and Plant Sciences attended an introductory lecture about microscopy. From 2011 onwards, such demonstrations will only be done in a walk-through style.

Two centrifuges, a standard desktop model and a microcentrifuge (Sigma, Wirsam Scientific Instruments) were purchased for R41 402. This would now enable users to do their basic preparation steps at the centre as well. This would also make the centre fully independent to apply the new "pay-as-you-go" approach. Prof. Van Wyk donated the money through his National Research Foundation (NRF) incentive allocation for 2010.

A total of 55 hours was spent on internal maintenance, with an estimated associated cost saving of approximately R36 000, should companies repairing microscopes have been called out for service repairs. Damage caused by inappropriate handling by users amounted to approximately R45 000. The Electronics Workshop deserves special mention for their assistance with the repairs to the warning light system of the Jeol SEM vacuum control circuitry. Spare parts for this microscope are not available anymore. The Instrumentation Workshop is also thanked for always being available to help at short notice with requests to repair and even manufacture smaller components of any kind.

Internal researchers and students of the faculty form the core of users.



research OUTPUTS

Research articles

Bem, D.B., Swart, H.C., Luyt, A.S., Coetzee, E. & Dejene, F.B. 2010. Properties of Green SrAl₂O₄ Phosphor in LDPE and PMMA Polymers. *Journal* of Applied Polymer Science 117(5): 2635-2640.

Božanić, D.K., Trandafilović, L.V., Luyt, A.S. & Djoković, V. 2010. 'Green' synthesis and optical properties of silver-chitosan complexes and nanocomposites. *Reactive & Functional Polymers* 70: 869-873.

Dikobe, D.G. & Luyt, A.S. 2010. Comparative study of the morphology and properties of PP/LLDPE/wood powder and MAPP/LLDPE/wood powder polymer blend composites. *Express Polymer Letters* 4: 729-741.

Dikobe, D.G. & Luyt, A.S. 2010. Morphology and Thermal properties of Maleic Anhydride Grafted Polypropylene/Ethylene-Vinyl Acetate Copolymer/Wood Powder Blend Composites. *Journal of Applied Polymer Science* 116: 3193-3201.

Kumar, V., Mishra, V., Biggs, M.M., Nagpure, I.M., Ntwaeaborwa, O.M., Terblans, J.J. & Swart, H.C. 2010. Electron beam induced green luminescence and degradation study of CaS:Ce nanocrystalline phosphors for FED applications. *Applied Surface Science* 256: 1720–1724.

Kumar, V., Nagpure, I.M., Ntwaeaborwa, O.M. & Swart, H.C. 2010. Synthesis of Ce³⁺ doped SrS nanocrystalline phosphors using a simple aqueous method. *Materials Letters* 64: 752-754. Kumar, V., Pitale, S.S., Mishra, V., Nagpure, I.M., Biggs, M.M., Ntwaeaborwa, O.M. & Swart, H.C. 2010. Luminescence investigation in Ce³⁺ doped CaS nanophosphors. *Journal of Alloys and Compounds* 492: L8-L12.

Leeuw, N.J., Swart, C.W., Joseph, M., Pohl, C.H., Van Wyk, P.W.J., Coetsee, E., Swart, H.C., Hugo, A. & Kock, J.L.F. 2010. The effects of palm oil breakdown products on lipid turnover and morphology of fungi. *Canadian Journal of Microbiology* 56(11): 883-889.

Mishra, S.B., Mishra, A.K., Luyt, A.S., Revaprasadu, N., Hillie, K.T., Steyn, W.J.VdM., Coetsee, E. & Swart, H.C. 2010. Ethyl vinyl acetate copolymer - SrAl₂O₄:Eu,Dy and Sr₄Al₁₄O₂₅:Eu,Dy phosphor based composites: Preparation and material properties. *Journal of Applied Polymer Science* 115(1): 579-587.

Mngomezulu, M.E., Luyt, A.S. & Krupa, I. 2010. Structure and Properties of Phase Change Materials Based on HDPE, Soft Fischer-Tropsch Paraffin Wax, and Wood Flour. *Journal of Applied Polymer Science* 118: 1541-1551.

Molefi, J.A., Luyt, A.S. & Krupa, I. 2010. Investigation of Thermally Conducting Phase-Change Materials Based on Polyethylene/Wax Blends Filled with Copper Particles. Journal of Applied Polymer Science 116: 1766-1774.

Ncango, D.M., Swart, C.W., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F. 2010. Mitochondrion activity and dispersal of *Aspergillus fumigatus* and *Rhizopus oryzae*. African Journal of Microbiology Research 4(9): 830-835. Swart, C.W., Swart, H.C., Coetsee, E., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F. 2010. 3–D architecture and elemental composition of fluconazole treated yeast asci. *Scientific Research and Essays* 5(22): 3411–3417.

Swart, C.W., Van Wyk, P.W.J., Pohl, C.H. & Kock, J.L.F. 2010. Variation in mitochondrial activity over the life cycle of *Nadsonia fulvescens*. *African Journal of Microbiology Research* 4(16): 1727-1732.

Thibane, V.S., Kock, J.L.F., Ells, R., Van Wyk, P.W.J. & Pohl, C.H. 2010. Effect of marine polyunsaturated fatty acids on biofilm formation of *Candida albicans* and *Candida dubliniensis*. *Marine Drugs* (Special Edition: *Marine Lipids*) 8(10): 2597-2604.

Conference contributions

Kock, J.L.F., Pohl, C.H., Sebolai, O.M., Swart, C.W. & Van Wyk, P.W.J. 2010. Yeast metabolite studies lead to antifungals with dual action. Poster presented at the 28th Specialised Symposium on Yeasts: Metabolic and Bioprocess Engineering for Sustainable Development, Momtien Riverside Hotel, Bangkok, Thailand. 15-18 September.

Swart, C.W., Swart, H.C., Coetsee, E., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F. 2010. *NanoSAM: a first application to yeast.* Paper delivered at the 28th Specialised Symposium on Yeasts: Metabolic and Bioprocess Engineering for Sustainable Development, Momtien Riverside Hotel, Bangkok, Thailand. 15-18 September.

Academic staff

Affiliate Professor: Prof. Pieter WJ van Wyk

Contact details

Prof. Pieter van Wyk

Faculty of Natural and Agricultural Sciences Centre for Microscopy University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone: Fax: E-mail: Website: +27 (0)51 401 2264 +27 (0)51 444 5945 vanwykpw@ufs.ac.za www.ufs.ac.za/ccem "CENSARDE entered a new era when the name of the centre was changed to accommodate Extension as part of its core identity and business."

Prof. Izak Groenewald

23 Centre for Sustainable Agriculture, Rural Development and Extension



Overview

The Centre for Sustainable Agriculture, Rural Development and Extension (CENSARDE) at the University of the Free State (UFS) is designed to accommodate postgraduate students who are working full-time, while furthering their studies by means of distance education. The courses on offer afford students the opportunity to acquire multi-disciplinary skills and knowledge in sustainable agricultural practices. The centre is proud of its students and their achievements.

Prof. Izak Groenewald is the director of CENSARDE. The contribution of Mr Johan van Niekerk, the centre's research associate, in guiding the students in their research efforts,

is one of the reasons for the centre's success in terms of the student throughput rate. The centre also has Professors Extraordinary in Profs. Edward Nesamvuni, Alice Pell, Frans Swanepoel and Monty Jones. Prof. Aldo Stroebel is a senior research fellow of the centre.



New intake of 2010 Master's degree students in Sustainable Agriculture.



CENSARDE's research is focused on rural development, the value-adding chain, agri-business management, as well as crop and livestock management. It aims to contribute towards the development and maintenance of sustainable production systems.

Students entering this programme come from all spheres of life, although they all share the common goal of learning more about the science of sustainability in agricultural production. Most of the students are in the full-time employment of the Department of Agriculture and the Agricultural Research Council (ARC). Some are commercial, part-time or small-scale farmers, while others are employed by banks, agri-businesses and consultancies. International students account for about 35% of the students.

The course content is scrutinised by local and international partners annually to ensure local applicability, relevancy and also to remain internationally on par. In 2010, 70 students enrolled for the Master's programme.

In the same academic year, 30 students graduated with a Master's degree in Sustainable Agriculture (MSA). This was the culmination of many months' hard work for these graduates who study part-time while working full-time. This brings the total number of MSA degrees awarded to 254 since our inception in 1994. CENSARDE has a proud track record of its graduates who leave the programme well equipped to address the challenges of the workplace. This is an important contribution since modern-day agriculture is a constantly changing environment with many constraints and challenges. Students develop technological, managerial and thinking skills that are embedded in the programme. ADSARD students at a practical training session on the research farm.

Activities and achievements

A new qualification namely an Advanced Diploma in Sustainable Agriculture and Rural Development (ADSARD) was launched, mainly based on a need expressed by the Eastern Cape Department of Agriculture.

ADSARD aims to meet the needs of the Agricultural Extension and Advisory Service to help their workforce attain a further qualification. Part of the plan is for extension officers with diplomas (NQF level 6) to be able to achieve an advanced diploma (NQF level 7) and to facilitate mobility for advanced qualifications. This is driven by the National Extension Recovery Plan of the government.

The centre underwent an institutional review conducted by a panel of international and local experts. Prof. Luc D'Haese from the University of Ghent, Belgium and Dr Akke van der Zijpp from the University of Wageningen, The Netherlands, were assisted by local Dr Elliot Zwane, President of the SA Society of Agricultural Extension and Prof. Johan van Rooyen from Stellenbosch University.

The review team commended the centre, its management, academic status, relevancy of course content and extended linkages. Several valuable recommendations were also made pertaining to programme structure, introducing new exit levels, increasing publications, introducing an advisory board and considering a name change to confirm the centre's involvement in agricultural advisory services. This name change was accepted by the UFS authorities and the centre is now known as the Centre for Sustainable Agriculture, Rural Development and Extension (CENSARDE).





Profs. Frans Swanepoel and Aldo Stroebel at the launch of their new book.

Professor Extraordinary of the centre and Director: Research Development, Prof. Frans Swanepoel and Prof. Aldo Stroebel, senior research fellow of CENSARDE, launched a book entitled *The role of livestock in developing communities: Enhancing multifunctionality.*

CENSARDE also facilitated regional workshops with the students and external supervisors. These were held to assist the MSA and ADSARD students in their tuition and research. Such workshops were held in Limpopo, KwaZulu-Natal, the Western Cape Province and Gauteng, the Dohnë Research Station in the Eastern Cape and in Windhoek, Namibia.

The class of 2010 can all be commended for the time they took to complete their studies while working full-time. The number of graduates from the 2010 academic year totalled 30 students.

Exchange students on their way to Virginia Tech, Blacksburgh, Virginia, USA.

National and international collaboration

CENSARDE was again involved in several **international linkages**.

Prof. Groenewald travelled to Virginia Polytechnic Institute and State University (Virginia Tech) in the United States, accompanying eight exchange students who studied at Blacksburgh, Virginia, during the second semester. Funding opportunities were investigated whilst in Washington.

Prof. Groenewald, Mr Johan van Niekerk and Mr Kevin Withfield travelled to Dronten University of Applied Sciences in The Netherlands to attend an International





A group of academics from various universities in Central and Eastern Europe, attending the international workshop at Dronten University of Applied Sciences, The Netherlands.

Week and participate in a workshop. This interaction resulted in a student exchange from The Netherlands. Jessica von Adel spent four months at the UFS. This visit also initiated discussions with funding partners at NUFFIC, The Netherlands Organisation for International Cooperation in Higher Education and Research, to assist in revitalising agricultural training colleges in South Africa.

The same three staff members visited Drs Laurens Klerks and Frans Dornman at Wageningen University in The Netherlands. This institution hosts the top experts of the world in Agricultural Extension. Valuable linkages were established and relevant literature acquired.



CENSARDE staff visiting Ghent University, Belgium. Front: Profs. Izak Groenewald and Luc D'Haese from Ghent. Back: Messrs Johan van Niekerk and Kevin Whitfield.

The Ghent University in Belgium was also visited by CENSARDE's three-man delegation, where Prof. Luc D' Haese hosted them. The purpose of the visit was to establish links with other rural development and sustainable agricultural institutions.

Mr Johan van Niekerk attended the First Intercontinental Meeting of the Global Forum for Rural Advisory Services (GFRAS) in Viña del Mar, Chile, hosted by the Latin-American Centre for Rural Development (RIMISP) and supported by the African Forum for Rural Advisory Services (AFAAS) from 2–5 November 2010. The meeting's objectives were networking and learning among rural advisory stakeholders, framing and validation of GFRAS's long-term strategy and defining a toolkit for evaluating extension systems and programmes.

The GFRAS forum consists of various stakeholders worldwide who have an interest and role in rural advisory services (RAS). The mission of this forum is to provide a space for advocacy and leadership by RAS stakeholders on pluralistic, demand-driven, rural and agricultural advisory services. GFRAS does this in the context of the global development agenda, with a goal of promoting sustainable growth and reducing poverty.



Mr Johan van Niekerk attending the GFRAS meeting in Chile.

Prof. Groenewald remains on the editorial board of the internationally-accredited scientific journal, the *Journal for Sustainable Agriculture.*

In terms of **regional linkages**, CENSARDE has a longterm cooperative agreement with academic and private institutions in Namibia. This was expanded to incorporate all relevant departments and centres from the UFS, especially the clusters headed by Profs. Maitland Seaman and Wijnand Swart. As the existing Memorandum of Understanding (MOU) approached expiry, it was extended to be more inclusive and valid for a further period.



Selected members from the faculty during the signing of the extended MOU with the Polytechnic of Namibia, Windhoek.

CENSARDE is using these networks to take ADSARD to a regional level at Southern Africa Development Community (SADC) universities.

Locally, CENSARDE attended the Annual Conference of the South African Society of Agricultural Extension, held at Langebaan in May 2010. Numerous current MSA students and graduandi attended this conference and initial steps were taken to form an Alumni of CENSARDE. Mr Johan van Niekerk is an active member of this society. He publishes in their journal and was instrumental in inviting GFRAS to present their 2012 conference in South Africa.

Prof. Groenewald, with his expertise in phosphate supplementation for free-grazing ruminants, is regularly invited to farmers' days and study groups locally. He actively advises feeding companies about recent advances in terms of this topic.

Research

CENSARDE is set to increase the number of publications from its staff and students in the coming year.

The centre gives thanks and recognition to Prof. Frans Swanepoel, Director of Research Development at the UFS, for his continued support and commitment to CENSARDE.

research **OUTPUTS** Sustainable Agriculture, Rural Development and Extension

Research articles

Nkosi, B., Meeske, R., Van Der Merwe, H.J. & Groenewald, I.B. 2010. Effects of homofermentative and heterofermentative bacterial silage inoculants on potato hash silage fermentation and digestibility in rams. *Animal Feed Science and Technology* 157(3): 195–200.

Tshovhote, N.J., Nesamvuni, A.E., Nephawe, K. & Groenewald, I.B. 2010. An evaluation of ratios as a measure of carcass traits using mature indigenous chickens in Limpopo Province of South Africa. *South African Journal of Animal Science* (supplement 1) 40(5): 467-467.

Van Niekerk, J.A., Stroebel, A., Van Rooyen, C., Whitfield, K. & Swanepoel, F.J.C. 2010. Towards designing a new agricultural extension service for the Eastern Cape Province: A perception analysis. *South African Journal of Agricultural Extension* 38(38): 65-76.

Whitfield, K.P. 2010. The holistic approach needed for all sustainability endeavours. *Human Settlements Review* 1(1): 145-156.

Chapters in books

Devendra, C., Swanepoel, F.J.C., Stroebel, A. & Van Rooyen, C. 2010. Implications and innovative strategies for enhancing the future contribution of livestock. In: *The Role of Livestock in Developing Communities: Enhancing Multifunctionality*, edited by A. Stroebel, F. Swanepoel & S. Moyo. Netherlands, Wageningen: CTA. pp. 171-190. Moyo, S. & Swanepoel, F.J.C. 2010. Multifunctionality of livestock in developing communities. In: *The Role of Livestock in Developing Communities: Enhancing Multifunctionality*, edited by A. Stroebel, F. Swanepoel & S. Moyo. Netherlands, Wageningen: CTA. pp. 1–11.

Nesamvuni, E., Swanepoel, F.J.C. & Stroebel, A. 2010. Interactions between gender, environment, livelihoods, food, nutrition and health. In: *The Role of Livestock in Developing Communities: Enhancing Multifunctionality*, edited by A. Stroebel, F. Swanepoel & S. Moyo. Netherlands, Wageningen: CTA. pp. 93-105.

Nesamvuni, E., Swanepoel, F.J.C. & Stroebel, A. 2010. Interactions between gender, environment, livelihoods, food, nutrition and health. In: *The Role of Livestock in Developing Communities: Enhancing Multifunctionality*, edited by A. Stroebel, F. Swanepoel & S. Moyo. South Africa, Bloemfontein: SUN MeDIA.

Pell, A., Stroebel, A. & Kristjanson, P. 2010. Livestock development projects that make a difference: What works, what doesn't and why. In: The Role of Livestock in Developing Communities: Enhancing Multifunctionality, edited by A. Stroebel, F. Swanepoel & S. Moyo. Netherlands, Wageningen: CTA. pp. 13-29.

Conference contributions

Lekalakala, R. & Nesamvuni, A.E. 2010. Effects of climate change on dairy cattle in South Africa. Poster presented at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19-23 July.

Lekalakala, R. & Nesamvuni, A.E.

2010. Impact of overgrazing on hydrological flow responses. Poster presented at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19-23 July.

Lekalakala, R. & Nesamvuni, A.E. 2010. Projected impacts of temperature and humidity on feedlot cattle in South Africa: Using temperature humidity index as an indicator of heat stress. Poster presented at the 45th Annual Congress of the Grassland Society of southern Africa (GSSA): Sustainable and adaptive practices in range and pasture systems, with an emphasis on arid regions, Kimberley, South Africa. 19–23 July.

Madzivhandila, T., Griffith, G. & Nesamvuni, A.E. 2010. Metaevaluations in government and government institutions: A case study example from the Australian Centre for International Agricultural Research. Poster presented at the 54th



250

National Conference of the Australian Agricultural and Resource Economics Society (AARES), Adelaide, Australia. 10-12 February.

Nkosi, B., Meeske, R., Van Der Merwe, H.J. & Groenewald, I.B. 2010. The effect of Lalsil Fresh LB on the fermentation quality and digestibility of a potato hash silage diet in rams. Poster presented at the 56th Meeting of the European Association for Animal Production, Antalya, Turkey. 17-22 September.

Nkosi, B., Meissner, H., Ratsaka, M., Palic, D., Meeske, R. & Groenewald, I.B. 2010. Ensiling potato hash with hay, poultry litter, whey or molasses. Poster presented at the 56th Meeting of the European Association for Animal Production, Antalya, Turkey. 17-22 September.

Petja, B., Nesamvuni, A.E. & Nkoana,

R. 2010. The role of geospatial information technology in decision support for rural agricultural development in the Nebo Plateau, South Africa. Poster presented at the 8th International Conference of the African Association of Remote Sensing of the Environment (AARSE2010): Earth Observation for Africa's Development Agenda, UN-ECA, Addis Ababa, Ethiopia. 25-29 October. Tshikolomo, K., Walker, S. & Nesamvuni, A.E. 2010. Rainfall influence on water gain and loss from Middle Letaba dam in Luvuvhu-Letaba water management area. Poster presented at the 11th WaterNet/ WARFSA/GWP-SA Symposium, Victoria Falls, Zimbabwe. 27-29 October.

Contact details

Prof. Izak Groenewald

Faculty of Natural and Agricultural Sciences Centre for Sustainable Agriculture, Rural Development and Extension University of the Free State PO Box 339 Bloemfontein South Africa 9300

Telephone:	+27 (0)51 401 3765
Fax:	+27 (0)86 525 5371
E-mail:	groenei@ufs.ac.za
Website:	www.ufs.ac.za/censard

Academic staff

Professor: Prof. Izak Groenewald

Professors Extraordinary: Profs. Frans Swanepoel, Edward Nesamuvuni, Alice Pell and Monty Jones Senior Research Fellow: Prof. Aldo Stroebel

Research Associate: Mr Johan van Niekerk

EXPERIMENTAL FARM

"The Afrikaner cattle on the farm are without a doubt one of the herds of Afrikaner cattle in the country that have the most potential and reasons to thrive."

🦰 Mr Jannie Myburgh
24 Paradys Experimental Farm

Overview

Paradys Experimental Farm is situated 14 km from the Main Campus of the University of the Free State (UFS). During 2010, it changed some of its structures aimed at providing student internship opportunities and this has already proven to be very successful. Paradys Experimental Farm accommodated five students in the internship programme in 2010. These students are involved with the management of the farm, thus immediately applying the theory learned in the different subjects. In this way, students are exposed to the practice and challenges of the agricultural sector and at farm level.



Paradys Experimental Farm



The internship programme is designed in such a way that it provides continuity in terms of the farm management system. Senior students are tasked with mentoring junior students in respect of the different operational arms of the farm.

Paradys Experimental Farm's main objectives are to enhance sustainable agriculture and to provide a facility for agricultural training and community service. 600 undergraduate students visited the farm in 2010. This brought them into practical contact with the animals, commodities and implements that they learn about in the theoretical lectures. This experience stimulates their interest and provides students who do not come from farms with a visual and practical farming experience.

Postgraduate students formed part of a poultry study and further studies are planned for 2011. Community service included a number of successful farmers' days with milk and red-meat producers, providing training to farmers and their workers.



McCormick tractor and John Deere planter used with the planting of maize.

Activities and achievements

Cultivated land

Grain production on the farm was drastically reduced in the 2010 season, due to poor grain prices during this period. Grain was therefore only planted for the purpose of fodder production and for feeding the still growing dairy herd.

The current focus is on the production of alternative feed crops to be used in the dairy arm of the farm. Sorghum, teff, Japanese radish and oats production were therefore increased as sources of feed for the farm's various livestock arms.

Dairy

Paradys Experimental Farm has a dairy with 120 cows, 60 of which are in milk, 15 dry and 53 young animals. The dairy consists of a Jersey stud and a Holstein commercial stud. The dairy aims to expand further to 400 lactating animals. The average milk production of the Jersey stud is 6 300 kg milk over a period of 305 days and the average inter-calf period is 390 days. The entire stud is subjected to artificial insemination (AI). The average insemination rate per conception on the Jersey stud is 1.72. New kraals were built for the milk cows during 2010, accommodating 200 lactating animals.



Our Holstein commercial stud.

Student training on the farm includes dairy and stud management and animal health. All female calves are being raised for the dairy and we are proud of the fact that we did not have a single mortality during the whole of 2010. We already have 22 new heifers in milk, ensuring that the stud grows constantly. The dairy also received a bronze award at the Agricultural Research Council's Master Dairy Farmer of the Year competition.

Sheep

During 2010, the decision was taken to replace the 36 Dorper sheep on the farm with South African Mutton Merino. The reason for this decision is that the Dorper is an extensive breed that does not perform optimally in an intensive meat-production system, the main aim of Paradys Experimental Farm. We believe that the South African Mutton Merino will serve our objectives better, namely:

- Intensive meat production from planted pastures;
- Spreading our risks in terms of meat and wool production;
- Lean carcass quality with great growth potential;
- Relatively fertile breed that are able to produce and raise twins;
- The best wool quality that can be produced under our circumstances;
- Ability to do wool education in terms of student training;
- Present AI courses; and
- Demonstrate to students general sheep farming principles.

The dual-purpose South African Mutton Merino is known as a 20% wool, 80% meat-producing breed. We manage



255



them as a stud, even though the sheep are not registered as stud animals, since we bought commercial animals.

The reason for the handling of the flock as a stud is simply for better management purposes.

The flock (48 ewes) was artificially inseminated with some of the best rams in South Africa with the help of Ramsem Al Station. This enabled us to enhance the quality of our sheep in the quickest and least expensive way possible. The flock is currently in lamb and the lambing percentage is currently 1.35 lambs per ewe.

The pastures are the main feed source, supplemented with licks according to the needs of the animals in different production phases. The flock is still in a growing phase and the ewe numbers will probably reach capacity at 80 head. This would only be possible if the pastures were expanded more with the planting of some other vegetation.

Our aim is for this flock of sheep to become something outstanding.

Beef cattle

The Afrikaner cattle (215) on the farm are without a doubt one of the herds of Afrikaner cattle in the country that have the most potential and reasons to thrive. The stud is still growing and a great stud is not bred in a few years' time, but rather over a 10- to 15-year period. If properly managed, we believe that this stud could become one of the best Afrikaner studs in the country for the following reasons:

- the best female genetics in South Africa;
- great bulls are supplied free of charge by breeders;
- selection is extremely strict since this is not a commercial farm; and
- expertise available from the UFS.

The heifers that came through in 2010 already resemble the type of animal that we strive for. They are somewhat



smaller but well adapted to our circumstances in terms of the veld, with minimum feeding supplements. The conception rate went up to 90% again in 2010.

A lesson learned was to take better care of the calving heifers after their first calf and to give better lick in wet years, since the veld is in poor condition during wet seasons. We are very grateful to Mr Cronje who is one of the breeders assisting us in our nucleus herd project by providing excellent bulls. We also wish to thank Prof. Neser for being the mastermind behind the herd and Prof. Van der Merwe who formulated the required cattle licks.

Contact details

Mr Jannie Myburgh

Faculty of Natural and Agricultural Sciences Paradys Experimental Farm University of the Free State PO Box 35265 Faunasig Bloemfontein South Africa 9300

 Telephone:
 +27 (0)51 443 9011

 Fax:
 +27 (0)51 443 9010

 Website:
 www.ufs.ac.za

Staff members

Farm Manager: Mr Jannie Myburg

Administrative Manager: Ms Amanda Smith

Students: Messrs Werner Brand, Johan Wolither, Jannie Nel, Cosmos Malejane, Johnny Molomo

Farm Workers: Mss Anna Sebonyane, Elisa Sebonyane, Messrs Thabo Khubeka, Vinie Khubeka, Isaac Nkotshane, Christiaan Olivier, Daniel Somi, Paulus Somi, Samuel Motswari, Samuel Kheswa, Petrus Ramatekoane, Petrus Moriribela, Stephen Bavuma, Richard Mxhaka, Jerry Mxhaka. Ernst Magala

Security: Messrs Daniel Mxhaka, Azael Khoele

258



"We strive to identify market needs, research these and provide a service."

Dr Ingrid Dennis

25 Institute for Groundwater Studies (IGS)



Overview

The Institute for Groundwater Studies (IGS) was founded in 1974 and is currently under the leadership of Dr Ingrid Dennis. She is assisted by Prof. Gerrit van Tonder, Drs Rainier Dennis and Danie Vermeulen, as well as Affiliate Associate Professors, Profs. Kai Witthüser and John Nieber.

Vision

To be the pre-eminent groundwater institution in Africa for academic training and relevant research.

Mission

To produce world class postgraduate students who can apply their knowledge to ensure sustainable groundwater resources.

To produce high-quality research that is relevant and practically applicable.

To serve the community through students, research and actions that will empower stakeholders to manage groundwater sustainability.

The research vision of the Institute for Groundwater Studies is to be the leading groundwater research group in Africa on aspects related to fractured rock aquifers, industrial and mining contamination, groundwater governance and groundwater resources.

Geohydrology is part of the Earth Sciences grouping of the South African Council for Natural Scientific Professions (SACNASP). As such, the IGS adheres to the requirements set by the organisation.

Very few geohydrology learning academies exist in South Africa; it is therefore very difficult to measure the standard of the IGS against other similar departments. Role players (government and industry) are therefore being requested to complete questionnaires during groundwater conferences in order to assess the specific needs and improvement recommendations in terms of student training. All suggestions are then evaluated and implemented, if valid.

IGS had an increase in student numbers in the B.Sc. Honours in Geohydrology degree from 29 in 2009 to 34 students in 2010 and in the M.Sc. degree from 38 in 2009 to 42 in 2010. Eight Ph.D. students were registered in 261

262

INSTITUTE FOR GROUNDWATER STUDIES



Taken at the IMWA 2010 Conference, from the left: Dr Brent Usher, former senior lecturer at IGS (currently working at Klohn Crippen Berger in Brisbane, Australia), Mr Adam Jarvis (University of Newcastle, UK) and Dr Danie Vermeulen (IGS).

2010. 11 of the postgraduate students were international students from Botswana, Cameroon, Ghana, Lesotho, Benin and Namibia. During the two graduation ceremonies of 2010, the IGS produced three Ph.D., six M.Sc. and 16 B.Sc. Honours students.

Activities and achievements

Prof. Gideon Steyl was invited to present two lectures on mine-water-related subjects, namely *The effect of* groundwater inflow in mine voids and the chemical composition of mine water and the effect it has on the local environment.

He was invited to act as advisor and reviewer on the Inter-Ministerial Committee for *Dealing with the Water Ingress and Acid Mine Drainage (AMD) Problems in the Witwatersrand Gold Mining Areas* (convened by the Council for Geoscience). He was also the project leader in a joint venture between Eskom and SASOL on the project *Sustainable Salt Sinks Phase II.*

Prof. Steyl was appointed on the reference group for the Water Research Commission (WRC) project *The use* of isotope hydrology to characterise and assess water resources in South(ern) Africa (K5/1907). Similarly, in another WRC project, he was the project leader in a smallscale study to investigate uranium oxide occurrence in South African regional waters with a dual perspective on groundwater and surface water. Dr Danie Vermeulen served on the following WRC Steering Committees:

- K5/1909: Reducing uncertainties of evapotranspiration and preferential flow in the estimation of groundwater recharge.
- K5/2015: Evaluating approaches to and benefits of minimising the formation of acid mine drainage through management of the disposal of sulphidic waste rock and tailings.
- K5/1975: Determining the socio-economic value of groundwater in the Table Mountain Group (TMG) aquifer.

Invited talks by Dr Vermeulen included:

- Water in the SASOL Secunda mines Will mines decant? SASOL Mining Management, Secunda, March 2010.
- Water in the coal industry, especially the needs in the Waterberg coalfield at the Fossil Fuel Foundation of Africa, Johannesburg, August 2010.
- Water in the SASOL Secunda mines SASOL Mine Water Management, at the New Energy Brown Paper meeting for SASOL Technology, SASOL Head Office in Rosebank, 18 November 2010.



Mr Lukas Smith, M.Sc. student (left) and Mr Gus Rowland, M.Sc. student (right), at the IMWA 2010 geology tour.



Dr Danie Vermeulen accompanied students from the institute to the International Mine Water Association Symposium (IMWA) 2010 that was held in Canada in September 2010. As part of the event, a geology tour was also undertaken.

Research

The following research projects were undertaken during 2010:

Development of decision-support guidelines for vulnerability assessments and adaptation requirements among rural economies and communities, including gender issues (phase 1) (WRC Project) – Climate change is already starting to affect some of the poor and most vulnerable communities around the world. The effect that increased droughts, extreme weather events, tropical storms and sea-level rises will have on large parts of Africa, will be experienced during our lifetime. For some rural communities, the consequences could be apocalyptic. These communities have limited access

From left: Dr Danie Vermeulen and Mr Lukas Smith (M.Sc. student) at the IMWA 2010 Conference in Canada.

to essential services, and that is also compounded by uneven distribution and over-exploitation of water resources. Understanding sensitivities and vulnerabilities of systems and communities is necessary to inform adaptation action.

Potential climate change impacts on Karoo aquifers (WRC Project) – very little research has been conducted on the future impact of climate change on groundwater resources in South Africa. Climate change can affect groundwater levels, recharge and groundwater contribution to baseflow. The question of the likely impact of climate change on renewable groundwater resources is highly relevant, but under-researched. As a first step the IGS is assessing the impact of climate change on South African Karoo aquifers.

Updating Groundwater Resource Directed Measures methodologies (WRC Project) – methods were developed to assess the groundwater component of the Resource-Directed Measures that include classification, the reserve and resource-quality objectives. As the methods were applied and tested, gaps have been identified. The aim of this project was therefore to build on the existing manual, address the gaps identified in the methods, and include new methods that can be applied to assess Groundwater Resource Directed Measures.

Bulk-flow parameter estimation (WRC Project) – the study firstly involves the usage of borehole geological and pump test data to determine an effective scaling methodology to determine transmissivities on any prescribed scale. Secondly, it involves determining the method in which aerial parameters should be applied to calculate regional parameters, i.e. at groundwater catchment scale. Finally, it involves evaluating water availability for human activities on a regional as well as local scale.

Light Non-Aqueous Phase Liquids (LNAPLs) (WRC Project) – this study focuses on the effects of LNAPLs on the South African environment and methodologies to effectively characterise and remediate contamination sites. Secondly, it focuses on transferring the knowledge gained to interested and affected parties. Finally, the focus is to assist the South African community in developing guidelines to cope with the presence of LNAPLs in the subsurface.

Water ingress rates into mining operations – this research involves general projects obtained as individual projects from mining companies. The main objective is to evaluate the rate or possible rate of water ingress in open-cast, burrow-pits and subsurface mining operations. It also involves the evaluation and determining of dewatering schemes and fill-up rates, as well as determining decanting points and the probability of mines decanting.

Mine-water quality and assessment options – here IGS acts as advisor in determining the most effective methodology in the determination of water impacts, i.e. hydrogeological, geochemical modelling and/or ABA evaluation.

National and international collaboration

Drs Rainier and Ingrid Dennis visited the University of Minnesota (UMN) for three weeks in June 2010 to establish ties with the UMN. This includes the exchange of undergraduate and postgraduate students, the exchange of faculty members, including research staff,





Dr Rainier Dennis (left) with Prof. George Pinder (one of the fathers of Groundwater) at the International Symposium on Environmental Hydraulics.

technical assistance and/or training, the exchange of training material, and joint research. Meetings were arranged with associated organisations such as the US Geological Survey (USGS), Minnesota Geological Survey and Minnesota Pollution Control Agency. A seminar was presented on the challenges facing the water industry in Southern Africa, with particular focus on South Africa. This visit resulted in Prof. John Nieber being appointed as Affiliate Professor at the UFS.

On their way back to South Africa, Dr Rainier Dennis presented a paper at the 6th International Symposium on Environmental Hydraulics in Athens, Greece.

Dr Ingrid Dennis attended a workshop in Potsdam, Germany, on Integrated Water Management (IWM) in gold mining areas of the upper and middle Vaal catchments of South Africa, also during June 2010. As a result of the workshop, the IGS, together with Geotec Rohstoffe GmbH (and other German partners), is busy developing a proposal entitled METSI: A project addressing gold mining-related water issues. Ph.D. student, Christopher Ndiweni, visited Dr Kenzi Karasaki at the Lawrence Berkeley National Laboratory twice during the year to address difficulties experienced with the inability of existing computer codes for groundwater flow to handle fracture flow. They finally solved this problem by adjusting the well-known TOUGH2 code.

Community service

The Institute for Groundwater Studies is involved in various community service projects. The following modules are involved in groundwater investigations: GHR611, GHR612, GHR613, GHR621 and GHR622.

The IGS presents short courses to industry and government on a regular basis and students have free access to these courses, although it does not form part of their formal educational programme.

Courses presented by Drs Rainier and Ingrid Dennis:

A five-day Groundwater Modelling and Risk Assessment Training Course designed to provide the attendees with the knowledge and tools necessary to solve miningrelated groundwater problems, was presented in Pretoria from 29 November to 3 December 2010. Software used in the tutorials includes PMWIN (a finite difference groundwater package), SPRING (a numerical model specifically developed for the simulation of groundwater flow in the mining environment) and Groundwater Expert (a stochastic-based risk assessment package). This course was co-presented by Prof. Christoph König, who obtained a Ph.D. at Ruhr University Bochum, Germany, and currently works at Delta h Consultants GmbH in Germany as the manager of software development and groundwater modelling, and Prof. Kai Witthüser, who has a Ph.D. in hydrogeology from the University of Karlsruhe in Germany. He is a partner at Water Geosciences Consulting and an Associate Professor at the University of the Free State (UFS).

Geohydrological Software Development for Decision Support Training Workshops were held in Bellville, Van Rhynsdorp and Pretoria during September 2010. Training was done on Aquiworx (integration between Aquimmon and AMS) and the analytical component of the Groundwater Expert (SAGDT).

A Groundwater Resource-Directed Measures (GRDM) Training Workshop was held in Stellenbosch from 13–14 December 2010. This two-day course sponsored by FETWATER, included the latest methodologies applied in GRDM assessments and the updated version of the GRDM software. Courses presented by Dr Danie Vermeulen:

Dr Vermeulen lectured on the impact of coal mining on the water resources of South Africa, acid mine drainage, ground water and geohydrology at the University of the Witwatersrand as part of the module in the postgraduate Master's programme for industrial personnel, *Coal and the Environment, Sustainable Development of the Coal Industry through Optimised Coal Production, Utilisation and Environmental Control.* Dr Vermeulen was voted best lecturer during the course.

He also presented Groundwater in the Waterberg Coalfield for the WRC in Lephalale during August 2010.

Courses and talks presented by Prof. Gerrit van Tonder:

A one-day practical pumping test course was given to the Free State Agricultural and Pretoria ARC's departments for borehole sustainable estimations and also to personnel from the Northern Cape Department of Water Affairs in Upington on pumping test analyses.

Prof. Van Tonder was invited to speak on environmentally friendly gardening and vermicomposting to a variety of garden societies/clubs, amongst others, the garden societies of Hertzogville and Hoopstad, during October 2010.

He also gave a talk on environmentally friendly gardening at the *Tuis/Home* readers' day that was held on his farm at Bainsvlei on 23 October 2010.

All researchers at the IGS assisted in presenting the Groundwater Field School for the Groundwater Division of South Africa in Bloemfontein during February 2010.

267



Geohydrology students at the borehole drilling at Eunice Secondary School.

> Drs Ingrid and Rainier Dennis accompanied officials from the Department of Water Affairs on two field trips to teach them about groundwater and its incorporation into the National Water Act. They also ran several groundwater training courses for students and government officials.

> As part of their practical training, postgraduate students investigated the possibility of drilling for water at Eunice Secondary School. The borehole was successfully sited by scientific methods and drilled and the students obtained access to a site where successful training could be done for the GHR 613 course. The IGS students did all their practical examinations at the site. The students also did their geophysical practical examination at the school, as well as a practical in pumping test analysis.

> The laboratory at the Institute for Groundwater Studies is contacted on a regular basis to assist school children in projects for the Eskom Science Expo. The laboratory and Prof. Gerrit van Tonder assisted a Grade 7 learner from the Universitas Primary School in Bloemfontein with her project that involved the development of a biofilter to remove phosphates, nitrates and ammonium in fish tanks. She received a gold medal at the Expo for her project.

Facilities

The IGS has created and paid for a new student/lecturing facility that can accommodate 40 students. This facility is not only used for teaching, but the students have

Borehole successfully drilled at Eunice Secondary School.

24/7 access to this room for studying or to work on their assignments.

Computer equipment for the programme is excellent, but the laboratory facilities are not sufficient for teaching and learning. The venues for contact learning, practical work and community-service learning are, however, suitable.

Geohydrology is a profession where fieldwork is a necessity. The IGS is well equipped for fieldwork. The IGS also has access to an in-house borehole in the lapa at the UFS that is used for teaching purposes. A test site is also available on campus with 30⁺ boreholes, where aquifer parameters can be determined as part of the course.

research OUTPUTS Groundwater Studies

Research articles

Bester, M. & Vermeulen, P.D. 2010. Investigation of potential water quality and quantity impacts associated with mining of the shallow Waterberg coal reserves, west of the Daarby Fault, Limpopo Province, South Africa. *Water SA* 36(5): 531-542.

Dennis, I., Pretorius, J. & Steyl, G. 2010. Effect of fracture zone on DNAPL transport and dispersion: A numerical approach. *Environmental Earth Science* 61: 1531–1540.

Steyl, G. & Dennis, I. 2010. Review of coastal-area aquifers in Africa. *Hydrogeology Journal* 18: 217-225.

Chapters in books

Akoachere, R.A. II & Van Tonder, G. 2010. Thermal dilution test: A new method for the determination of fracture positions, flow zones and ground water velocities in aquifers, using temperature as a tracer in single wells. In: *Proceedings of the International Mine Water Association (IMWA) Symposium 2010: Mine Water & Innovative Thinking*, edited by C. Wolkersdorfer & A. Freund. Canada: Cape Breton University Press. pp. 27–31.

Dennis, S.R. & Dennis, I. 2010. Potential climate impacts on South African aquifers. In: *Environmental Hydraulics* Vol. 2, edited by G.C. Christodoulou & A.I. Stamou. Leiden, The Netherlands: CRC Press/Balkema. pp. 1163–1170.

Vermeulen, P.D. & Dennis, I. 2010. The assessment of mine rebound and decanting in deeper coal mines. In: Proceedings of the International Mine Water Association Symposium 2010: Mine Water & Innovative Thinking, edited by C. Wolkersdorfer & A. Freund. Canada: Cape Breton University Press. pp. 511–514.

Report

Dennis, S.R. & Dennis, I. (with inputs from Phaello Rantlhomela & Corneli Hogan). 2010. *Potential climate change impacts on Karoo aquifers. Water Research Project no. K8/864.* Report to the Water Research Commission, Pretoria, South Africa.

Conference contributions

Dennis, S.R. & Dennis, I. 2010. Fuzzy Logic Risk Model: A tool to assess the impacts of mining on groundwater systems. Proceedings of the Biennial Conference and Exhibition of the Water Institute of Southern Africa (WISA) 2010, Durban Convention Centre, Durban, South Africa. 18–22 April.

Dennis, S.R. & Dennis, I. 2010. Potential climate change impacts on South African aquifers. Proceedings of the 6th International Symposium on Environmental Hydraulics (ISEH 2010), Athens, Greece. 23-25 June. pp. 1163-1170.

Lorentz, S.A., Freese, C., Le Roux, P.A.L., Van Tol, J.J. & Vermeulen, P.D. 2010. Hillslope hydrological response using catena pedology. Proceedings of the European Geosciences Union (EGU) General Assembly 2010, Vienna, Austria. 2-7 May. Geophysical Research Abstracts, EGU2010 12: 14427.

Vermeulen, P.D. 2010. Groundwater in coal mining. Invited paper delivered at Mine Water and Waste Water Management Conference (Madats Mzansi), South Africa Reserve Bank, Pretoria, South Africa. 16-18 November.

Vermeulen, P.D. 2010. Is it necessary to diffuse the acid mine water bomb threatening Johannesburg? A groundwater hydraulics perspective. Invited paper delivered at the Sustainable Water Management, Waste Water and Sanitation Conference 2010, Johannesburg, South Africa. 27-29 October.

Vermeulen, P.D. 2010. Water in coal mining. Keynote address delivered at the Mine Water and Waste Water Management Conference (Madats Mzansi), South Africa Reserve Bank, Pretoria, South Africa. 16-18 November.

Vermeulen, P.D. & Dennis, I. 2010. The assessment of mine rebound and decanting in deeper coal mines. Paper delivered at the International Mine Water Association (IMWA) Symposium 2010: Mine Water & Innovative Thinking, Sydney, Nova Scotia, Canada. 5-9 September.



270



Contact details

Dr Ingrid Dennis

Faculty of Natural and Agricultural Sciences Institute for Groundwater Studies University of the Free State PO Box 339 Bloemfontein 9300 South Africa

Telephone: Fax: Email: Website: +27 (0)51 401 3481 +27 (0)51 444 6538 dennisi@ufs.ac.za www.ufs.ac.za/igs

Academic staff

Director: Dr Ingrid Dennis

Professor: Prof. Gerrit van Tono

Researchers: Drs Rainier Dennis, Danie Vermeulen and Mr Eeclo Lukas

Affiliate Associate Professor: Prof. Kai Witthüser Affiliate Professor: Prof. John Nieber

Affiliate Researchers: Profs. Jopie Botha, Gideon Steyl and Dr Johan van der Merwe

Laboratory Staff: Mrs Lore-Mari Cruywagen, Mrs Elna de Neckar, Mrs Henrihet Human, Mrs Jossie van der Merwe and Mrs Ennie NciNci

WORKSHOPS

0

ø

"The estimated saving for the Faculty of Natural and Agricultural Sciences amounts to R3,36 million for the past year."

– Mr Adriaan Hugo

Electronics Workshop





Overview

The Electronics Workshop at the University of the Free State (UFS) mostly supports the Faculty of Natural and Agricultural Sciences in terms of the maintenance and development of electronic systems and equipment. In total, 468 work requisitions were received over the past year, representing 723 apparatus. Of these, 29 were for development projects. Some were new projects, while others were extensions of existing systems as well as the upgrading of older systems, as shown in tables 2 and 3.

Of a possible 5 699 working hours, 5 602 were actively used, representing 98,3% of the total number of working

hours. The possible hours were calculated at 7,25 hours per day per staff member present.

Table 1 indicates the number of hours spent per each of the 34 departments and divisions that made use of the services of the Electronics Workshop.

Department	Total time spent (hours)	Percentage
Chemistry	923	16,48%
Physics	923	16,48%
Microbial, Biochemical and Food Biotechnology	734	13,10%
Plant Sciences	707	12,62%
Soil, Crop and Climate Sciences	420	7,50%
Internal Administration	377	6,73%
Animal, Wildlife and Grassland Sciences	303	5,41%
Geology	270	4,81%
Outside work	126	2,25%
Computer Science and Informatics	124	2,21%

Table 1

Mr Innes Basson building a new instrument for measuring pressure and power quality for the surface characterisation systems in the National Nano Surface Characterisation Facility (NNSCF) in the Department of Physics.

AND AGRICULTURAL SCIENCES ANNUAL REPORT 2010	
274	

Department	Total time spent (hours)	Percentage
Zoology and Entomology	97	1,73%
Clinical Skills	85	1,52%
Electronics	84	1,50%
Urban and Regional Planning	68	1,21%
Law	62	1,10%
Natural and Agricultural Sciences - General	41	0,73%
Architecture	39	0,70%
National Control Laboratory	33	0,59%
Haematology	21	0,37%
Institute for Groundwater Studies	20	0,35%
Genetics	20	0,36%
Centre for Environmental Management	19	0,34%
Theology	18	0,32%
Experimental Farms	14	0,26%
Geography	13	0,23%
Medical Physics	12	0,21%
Physiotherapy	10	0,19%
Physical Resources	10	0,19%
Exercise and Sport Science	8	0,14%
Centre for Microscopy	8	0,14%
Pharmacology	4	0,07%
Grounds	4	0,07%
Lengau Agricultural Development Centre	3	0,05%
UVPERSU	2	0,04%
Total	5 602	100%

Time spent on different faculties:

Natural and Agricultural Sciences	92,54%
Other	7,46%

Department	Apparatus
Physics	6 x Access Controls
	4 x Power Supplies
	2 x UV Units
	1 x Nano Amp. Meter
	1 x Focus Control
	1 x P C Board machine
Chemistry	8 x Access Controls
	4 x 10m Amp. Sources
	2 x Honours Practical
	Measuring Sets
	2 x UV units
	2 x Access Controls
	1 x Camera System
Microbial, Biochemical and Food Biotechnology	4 x Access Controls
	1 x Autoclave Controller
	1 x Speed Controller
	1 x Camera System
Plant Sciences	5 x Glass Houses
	1 x Access Control
Urban and Regional Planning	14 x Access Controls
Architecture	8 x Access Controls
Law	5 x Camera Systems
Computer Sciences and Informatics	5 x Alarm Systems
Animal, Wildlife and Grassland Sciences	4 x Access Controls
Farms	4 x Alarm Systems
Zoology and Entomology	2 x Access Controls
Clinical	1 x Timer
Theology	1 x Access Controls

Table 2 - Completed projects

Time spent on different activities:

Maintenance	65,23%
Development	28,04%
Administration	6.73%

Mr Chad Lowe working on a high voltage module for the NanoSAM in the National Nano Surface Characterisation Facility (NNSCF) in the Department of Physics.

Activities

Messrs Adriaan Hugo and Innes Basson attended a course at Physical Electronics in America, together with Prof. Koos Terblans and Dr Lisa Coetsee from the Department of Physics. The course addressed the maintenance and operation of the new PHI 700 NanoSAM and PHI 5000 Versa probe. The course was very educational, not only with regard to the new equipment, but also regarding some of the older apparatus as well, as there are similar units involved. We also strengthened personal ties with the personnel at Physical Electronics, which will be of great benefit in future.

Mr Hugo was invited to serve on a panel of five persons to evaluate the Departments of Electronics and Instrumentation of the University of KwaZulu-Natal. The purpose of this was to make suggestions for improvement. It was an educational process and good measuring opportunity to see how we compare to other universities. It was clear that our workshop's work, especially concerning the development of projects, is of a high standard. They are going to use our management system as model to better their system.

The modernisation of the electronic temperature control system for the glasshouses at the Department of Agriculture was completed. This system is continually monitored and improvements are implemented where necessary.

It is imperative that circuit diagrams be supplied when new apparatus is bought, and where possible, the equipment must be standardised. This is to ensure that there is a better chance of success in the repairs of the apparatus. In recent years, a high number of recently bought equipment became faulty without any information available on them, placing pressure on the workshop. The Electronics Workshop continually aspires to improve service and be as productive as possible. The situation regarding the lack of diagrams negatively affects our productivity, as a lot of time is wasted, for example, trying to find information on the Internet. In the past, the departments were responsible for supplying all the relevant technical information pertaining to the equipment they acquire and use.

The estimated saving for the Faculty of Natural and Agricultural Sciences for the past year amounts to R3,36 million. This amount is calculated by taking the actual number of working hours multiplied by the market-related hourly rate of R600. When looking at the amount and complexity of the projects done, this amount could easily be doubled if the work had been outsourced.

Staff members

Head: Mr Adriaan Hugo

Control Technicians: Messrs Innes Basson, Henri Roodt and Chad Lowe

Contact details

Mr Adriaan Hugo

2011

Faculty of Natural and Agricultural Sciences Electronics Workshop University of the Free State PO Box 339 Bloemfontein 9300 South Africa

Tel: E-mail: Website: +27 (0)51 401 2494 hugoab@ufs.ac.za www.ufs.ac.za

"The estimated saving for the Faculty of Natural and Agricultural Sciences for the past year amounts to R2,55 million."

— Mr Japie Myburgh

Instrumentation Workshop



Overview

The aim of the Instrumentation Workshop is to manufacture equipment for academic staff that mainly assists them in research. Amongst others, we manufacture pipette stands, containers for test-tube bottles, laboratory trolleys, stands for cadavers at Anatomy, and we service and repair vacuum pumps.

Furthermore, we design and manufacture stainless steel bailers for the Institute for Groundwater Studies, and filaments and heaters that the Department of Physics use with high-evaporation apparatus. We also service and repair scales and microscopes. We do work for all the departments on campus, including the Faculty of Health Sciences. We mainly support the Faculty of Natural and Agricultural Sciences.



Time spent on different faculties:

Natural and Agricultural Sciences	95,29%
Other	4,71%

The estimated saving for the Faculty of Natural and Agricultural Sciences for the past year amounts to R2,55 million. This amount is calculated by multiplying the actual number of working hours by the market-related hourly rate of R400.

Single ear threshing machine



Table 1

Department	Total time spent (hours)
Natural and Agricultural Sciences	
Chemistry	1 188
Zoology and Entomology	450
Electronics	346
Physics and Astronomy	584
Geology	284
Institute for Groundwater Studies	640
Instrumentation Maintenance	160
Internal Administration	200
Microbial, Biochemical and Food Biotechnology	450
Plant Sciences	670
Soil, Crop and Climate Sciences	935
Animal, Wildlife and Grassland Sciences	15
National Control Laboratory	150
Health Sciences	
Haematology	150
Cardiothoracic Surgery	30
External Work	
Various institutions	120
Total	6 372

Activities

Table 2 – Completed projects

Department	Apparatus
Chemistry	Design and manufacture 'pressure bomb' for Prof. Luyt
	Service vacuum pumps
	Design and build laboratory jacks
	Design and manufacture nitrogen trolley
Zoology	Manufacture nets to capture insects
	Design and manufacture insect nets
	Design and manufacture ground drills and funnel stands
Physics	Service and manufacture heaters and filaments
	Design and manufacture burn-off heaters and filter containers
	Cut different samples for research
	Service and repair of vacuum pump
Institute for Groundwater	Design and manufacture water sample containers
Studies	Design and manufacture kinetic cell containers
	Design and manufacture differently sized stainless steel bailers
Microbiology	Manufacture trolley for trays and trays of stainless steel
	Repair shakers
	Repair centrifuges
	Manufacture Perspex and aluminium Effendorf containers
	Manufacture pipette stands
	Manufacture test-tube shelves
	Manufacture filter containers and sample equipment for mining water
	Manufacture PVC bioreactors and make adaptations for research
Botany	Manufacture rust-enhancing frames
	Manufacture spray-track collector equipment
	Manufacture insect cage frames
	Manufacture Perspex airflow boxes
Agriculture	Manufacture PVC steam pots
	Manufacture container for storage of ceramic plates
	Manufacture trolley for glasshouse
	Cut different PCV pipes in different lengths
Soil Science	Manufacture segment retention columns
	Manufacture stand for vacuum apparatus and column shelves
	Manufacture ground drills and seedbed rollers
Geology	Manufacture lock-up cabinets for crystals and precious stones
	Manufacture grinding disc
	Manufacture stainless steel sample containers
Other departments	Throughout the year, many departments' vacuum pumps were repaired and serviced
	Many Perspex pipette shelves were manufactured at 30% of the supplier's price
	Throughout the year, more of the old microscopes and balances were serviced

282

Contact details

Mr Jannie Myburgh

Faculty of Natural and Agricultural Sciences Instrumentation Workshop University of the Free State PO Box 339 Bloemfontein 9300 South Africa

Tel: E-mail: Website: +27 (0)51 401 2341 myburghjs@ufs.ac.za www.ufs.ac.za

Staff members

Section Head: Mr Jannie Myburgh

Assistant Head: Mr Johan Erasmus

Control Technicians: Messrs Pieter Botes, Joggie Rautenbach

Technical assistant: Messrs George Tshwene, Edward Hlazo







Comparison for the Faculty of Natural and Agricultural Sciences: 2009-2010



5	0	
2	0	Э

Year				Female					Male					Total		
	Description	Black	Coloured	Asian	White	Total	Black	Coloured	Aisan	White	Total	Black	Coloured	Asian	White	Total
2009	Under- graduate	980	34	14	463	1491	898	27	19	813	1757	1878	61	33	1276	3248
	Postgraduate	304	13	21	267	605	495	20	25	469	1009	799	33	46	736	1614
	Occasional	116	2		16	134	124	1		20	145	240	3		36	279
TOTAL		1400	49	35	746	2230	1517	48	44	1302	2911	2917	97	79	2048	5141
2010	Under- graduate	1121	31	16	503	1617	1048	38	20	828	1934	2169	69	36	1331	3605
	Postgraduate	365	14	15	288	682	533	25	19	483	1060	898	39	34	771	1742
	Occasional	128	5	1	15	149	128	2	1	26	157	256	7	2	41	306
TOTAL*		1614	50	32	806	2502	1709	65	40	1337	3151	3323	115	72	2143	5653

Student figures: 2009-2010

*2010 Final HEMIS figures not yet available

International Students

Nationality	Year		
	2009	2010	
Asian countries	24	22	
Botswana	23	28	
Democratic Republic of the Congo	1	2	
European countries	12	9	
Lesotho	146	201	
Malawi	5	3	
Mauritius	3	4	
Mozambique	7	2	
Namibia	65	88	
North America	5	2	
Other African countries	71	84	
Swaziland	6	6	
Zambia	8	13	
Zimbabwe	62	86	

Post-/Undergraduate Students

	Year	
	2009	2010
Undergraduate	3248	3605
Postgraduate	1614	1742
Occasional	279	306
	5141	5653

		Year	
	2009	2010	
Doctoral	239	239	
Master's	814	932	
	1053	1171	



286

Accredited Articles (2008-2010)





Books (2008-2010)



Local Conferences (2008-2010)

International Conferences (2008-2010)



List of abbreviations

ARG	Department of Architecture	FSK	Department of Physics
BOR	Department of Quantity Surveying and Construction Management	GEN	Department of Genetics
CEM	Department of Chemistry	GEOG	Department of Geography
DK	Dean's Office	GGK	Department of Soil, Crop and Climate Sciences
DRK	Department of Zoology and Entomology	IGS	Institute for Groundwater Studies
LEK	Department of Agricultural Economics	SRB	Disaster Management Training and Education Centre for Africa (DiMTEC)
MBV	Department of Microbial, Chemical and Food Biotechnology	SSB	Department of Urban and Regional Planning
PLK	Department of Plant Sciences	STAT	Department of Mathematical Statistics and Actuarial Science
RKW	Department of Computer Science and Informatics	SVL	Centre for Sustainable Agriculture, Rural Development and Extension
SM	Centre for Microscopy	VERB	Consumer Science
SOB	Centre for Environmental Management	VWW	Department of Animal, Wildlife and Grassland Sciences
WISK	Department of Mathematics and Applied Mathematics		
GLOSSARY



A	
AAAE -	African Association of Agricultural Economists
AEASA -	Agricultural Economics Association of South Africa
AAPS -	Association of African Planning Schools
AAS -	Atomic Absorption Spectroscopy
ACCFP -	African Climate Change Fellowship Programme
Adh -	Alcohol dehydrogenase
ADSARD -	Advanced Diploma in Sustainable Agriculture and Rural Development
AEON -	Africa Earth Observation Network
AFAAS -	African Forum for Rural Advisory Services
AI -	Artificial Insemination
ALC -	African Laser Centre
AMD -	Acid Mine Drainage
AMI -	Advanced Metal Initiative
ARC -	Agricultural Research Council
ART -	Artificial Reproduction Techniques
ASAQS -	Association of South African Quantity Surveyors
ASOCSA -	Association of Schools of Construction of Southern Africa
AVS -	American Vacuum Society
AZEF -	Arid Zone Ecology Forum
В	
BBSRC/DfID -	Biotechnology and Biological Sciences Research Council and the Department for International Development
BGRI -	Borlaug Global Rust Initiative

(
l	

<u> </u>	
CANSA -	Cancer Association of South Africa
CAPS -	Curriculum and Assessment Policy Statement

CATSA -	Catalysis Society of South Africa
CDS -	Centre for Development Support
CED -	Centre for Education Development
CENSARDE -	Centre for Sustainable Agriculture, Rural Development and Extension
CEO -	Chief Executive Officer
CePHMa -	Centre for Plant Health Management
CHESD -	Centre for Higher Education and Studies and Development
CHPC -	Centre for High Performance Computing
CIAT -	Centre for the Improvement of Tropical Crops
CIB -	Centre of Excellence for Invasion Biology
CIDB -	Construction Industry Development Board
CIOB -	Chartered Institute of Building
CLSM -	Confocal Laser Scanning Microscope
COE -	Centre of Excellence
CPD -	Continuing Professional Development
CRATerre-ENSAG -	The International Centre for Earth Construction at the National Superior School of Architecture of Grenoble
CSIR -	Council for Scientific and Industrial Research
CST-SA -	Cereal Society and Technology-SA
CUT -	Central University of Technology

D

DAFF -	Department of Agriculture, Forestry and Fisheries
DFG -	Deutche Forschungsgemeinschaft
DiMTEC -	Disaster Management Training and Education Centre for Africa
DMISA -	Disaster Management Institute of Southern Africa

DSC -	Differential Scanning Calorimetry
DST -	Department of Science and Technology
DTI -	Department of Trade and Industry

Е

EBV -	Breed Value Estimations
ECA -	European Crystallographic Association
ECM26 -	European Crystallographic Meeting
EGU -	European Geosciences Union
ESTE -	Excited States of Transition Elements
ETRA -	Eye-Tracking Research & Applications
EU -	European Union

F

FABI -	Forestry and Agricultural Biotechnology Institute
FAO -	Food and Agricultural Organisation
FET -	Further Education and Training
FMP -	Facilities Management Programme
FGAP -	Faculty of Genomics and Proteomics

G

GFRAS -	Global Forum for Rural Advisory Services
GIS -	Geographical Information Systems
GRDM -	Groundwater Resource-Directed Measures
GRF -	German Research Foundation

Η

HASYLAB -

Ι

IBREAM -	Institute for the Breeding of Rare and Endangered African Mammals
ICC -	International Association for Cereal Science and Technology
ICN -	International Conference on Nanomaterials

Hamburg Synchrotron Radiation Laboratory

ICPOES -	Inductively Coupled Plasma Optical Emission Spectroscopy
IDC -	Industrial Development Corporation
IDECAT -	Integrated Design of Catalytic Nanomaterials for Sustainable Production
IDP -	Internationally Displaced Persons
IFHE -	International Federation for Home Economics
IFORS -	International Federation of Operational Research
IGS -	Institute for Groundwater Studies
ILO/UNEP -	
ILVO -	Institute for Agricultural and Fisheries Research
IMA-COM -	Commission on Ore Mineralogy of the International Mineralogical Association
IMC -	Inter-Ministerial Committee
IMWA -	International Mine Water Association
INCRoP -	Insects on New Crops Programme
INQUA-	International Union for Quarternary Research
IPMP -	Intensive Project Management Programme
IQF -	Individually Quick Frozen
IT -	Information Technology
IUCr -	International Union of Crystallography
IUFoST -	International Union of Food Science and Technology
IUFRO -	International Union of Forest Research Organisations
IWM -	Integrated Water Management
IWRM -	Integrated Water Resources Management
IyA -	Inkaba yeAfrica
V	
V	
KIFI -	Kamutjonga Inland Fisheries Institute

L

LFA -	Landscape Function Analysis
LNAPL -	Light Non-Aqueous Phase Liquids
LRAD -	Land Redistribution for Agricultural Development
LRI -	Laser Research Institute

Μ

MCA-L -	Millennium Challenge Account-Lesotho
NCC -	Millennium Challenge Corporation
MNS -	Material and Nanosciences Cluster
MOF -	Metal Organic Framework
- UON	Memorandum of Understanding
MRM -	Mineral Resource Management
MSA -	Master's Degree in Sustainable Agriculture
MUCPP -	Mangaung/University Community Partnership Programme

Ν

NanoSAM -Nano Scanning Auger Microscope NATP -New Academic Tutor Programme NECSA -Nuclear Energy Corporation of South Africa NHC -National Heritage Council NMISA -National Metrology Institute of South Africa NMMU -Nelson Mandela Metropolitan University NMR -Nuclear Magnetic Resonance NRF -National Research Foundation National Science and Technology Forum NSTF -NTeMBI -Nuclear Technologies in Medicine and the Biosciences NUFFIC -The Netherlands Organisation for Cooperation in Higher Education and Research NWO-WOTRO -The Netherlands Organisation for Scientific Research and Science for Global Development \mathbf{O} ORASECOM -Orange-Senqu River Commission

Р

PAAZAB -	African Association of Zoos and Aquariums
PARSA -	Parasitological Society of Southern Africa
PC HT&S -	Programme Committee Meeting of the Household Technology and Sustainability Committee

PCR -	Polymerase Chain Reaction
PGE -	Platinum Group Elements
PGR -	Plant Growth Regulators
PHP -	Peoples' Housing Process
PMI -	Post-mortem Interval
PPRI -	Plant Protection Research Institute
PRT -	Protein Research Trust

Q

QCP -	Quantity Surveying, Construction Management
	and Project Management

R

RAS -	Rural Advisory Services
R&D -	Research and Development
RICS -	Royal Institute of Chartered Surveyors
RIMISP -	Latin-American Centre for Rural Development

S

SA -	South Africa
SAARMSTE -	South African Association for Research in Mathematics, Science and Technology Education
SAB -	The South African Breweries Limited
SABS -	South African Bureau of Standards
SACAP -	South African Council for the Architectural Professions
SACLA -	Southern African Computer Lecturers Association
SACNASP -	South African Council for Natural Science Professions
SACPCMP -	South African Council for the Project and Construction Management Professions
SACPLAN -	South African Council for Planners
SACPVP -	South African Council for the Property Valuation Profession

292

SACQSP -	South African Council for the Quantity Surveying Profession
SADC -	Southern African Development Community
SAFEFE -	South African Foundation of Economic and Financial Education
SAFOI -	South African Fryer Oil Initiative
SAIA -	South African Institute of Architects
SAIP -	South African Institute of Physics
SAM -	Scanning Auger Microscope
SANDF -	South African National Defence Force
SANPAD -	South Africa-Netherlands Research Programme on Alternatives in Development
SAPOA -	South African Property Owners' Association
SAPS -	South African Police Service
SASAS -	South African Society for Atmospheric Sciences
SASCP -	South African Society of Crop Production
SASHS -	Southern African Society for Horticultural Sciences
SASRI -	South African Sugarcane Research Institute
SAWMA -	South African Wildlife Management Association
SAWSS -	South African Weed Science Society
SEM -	Scanning Electron Microscope
SIDA -	Swedish International Development Agency
SIFE -	Students in Free Enterprise
SIL -	International Society of Limnology
SSSSA -	Soil Science Society of South Africa

Т

TEM -	Transmission Electron Microscope
TGA -	Thermal Gravimetric Analysis
THRIP -	Technology and Human Resources for Industry Programme
TMG -	Table Mountain Group
TWAS -	Third World Academy of Science

U

UCLA -	University of California Los Angeles
UEC -	Unit for Earth Construction

UFS -	University of the Free State
UJ -	University of Johannesburg
UK -	United Kingdom
UKZN -	University of KwaZulu-Natal
UMN -	University of Minnesota
UNESCO -	United Nations Educational, Scientific and Cultural Organisation
UNICEF -	United Nations Children's Fund
UN-OCHA -	United Nations Office for the Coordination of Humanitarian Affairs
UNU -	United Nations University
UNU-EHS -	United Nations University's Institute for Environment and Human Security
UNU-FLORES -	United Nations University Institute for Integrated Management of Material Fluxes and Resources
USA -	United States of America
USGS -	United States Geological Survey
UWM -	University of Wisconsin-Milwaukee

W

WITS -	University of the Witwatersrand
WRC -	Water Research Commission
WRCP -	Wetlands Restoration and Conservation Project
wwu -	Muenster University

Х

Y YWP -

XPS -X-ray photon spectroscope

Young Water Professionals

GLOSSARY

