



Prof. Willem van der Westhuizen

# Department of Geology

## Overview

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

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

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

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

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

Three M.Sc. studies were initiated during 2007:

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

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

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

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

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

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

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



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



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

Meteorites also form part of the research of this department and currently this aspect forms part of the research of Ms Annegret Lombard under the supervision of Prof. Tredoux.

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

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

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

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

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

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

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

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

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

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

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

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

## Collaboration

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

### Local

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

- UraniumOne Africa (Pty) Ltd.

### International

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

## Staff

**Professor:** Prof. Willem van der Westhuizen

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

**Senior Lecturers:** Drs Christoph Gauert, Hermann Praekelt

**Junior Lecturer:** Ms Annegret Lombard

**Part-Time Professor:** Prof. Aylva Schoch

**Part-Time Lecturer:** Mr Leon Nel

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

**Secretary:** Ms Petro S. Swart

**Professional Officer:** Mr Peet H. Roodt

**Senior Officer:** Ms Rina Immelman

**Technician:** Mr Andries Felix

**Assistant Aid:** Mr Jonas Choane

**Technical Aid:** Mr Daniel Radikgomo

## Contact details

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

## Research outputs

### Research articles

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

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

### Conference contributions

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

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

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

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

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

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

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

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

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

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