

Department of Geology

Overview

A total of 72 degrees were awarded by the department over the course of the year; with 41 students receiving BSc degrees, 25 honours degrees, one MSc degree, and five Mineral Resource Throughput Management (MRTM) degrees. The department was responsible for the presentation of six undergraduate and three honours programmes, as well as the master's degree in MRTM, and supervised the continued research of 46 students in the MRTM programme, nine MSc candidates, and five PhD candidates.

Prof Willem van der Westhuizen retired at the end of 2015 after being associated with the department for more than 40 years. Prof Marian Tredoux was retained on contract for the year. Prof Gerard Germs was appointed as affiliated associate professor. Ms Justine Magson took over the duties of programme director from Dr Hermann Praekelt at the start of the year. Two postdoctoral researchers, Drs Matthew Huber and Elizaveta Kovaleva (under the supervision of Prof Marian Tredoux and Dr Freddie Roelofse), joined the department during the year. Mr John Clark was appointed on contract for the duration of the year and assisted the department with the presentation of a number of first- and second-year modules.

Achievements

Ms Bianca Kennedy, MSc student of Prof Marian Tredoux, was awarded the Corstorphine Medal and the John Handley Award of the Geological Society of South Africa for her dissertation entitled "Investigation of the possibility of platinum-group element clusters in magmatic systems using synthetic sulphide melts". The former recognises an MSc thesis of a particularly high

standard that is worthy of international recognition, and the latter the best dissertation submitted to a South African university over the course of the preceding year. Ms Kennedy shared these two awards with Mr Michael Hartnady of the University of Cape Town.

Prof Christoph Gauert was appointed as a visiting professor at the University of Panzihua (Yunnan, China) in March 2015. Prof Marian Tredoux was appointed as external examiner for the University of Limpopo's School of Physical and Mineral Science (focus area: Geology) for the next three years. The visiting investigator appointment of Dr Freddie Roelofse at the Department of Terrestrial Magnetism, Carnegie Institution for Science, was extended until the end of 2016.

Activities

It was a busy year as usual with undergraduate and honours students embarking on numerous field trips across the country and with staff members travelling both locally and abroad. Staff members and students presented their work at several conferences, including the Igneous and Metamorphic Studies Group meeting (University of Pretoria, January 2015), Precious Metals 2015 (Cornwall, UK, May 2015), the Society for Geology Applied to Mineral Deposits conference (Nancy, France, August 2015), Goldschmidt 2015 (Prague, Czech Republic, August 2015), and the Layered Intrusions Research Group meeting (Potsdam, Germany, August 2015). Prof Christoph Gauert and Dr Freddie Roelofse attended a workshop in August organised by the International Continental Scientific Drilling Programme at the Deutsches GeoForschungs Zentrum, Potsdam, Germany, to discuss matters related to a potential drilling project in the Bushveld Complex.

Mr Colin Rice of Colin Rice Exploration and Training presented a one-day "Introduction to Drilling" course to the department's honours students in April. Several Geotalks and student colloquia were also presented over the course of the year. Mr Stuart Bateman (InnovX systems) presented a talk entitled "Latest developments in portable X-ray equipment" in March, followed by a practical session on the use of a handheld X-ray fluorescence (XRF) spectrometer for the department's third-year geochemistry students.

Prof Christoph Gauert was involved in a joint excursion between the Department of Geology and the Universities of Graz and Leoben to the Bushveld Complex, the Vredefort Dome, and Kimberley. Part of this joint excursion was also attended by the department's third-year group. Prof Gauert also attended the Platreef workshop and the associated excursions to Mokopane and surroundings in May, and was responsible for organising and leading the annual economic geology honours field trip to the Transvaal Basin that took place in June, where students were exposed to various aspects of the metallogeny and economic geology of the Witwatersrand



Honours students on the annual economic geology field trip organised and led by Prof Christoph Gauert.

Supergroup, the Uitkomst Complex, the Bushveld Complex, and alluvial diamond deposits (see photo). Prof Gauert also organised two one day excursions in October for the department's third year students to Shafts 2 and 3 of Beatrix Gold Mine. The third year field trip to the Vredefort structure in September, led by Dr Roelofse, Mss Thendo Mapholi, and Rinae Makhadi, was once again a great success.

The annual second year field school to the Barkly East district, under the guidance of Mr Adriaan Odendaal, took place in October. Mr Odendaal also led a field excursion to the Vanderkloof district for the department's honours students in August, where the students performed sedimentological fieldwork that included mapping and the compilation of sedimentological profiles. Mr Odendaal attended the Origins and Evolution of the Cape Mountains and Karoo Basin Imbizo held at the Nelson Mandela Metropolitan University during November and presented his work on structures interpreted as lungfish burrows in the lower Beaufort Group of the Karoo Supergroup.

First year students enjoyed two field excursions to Austin's Post and Omerin as part of their first and second semester Geology modules respectively. Mr Raimund Rentel accompanied the honours mineralogy students to the Northern Cape province in March, where the students studied several pegmatite occurrences and alluvial diamond workings.

Visitors to the department over the course of the year included Profs Aberra Mogessi, Frank Melcher, and C Hauzenberger (University of Graz, University of Leoben), as well as Dr Jock Robey (De Beers, retired).

Community Service

The department again hosted the Free State leg of the Minquiz National Science Competition, held on 14 May 2015. A total of 26 schools (mostly from the Free State), each represented by three learners, took part in the competition. The learners were also afforded the opportunity of visiting the departments of Chemistry, Physics, and Geology in order to see what these departments have on offer for prospective students.

National and International Collaboration

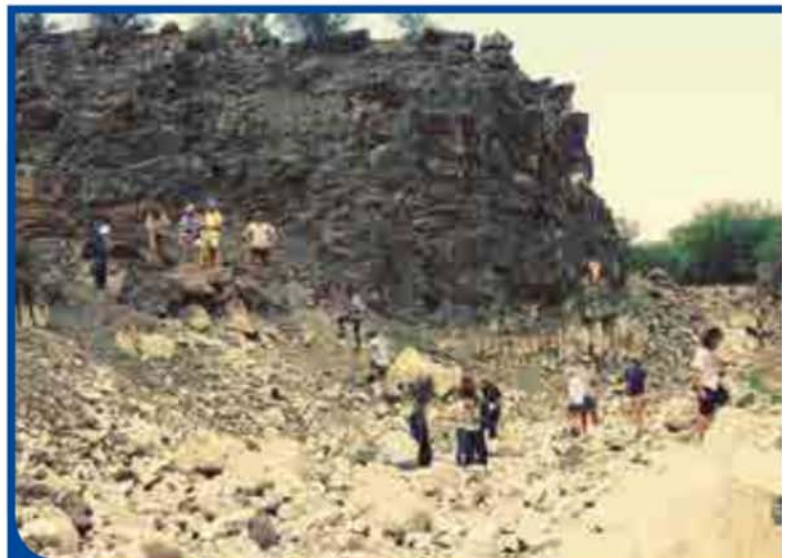
Staff in the department actively collaborated with the following researchers at national and international institutions over the course of the year:

- Dr David Cornell, University of Gothenburg.
- Profs F Zaccarini and G Garuti, University of Leoben.
- Dr Iain McDonald, Cardiff University.
- Prof Dr Chris Ballhaus, Steinmann Institute, Bonn University.
- Dr Lutz Hecht, Museum für Naturkunde, Berlin.
- Drs Lukas Ackerman and J Trubac, Institute of Geology v.v.i., Academy of Sciences of the Czech Republic.
- Prof C Hauzenberger, University of Graz.
- Dr G Costin, Rhodes University.
- Dr A Zeh, University of Frankfurt.
- Dr Habil Aleksandra Gaweda, Uniwersytet Slaski W. Katowicach, Poland.



Honours mineralogy students visiting alluvial diamond workings in the Northern Cape province.

- Drs Rick Carlson and Timothy Mock, Department of Terrestrial Magnetism, Carnegie Institution for Science.
- Prof Lewis Ashwal, School of Geosciences, University of the Witwatersrand.
- Prof Dr Rolf Romer and Dr Bob Trumbull, Deutsches GeoForschungs Zentrum.



Honours Mineralogy students studying stromatolitic dolomites on their field trip to the Northern Cape province under the guidance of Mr Raimund Rentel.

Research Outputs

Research Articles

Claassen, J.O. 2015. Application of systemic flow based principles

in mining. *The Journal of the South African Institute for Mining and Metallurgy* 115: 747–754.

Clark, J.H.A., Tredoux, M. & Van Huyssteen, C.W. 2015. Heavy metals in the soils of Bloemfontein, South Africa: Concentration levels and possible sources. *Environmental Monitoring and Assessment* 187: 439.

Colliston, W.P., Cornell, D.H., Schoch, A.E. & Praekelt, H.E. 2015. Geochronological constraints on the Hartbees River Thrust and Augrabies Nappe: New insights into the assembly of the Mesoproterozoic Namaqua-Natal Province of South Africa. *Precambrian Research* 265: 150–165.

Gauert, C., Schannor, M., Hecht, L., Radtke, M. & Reinholz, U. 2015. A comparison of in situ analytical methods for trace element measurement in gold samples from various South African gold depositors. *Geostandards and Geoanalytical Research* 40(2): 267–289.

Hansen, R.N. 2015. Contaminant leaching from gold mining tailings dams in the Witwatersrand Basin, South Africa: A new geochemical modelling approach. *Applied Geochemistry* 61: 217–223.

Kovaleva, E., Klotzli, U., Habler, G. & Wheeler, J. 2015. Planar microstructures in zircon from paleo-seismic zones. *American Mineralogist* 100: 1834–1847.

Mielke, C., Boesche, N.K., Rogass, C., Kaufmann, H. & Gauert, C. 2015. New geometric hull continuum removal algorithm for automatic absorption band detection from spectroscopic data. *Remote Sensing Letters* 6: 97–105.

Roelofse, F. & Mulder, K. 2015. Die invloed van verpoëtering op die kwikinhoud van verskeie gesertifiseerde verwysingsmaterials. *Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie* 34(1): Art 1290.

Roelofse, F., Ashwal, L.D. & Romer, R.L. 2015. Multiple, isotopically heterogeneous plagioclase populations in the Bushveld Complex suggest mush intrusion. *Chemie der Erde* 75: 357–364.

Chapter in Book

Staff

Professor: Prof WA van der Westhuizen.

Associate Professors: Profs WP Colliston, CDK Gauert, and M Tredoux.

Senior Lecturers: Drs JO Claassen, HE Praekelt, and F Roelofse.

Lecturer: Mr AI Odendaal.

Junior Lecturers: Mss J Magson, R Makhadi, T Mapholi, and Mr R Rentel.

Affiliated Academic/Research Staff: Profs GJ Beukes, DE Miller, R Scheepers, GJB Germs, R Schouwstra, L Jacobson, AE Schoch, Drs JC Loock, L Nel, PJ

Netshitungulwana, R., Yibas, B., Gauert, C., Vermeulen, D., Novhe, O. & Motlakeng, T. 2015. Investigation of the metal contamination in the Upper Olifants Primary Catchment by using stream sediment geochemistry, Witbank Coalfield, South Africa. In: *Sediment Matters*, edited by P. Heining & J. Cullmann. New York: Springer Publishing Company. pp. 169–186.

Conference Contributions

Castillo, J., Gomez-Arias, A., Posthumus, J., Welman-Purchase, M. & Van Heerden, E. 2015. *Geochemical study of the interaction of acid and alkaline mine drainage with BaCO₃*. Proceedings of the 10th International Conference on Acid Rock Drainage (ICARD) & the International Mine Water Association's (IMWA) Annual Meeting (ICARD-IMWA 2015), Grand Hyatt Hotel, Santiago, Chile. 21–24 April. pp. 1–12.

Giebel, R.J., Gauert, C. & Costin, G. 2015. *Rare earth minerals in the lower part of the Palabora Carbonatite Complex, South Africa*. Proceedings of the 13th Biennial Meeting of the Society for Geology Applied to Mineral Deposits (SGA), Centre National de la Recherche Scientifique, Nancy, France. 24–27 November. pp. 1009–1012.

Gomez-Arias, A., Castillo, J., Welman-Purchase, M., Posthumus, J. & Van Heerden, E. 2015. *Evidences of effective treatment of alkaline mine drainage with BaCO₃*. Proceedings of the 10th International Conference on Acid Rock Drainage (ICARD) & the International Mine Water Association's (IMWA) Annual Meeting (ICARD-IMWA 2015), Grand Hyatt Hotel, Santiago, Chile. 21–24 April. pp. 1–12.

Pretorius, RN Hansen, H Prinsloo, Messrs AC Dunne, PJ Grobler, PG Laurens, and MJAR Vrijens.

Secretary: Ms PS Swart.

Administrative Officers: Mss R Immelman and C van der Vyver.

Technical Support Staff: Messrs J Choane, A Felix, D Radikgomo, and Ms M Purchase.

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