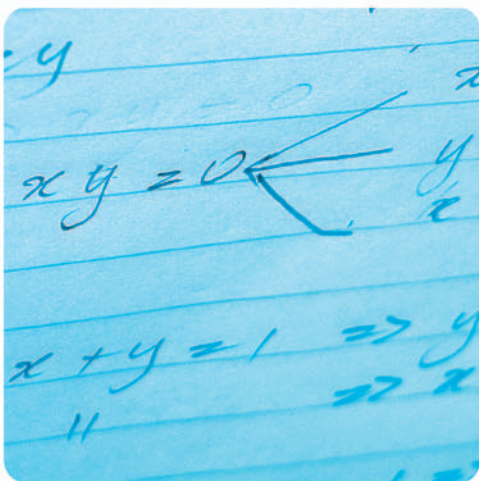
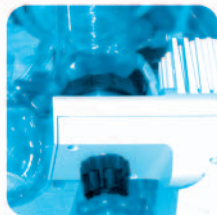


Faculty of Natural and Agricultural Sciences

Report 2008



Faculty of

**Natural and
Agricultural Sciences**

Report 2008

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Preface

From the Dean's Office

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

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

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

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

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

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



Prof. Herman van Schalkwyk.

lationships both within and outside the faculty and the university.

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

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

Staff in the dean's office



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

- Prof. James du Preez, Departmental Chair of the Department Microbial, Biochemical and Food Biotechnology, received the silver medal for exceptional published research awarded at the biennial conference of the South African Society for Microbiology hosted in Graham's Town. It was only the seventh time since 1986 that the medal was awarded;
- A study of the UFS about how the change in the packaging of DNA with cellular development is influenced by the expression of genes, in which Prof. Hugh Patterson played a leading role, was published in a leading peer-reviewed scientific journal *Proceeding of the National Academy of Sciences* of the USA (PNAS). The PNAS journal has an impact factor of 10, which means that studies published in this journal

are referred to by ten other scientific studies within the scope of two years;

- Prof. Riaan Luyt, professor in Chemistry and head of the Natural Sciences Programme at the Qwaqwa Campus, received an honorary medal from the Polymer Institute of the Slovak Academy of Sciences during a conference hosted in the High Tatras mountains of Slovakia;
- Prof. Maryke Labuschagne from the Department of Plant Sciences was the recipient of the National Science and Technology Forum's (NSTF) research capacity-development award. A team consisting of Prof. Jan van der Westhuizen and Dr Susan Bonnet from the Department of Chemistry, Prof. Kenneth Swart and Prof. Thinus van der Merwe from FARMOVS-PAREXEL also

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

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

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

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

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

Faculty news

Successful visit from delegation of the University of Minnesota

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

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

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



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

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

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

50 years of Agriculture celebrated



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

Winners of NSTF awards assist with recruitment of students



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

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

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

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

Young scientists learn what faculty can offer



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

Two UFS academics appointed on the Land Bank Board



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

UFS extends exchange agreement with USA university



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

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

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

Itjoriseng Project launched



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

2007 Faculty report launched

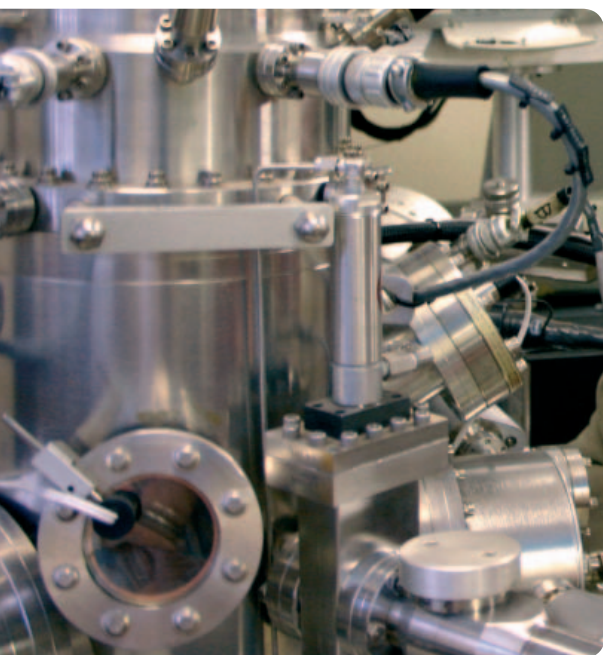


The faculty once again produced another report in which the various departments and centres highlighted their activities for 2007. The report was so well received that a second edition had to be printed. Here are some of the departmental chairpersons during the launch of the report in June 2008.

Department of

Physics

“We are one of the leaders in nanotechnology research. Our achievements in Physics in particular have made national and international headlines.” - Prof. Hendrik Swart.



Prof. Hendrik Swart.

Overview

The Department of Physics again had a number of highlights in terms of academic excellence in 2008.

Profs Pieter Meintjes and Koos Terblans were promoted to full professor, Dr Matie Hoffman to associate professor and Dr Martin Ntwaeaborwa to senior lecturer. Profs Pieter Meintjes, Koos Terblans and Wiets Roos obtained a C2 evaluation, Dr Martin Ntwaeaborwa a Y2 and Prof Swart a B2 rating from the National Research Foundation (NRF). Both Prof. Hendrik Swart and Dr Martin Ntwaeaborwa were finalists in the National Science and Technology Forum's (NSTF) research capacity developer and black researcher

categories, respectively. The NSTF awards give recognition to the outstanding contributions of individuals and groups to science, engineering and technology. Prof. Swart also received the Faculty of Natural and Agricultural Science honourable award for mentorship.

Dr Martin Ntwaeaborwa spent three months at the University of Florida, United States of America (USA) studying the synthesis of quantum dots by a hot solution method. He also started NRF-supported collaborations with South Korean Universities. He regularly gave invited talks at other universities such as the University of the Witwatersrand. He is a member of the High Resolution Transmission

Electron Microscopy (HRTEM) committee of the NRF (working in partnership with the Department of Science and Technology) to establish a National HRTEM Centre. He also accompanied Prof. Herman van Schalkwyk, Dean of the Faculty of Natural and Agriculture Science at the University of the Free State (UFS), to Virginia Polytechnic Institute and State University (Virginia Tech) for discussion and signing of a memorandum of understanding in terms of research collaboration between Virginia Tech and the UFS.

Prof. Roos and one of his M.Sc. students, Mr Charl Jafta, identified the need for X-ray photo electron spectroscopy results (which gives the chemical state of elements on the surface). They successfully rehabilitated the XPS spectrometer originally obtained from the Max Planck Institute in Germany, which had been out of action for some time because of x-ray- and ion beam alignment problems. The system is at present fully operational. In their specific research on segregation the doping of Cu with Al is a first step in specimen preparation. This experimental part led to an annealing system which provides for power failures and monitoring the non-reactive gas atmosphere in the annealing tube. The success of the annealing system was confirmed by XPS results from specimens annealed for ten days at 900°C.

In December 2008, Prof. Hendrik Swart and Prof. Jannie Swarts from the Department of Chemistry received R10 million

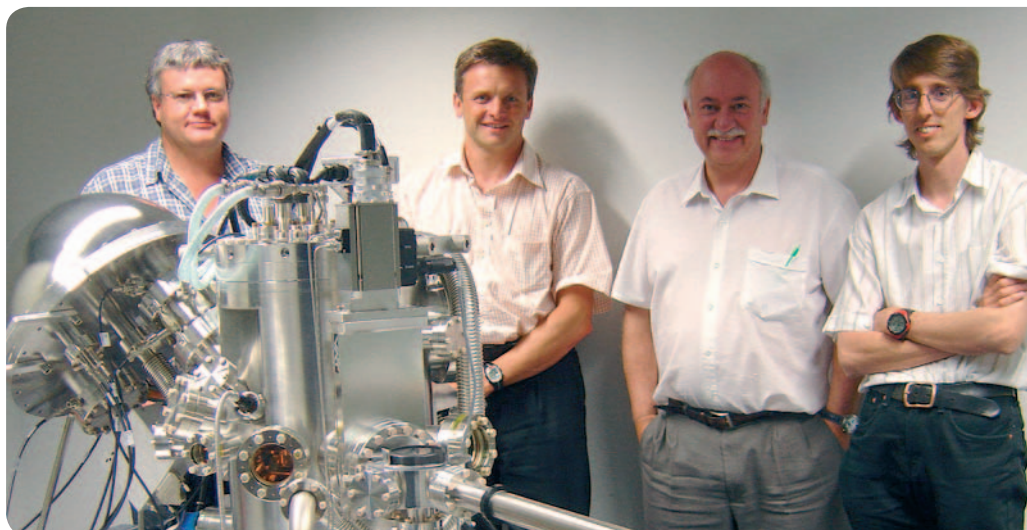
from the National Equipment Programme of the NRF, as well as R3 million from the South African oil giant SASOL, to purchase a nano Scanning Auger Microprobe and an X-ray photoelectron spectroscope to analyse and characterise very small particles. The uniqueness of the system lies in its high resolution capability, which makes it ideal for nanotechnology research. The UFS is one of the leaders in nanotechnology research, and the achievements of Physics in particular have made national and international headlines. The total cost of this equipment package exceeds R23 million and the UFS will be the only institution in Africa, and one of only a few institutions world-wide, that has access to this instrumental array. Profs Hendrik Swart, Jannie Swarts and Koos Terblans have visited several companies in Germany, the United Kingdom (UK) and the USA for live demonstrations on the different systems in order to determine which systems will give us the best performance. Another very valuable addition to the research infrastructure, namely Raman and FTIR spectroscopy, was done from a grant (R1.3 million) obtained from the NRF by Dr Martin Ntwaeaborwa.

Students took part in the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns" competition in Johannesburg, where Mr Charl Jaffa was awarded second prize for his poster. Ms Coetzee again won a software prize with her paper. Ph.D. degrees were awarded to Drs Simon Dhlamini and Edward Jurua. M.Sc. degrees were awarded to Mr Brain van Soelen (cum laude), Hendrik van Heerden and Bosco Oruru.

Staff members and postgraduate students attended several international conferences and summer schools. Mr Edward Jurua attended the School on Astrophysical Fluid Dynamics in Trieste, Italy, while both Messrs Bosco Oruro and Pheneas Nkundubakura attended the High Energy Astrophysics summer school at the University of Urbino, Italy. Mr Nkundubakura also attended the First Middle East-Africa Regional



Prof. Hendrik Swart receiving the faculty's award for mentorship from the Dean of the Faculty of Natural and Agricultural Sciences, Prof. Herman van Schalkwyk.



Profs Hendrik Swart (left) and Jannie Swarts (second from the right) standing at the back of the Versaprobe XPS system during the demo at the SuSoS Laboratorium in Dübendorf, Switzerland. With them are Dr Wolfgang Bets (PHI) (second from the left) and Dr Stefan Zuercher of SuSoS (right).

meeting of the International Astronomical Union (IAU) in Cairo, Egypt. Prof. Pieter Meintjes and two of his Ph.D. students, Bosco Oruro and Pheneas Nkundubakura, gave presentations at the 2008 SKA (Square Kilometre Array) project postgraduate conference in Stellenbosch at the Institute for Advanced Studies.

Profs Swart and Terblans and Dr Dhlamini gave presentations at the 14th International Conference on Solid Films and Surfaces (ICSFS), Trinity College, Dublin, Ireland. Prof. Swart and Dr Ntwaeaborwa both presented their work at the 14th International Workshop on

Inorganic and Organic Electroluminescence and 2008 International Conference on the Science and Technology of Emissive Displays and Lighting, Bagni di Tivoli, Rome, Italy. Profs Swart and Terblans and Mr Heinrich Joubert also made contributions at the 23th International Conference on Atomic Collisions in Solids (ICACS), Phalaborwa. Dr Ntwaeaborwa was sponsored by his American collaborators to present a poster at the American Vacuum Society – 55th International Symposium, Boston, USA. Prof. Matie Hoffman attended the workshop at the Cincinnati Observatory Centre in the USA.

The Research Institute for Education Planning (RIEP) at the UFS trained Grade 12 Science teachers in preparation for the implementation of the National Curriculum Statement for Physical Sciences during the year. The Physical Sciences subject advisors of the Northern Cape Department of Education attended a three-day workshop at the UFS Main Campus where the new Grade 12 subject content was discussed. Prof. Matie Hoffman was involved in the training sessions. Similar training sessions for Physical Sciences teachers in the Northern Cape also took place in Kimberley and Springbok. ■



Prof. Koos Terblans and Mr. Heinrich Joubert on the boat cruise at the 23th ICACS conference in Phalaborwa, South Africa.

Staff

Main Campus:

Professor: Profs Hendrik Swart, Koos Terblans, Pieter Meintjes

Associate Professor: Profs Matie Hoffman, Wiets Roos

Senior Lecturers: Drs Ted Kroon, Martin Ntwaeaborwa

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

Professional Officer: Mr Heinrich Joubert

Administrative Officer: Ms Elsa Pretorius

Owaqwa Campus:

Senior Lecturers: Dr Francis Dejene

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

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Research outputs

Research articles

Coetsee, E., Botha, R., Terblans, J.J. & Swart, H.C. 2008. Lumineserende eienskappe van $Y_2SiO_5:Ce$ nanodunlagies. *Die Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 27(2): 146.

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Ntwaeaborwa, O.M., Dhlamini, M.S., Botha, J.R. & Swart, H.C. 2008. Characterization of sol-gel $SiO_2:Ce,Tb$ powder and pulsed laser deposited

thin film phosphor. *Physica Status Solidi C*. 5(2): 602-605.

Chapters in books

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Conference contributions

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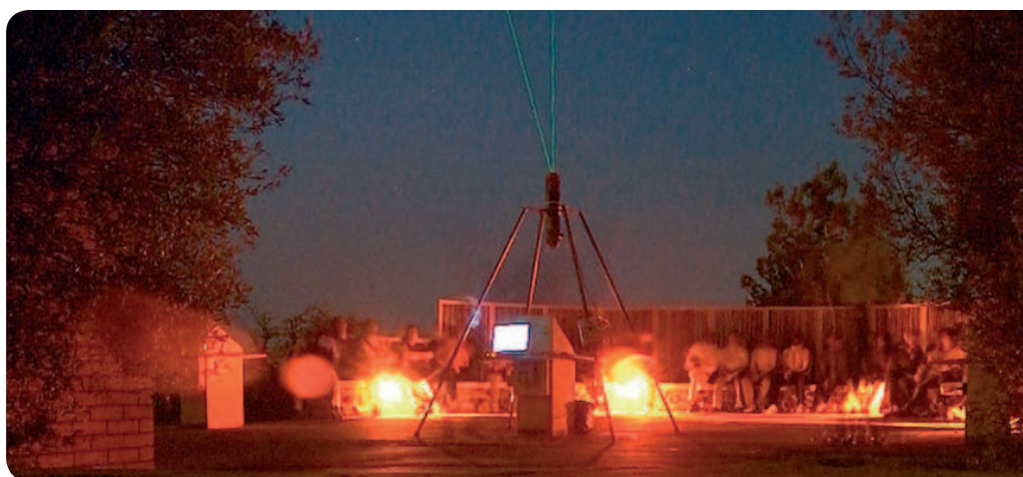
Bem, D.B., Swart, H.C., Luyt, A.S., Coetzee, E. & Dejene, F.B. 2008. *Properties of Blue SrAl₂O₄ Phosphor in LDPE/PMMA Polymers*. Poster presented at the 53rd Annual Conference of the South African Institute of Physics (SAIP), University of Limpopo, Mankweng, South Africa. 9-11 July.

Biggs, M.M., Ntwaeaborwa, O.M. & Swart, H.C. 2008. *The luminescent mechanism of the ZnS:Mn nano-phosphor*. Paper presented at the 53rd Annual Conference of the South African Institute of Physics (SAIP), University of Limpopo, Mankweng, South Africa. 9-11 July.

Biggs, M.M., Swart, H.C., Terblans, J.J. & Ntwaeaborwa, O.M. 2008. *Luminessensie meganisme van gesintetiseerde nanodeeltjies en kommersiële ZnS:Mn²⁺ fosfor*. Paper presented at the Annual Symposium of the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns" (SAAWK), University of Johannesburg, Johannesburg, South Africa. 31 October.

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Dhlamini, M.S., Ntwaeaborwa, O.M., Ngaruiya, J.M., Terblans, J.J. & Swart, H.C. 2008. *Sol-gel synthesis and luminescent properties of nanoparticulate ZrO₂:PbS powder phosphor*. Poster presented at the 14th International Conference on Solid Films and Surfaces (ICSFS), Trinity College, Dublin, Ireland. 29 June - 4 July.



The new laser pointer installed at the Boyden Observatory.

Dolo, J.J., Terblans, J.J. & Swart, H.C. 2008. *Photoluminescence and structural studies of Gd₂O₂S:Tb phosphor powder*. Poster presented at the 53rd Annual Conference of the South African Institute of Physics (SAIP), University of Limpopo, Mankweng, South Africa. 9-11 July.

Jafta, C.J., Roos, W.D. & Terblans, J.J. 2008. *An argon filled user-friendly annealing system*. Poster presented at the 53rd Annual Conference of the South African Institute of Physics (SAIP), University of Limpopo, Mankweng, South Africa. 9-11 July.

Jafta, C.J., Roos, W.D. & Terblans, J.J. 2008. *'n Gebruikersvriendelike uitgloeisisteam*. Poster presented at the Annual Symposium of the "Suid-Afrikaanse Akademie vir Wetenskap en Kuns" (SAAWK), University of Johannesburg, Johannesburg, South Africa. 31 October.

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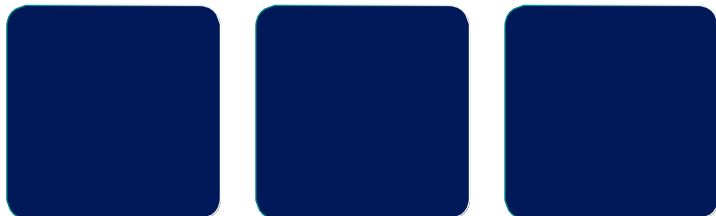
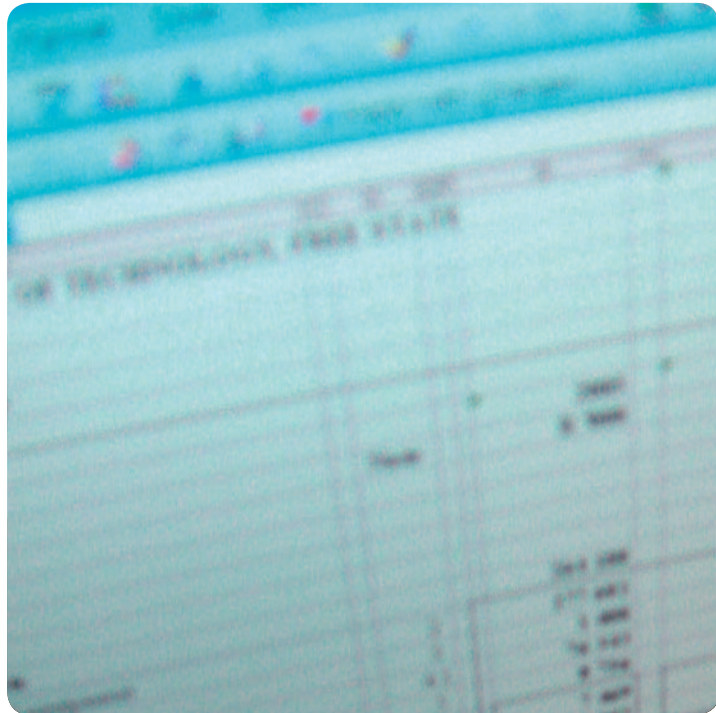
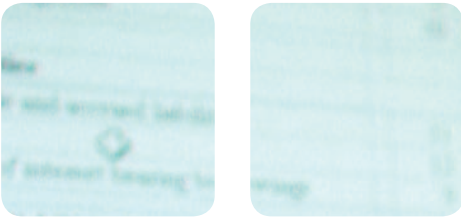
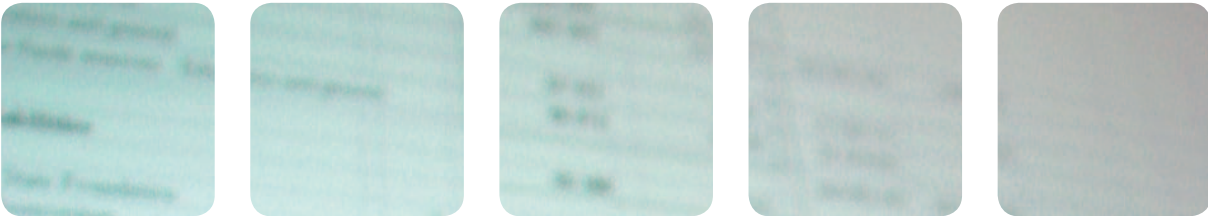
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- Mothudi, B.M., Ntwaeaborwa, O.M. & Swart, H.C.** 2008. *Synthesis and characterization of SrAl₂O₄:Ce³⁺ prepared via the combustion method.* Paper presented at the 53rd Annual Conference of the South African Institute of Physics (SAIP), University of Limpopo, Mankweng, South Africa. 9-11 July.
- Mothudi, B.M., Ntwaeaborwa, O.M. & Swart, H.C.** 2008. *Synthesis and characterization of SrAl₂O₄:Eu³⁺ and SrAl₂O₄:Eu²⁺,Dy³⁺ prepared via the combustion method.* Paper presented at the 2nd International Symposium on Luminescence, Port Elizabeth, University of Rhodes, South Africa. 29 June - 04 July.
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- Terblans, J.J. & Swart, H.C.** 2008. *The segregation of Bi and S from a Cu(Bi,S) ternary crystal.* Poster presented at the 14th International Conference on Solid Films and Surfaces (ICSFS), Trinity College, Dublin, Ireland. 29 June - 4 July.
- Terblans, J.J., Joubert, H.D. & Swart, H.C.** 2008. *Extracting inter-diffusion parameters from Ni/Cu thin films by means of profile reconstruction with the MRI model.* Poster presented at the 23th Biannual International Conference on Atomic Collisions in Solids (ICACS), Hans Merensky Wildlife Estate, Phalaborwa, Limpopo, South Africa. 16-22 August.



Statistical data

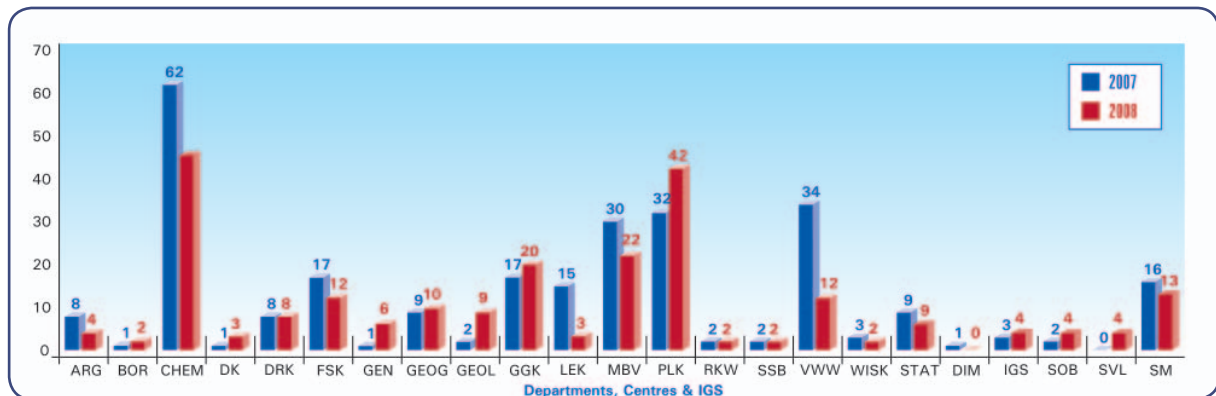


Research outputs: 2007-2008

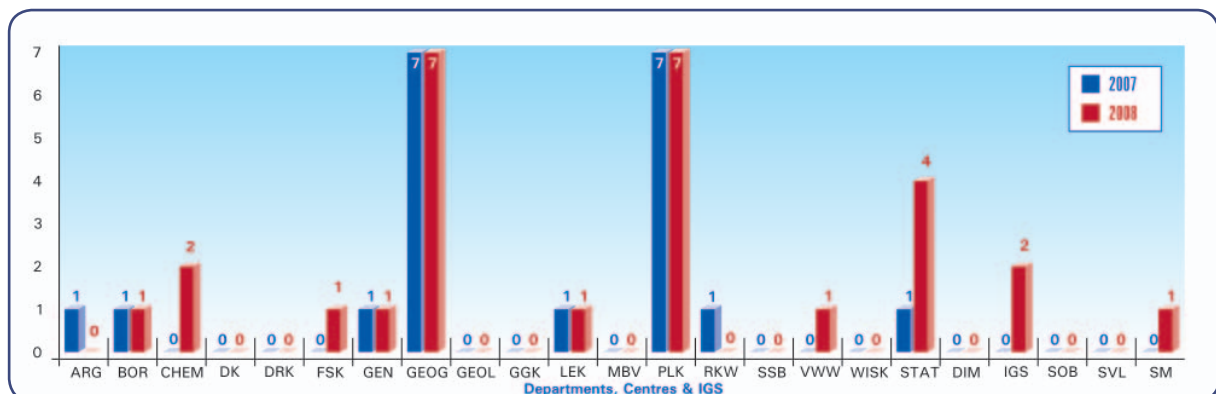
List of abbreviations

Abbreviation	Name	Abbreviation	Name
ARG	Department of Architecture	GGK	Department of Soil, Crop and Climate Sciences
BOR	Department of Quantity Surveying and Construction Management	IGS	Institute for Groundwater Studies
SOB	Centre for Environmental Management	LEK	Department of Agricultural Economics
CEM	Department of Chemistry	MBV	Department of Microbial, Biochemical and Food Biotechnology
SM	Centre for Microscopy	PLK	Department of Plant Sciences
SVL	Centre for Sustainable Agriculture and Rural Development	RKW	Department of Computer Science and Informatics
DK	Dean's Office	SSB	Department of Urban and Regional Planning
DRK	Department of Zoology and Entomology	SRB	Disaster Management Training and Education Centre for Africa (DIMTEC)
FSK	Department of Physics	VWW	Department of Animal, Wildlife and Grassland Sciences
GEN	Department of Genetics	STAT	Department of Mathematical Statistics and Actuarial Science
GEOG	Department of Geography	WISK	Department of Mathematics and Applied Mathematics
GEOL	Department of Geology		

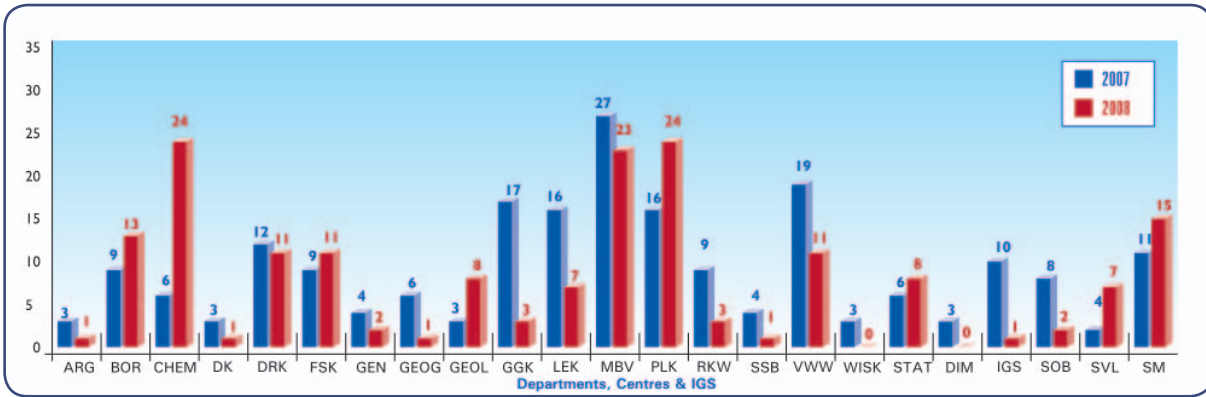
Accredited articles



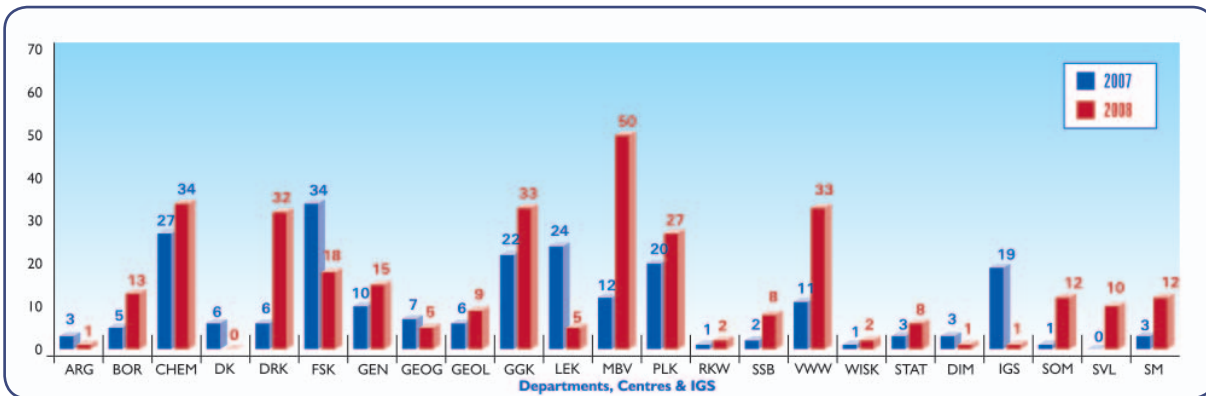
Books



International conferences



Local conferences



Student figures: 2007-2008

Student figures

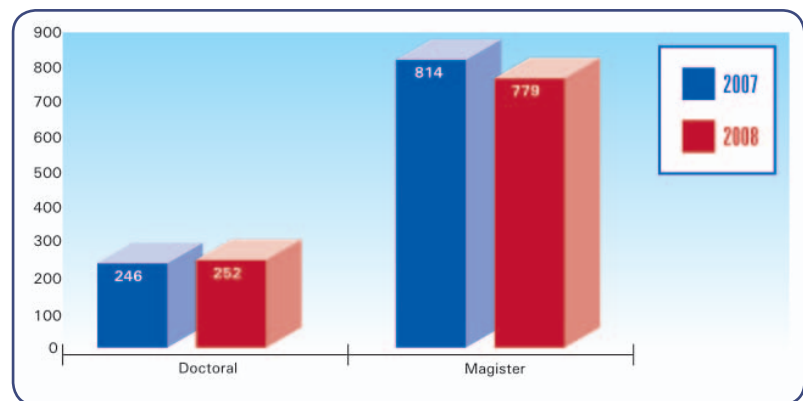
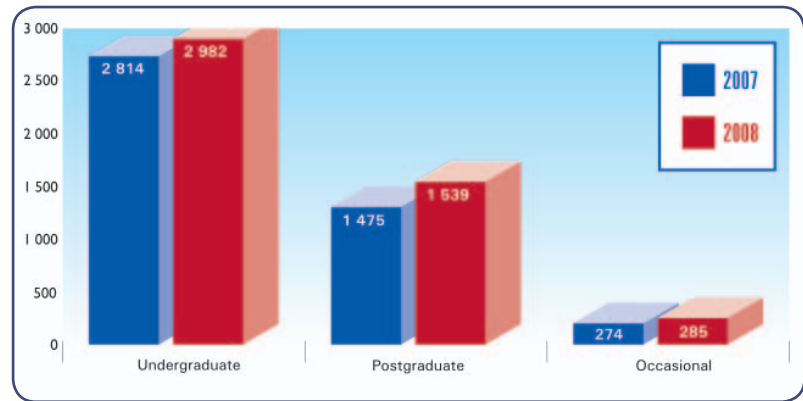
Year	Description	Black	Coloured	Asian	White	Total
2007	Undergraduate	1492	66	38	1218	2814
	Postgraduate	710	41	40	684	1475
	Occasional	230	6	2	36	274
*TOTAL		2432	113	80	1938	4563
2008	Undergraduate	1667	51	37	1227	2982
	Postgraduate	755	40	43	701	1539
	Occasional	260	5	1	19	285
* TOTAL		2682	96	81	1947	4806

International students

Nationality	Year	Year
	2007	*2008
Angola	2	0
Asian countries	20	24
Botswana	17	23
Democratic Republic of the Congo	0	1
European countries	9	10
Lesotho	118	144
Malawi	3	5
Mauritius	2	3
Mozambique	4	7
Namibia	54	65
North America	15	5
Other African countries	47	69
South America	1	0
Swaziland	5	6
Zambia	7	7
Zimbabwe	48	60
Total	352	429

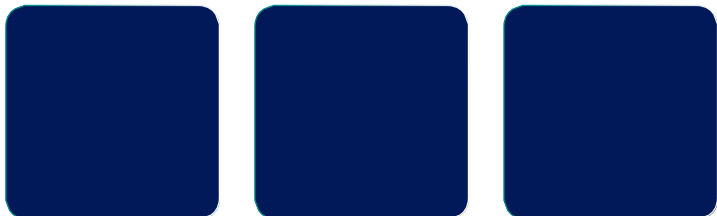
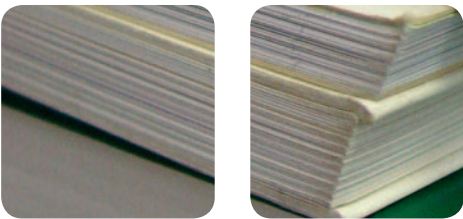
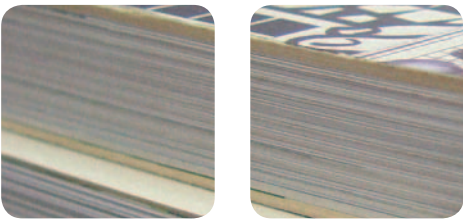
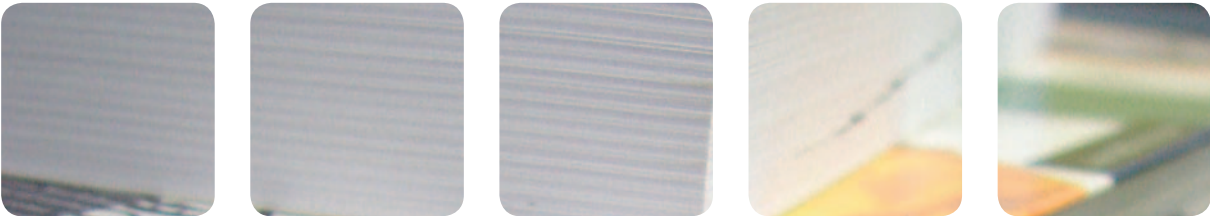
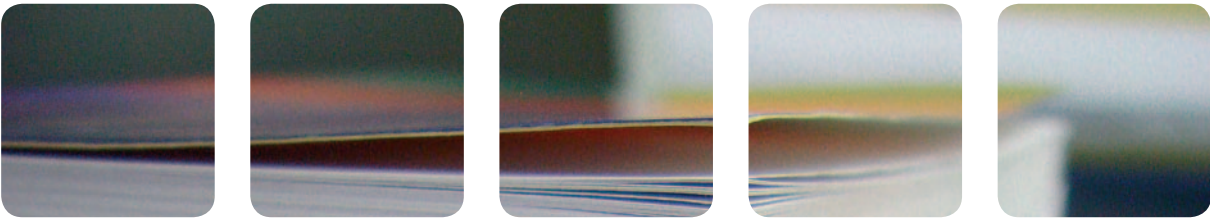
*2008 Final HEMIS figures not available

Comparison for the Faculty of Natural and Agricultural Sciences





Glossary



Glossary

A

AACC -	American Association for Cereal Chemists
AACE -	Association for the Advancement of Cost Engineering
ADF -	Amsterdam Density Functional Programme
ADG -	Average Daily Grain
AEASA -	Agricultural Economics Association of South Africa
AEON -	the African Earth Observation Network
AGU -	American Geophysical Union
AI -	Artificial Insemination
ARC -	Agricultural Research Council
ARV -	Antiretroviral
ASC -	Architecture Student Conference
ASAQS -	Association of South African Quantity Surveyors
ASOCSA -	Association of Schools of Construction of Southern Africa

B

BBSRC -	Biotechnology and Biological Sciences Research Council
BMBF -	Federal Ministry of Education and Research, Germany

C

CAA -	Commonwealth Association of Architects
CANSA -	Cancer Association of South Africa
CAB -	Centro de Astrobiología
CED -	Centre for Education Development
CePHMa -	Centre for Plant Health Management
CHESD -	Centre for Higher Education Studies and Development
CHPC -	Centre for High Performance Computing
CIDB -	Construction Industry Development Board
CIOB-SA -	Chartered Institute of Building, South Africa
CSIR -	Council for Scientific and Industrial Research Organisation
CSTA -	Cereal Science and Technology Association
CUT -	Central University of Technology

D

DiMTEC -	Disaster Management Training and Education Centre for Africa
DMISA -	Disaster Management Institute of Southern Africa
DRRW -	Durable Rust Resistance in Wheat
DST -	Department of Science and Technology
DWAF -	Department of Water Affairs and Forestry

E

ECA -	European Crystallographic Association
EGIC -	Economic Growth and International Competitiveness
EMSA -	Environmental Management Systems Association
EMS -	Environmental Management Systems
EPWP -	Expanded Public Works Programme

F

FAO -	Food and Agricultural Organisation
FETWater -	Framework Programme for Research Education and Training in Water
FMP -	Facilities Management Programme
FSRDPP -	Free State Rural Development Partnership Project
FTIR -	Fourier Transform Infra Red Spectrometer

G

FGAP -	Facility for Genomics and Proteomics
GIS -	Geographical Information Systems
GMO -	Genetically Modified Organisms
GRDM -	Groundwater Resource Directed Measures
GSSA -	Grassland Science Society of South Africa
GSSA -	Geological Society of South Africa

H

HCI -	Human-computer Interaction
HRTEM -	High Resolution Transmission Electron Microscopy

I

IAMA -	International Food and Agribusiness Management Association
IAU -	International Astronomical Union
ICACS -	International Conference on Atomic Collisions in Solids
ICCC -	International Conference on Coordination Chemistry
ICEC -	International Cost Engineering Council
ICRISAT -	International Crops Research Institute for the Semi-Arid Tropics
ICSU -	International Council for Science
IDC -	Industrial Development Corporation
IGC -	International Geological Congress
IGS -	Institute for Groundwater Studies
IMWA -	International Mine Water Association
INCRoP -	Insects on New Crops Programme
IPMP -	Intensive Project Management Programme
ISI -	International Statistical Institute
ISME -	International Society for Microbial Ecology
IT -	Information Technology
IUMS -	International Union of Microbiological Societies

L

LPI -	Lunar and Planetary Institute
LRAD -	Land Redistribution for Agricultural Development

M

MCEE -	Minnesota Council on Economic Education
MDC -	Maputo Development Corridor
MEC -	Member of the Executive Council
MNS -	Material and Nanosciences Cluster
MOU -	Memorandum of Understanding
MRC -	Medical Research Council
MSA -	Masters in Sustainable Agriculture
MSSA -	Microscopy Society of Southern Africa
MUCPP -	Mangaung University Community Partnership Programme

N

NAMC -	National Agricultural Marketing Council
NASA -	National Aeronautics and Space Administration
NASSP -	National Astrophysics and Space Science Programme
NBN -	National Bioinformatics Network
NCEE -	National Council for Economic Education
NDF -	Neutral Detergent Fibre
NECSA -	Nuclear Energy Corporation of South Africa
NERPO -	National Emergent Red Meat Producers Organisation
NGO -	Non-Governmental Organisation
NRF -	National Research Foundation
NSTF -	National Science and Technology Forum
NWGA -	National Wool Growers' Association

O

OECD -	Organisation for Economic Cooperation and Development
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P

PAQS -	Pacific Association of Quantity Surveyors
PDMS -	Provincial Disaster Management Centre
PRT -	Protein Research Trust

R

RDP -	Redress and Development Programme
RIBA -	Royal Institute of British Architects
RICS -	Royal Institute of Chartered Surveyors
RIEP -	Research Institute of Education Planning
RMMA -	Red Meat Abattoirs Association
RPO -	Red Meat Producers Organisation
RTPI -	Royal Town Planning Institute

S

SA -	South Africa
SAAPMB -	South African Association of Physicists in Medicine and Biology
SAB -	South African Breweries Limited

SABC -	South African Broadcasting Corporation
SACAP -	South African Council for the Architectural Professions
SACPCMP -	South African Council for the Property Valuers Profession
SACPLAN -	South African Council of Planners
SACQSP -	South African Council for the Quantity Surveying Profession
SADC -	Southern African Development Community
SAFA -	South African Feedlot Association
SAFEFE -	South African Foundation for Economic and Financial Education
SAFOI -	South African Fryer Oil Initiative
SAIA -	South African Institute of Architects
SAIM -	Society for Industrial and Applied Mathematics
SAISC -	Southern African Institute of Steel Construction
SANBI -	South African National Biodiversity Institute
SANCID -	South African Commission on Irrigation and Drainage
SANPAD -	South African Netherlands Research Programme on Alternatives in Development
SANSA -	South African National Survey of Arachnida
SAPOA -	South African Property Owners Association
SAPPS -	Symposium of the South African Pecan Producers Association
SAQA -	South African Qualifications Authority
SASA -	South African Statistical Association
SASHS -	Southern African Society for Horticultural Sciences
SASM -	South African Society for Microbiology
SAWMA -	South African Wildlife Management Association
SAWSS -	Southern African Weed Science Society
SCM -	Scientific Computing and Modeling
SEG -	Society of Economic Geologists
SEM -	Scanning Electron Microscope

SLE -	Senior Lecturer Equivalent
SSSSA -	Soil Science Society of South Africa
SWMA -	Southern African Wildlife Management Association

T

TEM -	Transmission Electron Microscope
THRIP -	Technology and Human Resource for Industry Programme

U

UCT -	University of Cape Town
UEC -	Unit for Earth Construction
UFS -	University of the Free State
UJ -	University of Johannesburg
UK -	United Kingdom
UN -	United Nations
UNESCO -	United Nations Educational, Scientific and Cultural Organisation
UNU -	United Nations University
UP -	University of Pretoria
USA -	United States of America
USAID -	United States Agency for International Development
UWC -	University of the Western Cape

W

WCAP -	World Conference on Animal Production
WITS -	University of the Witwatersrand
WRC -	Water Research Commission

