



# DEPARTMENT OF **Geology**

## **Contact Details**

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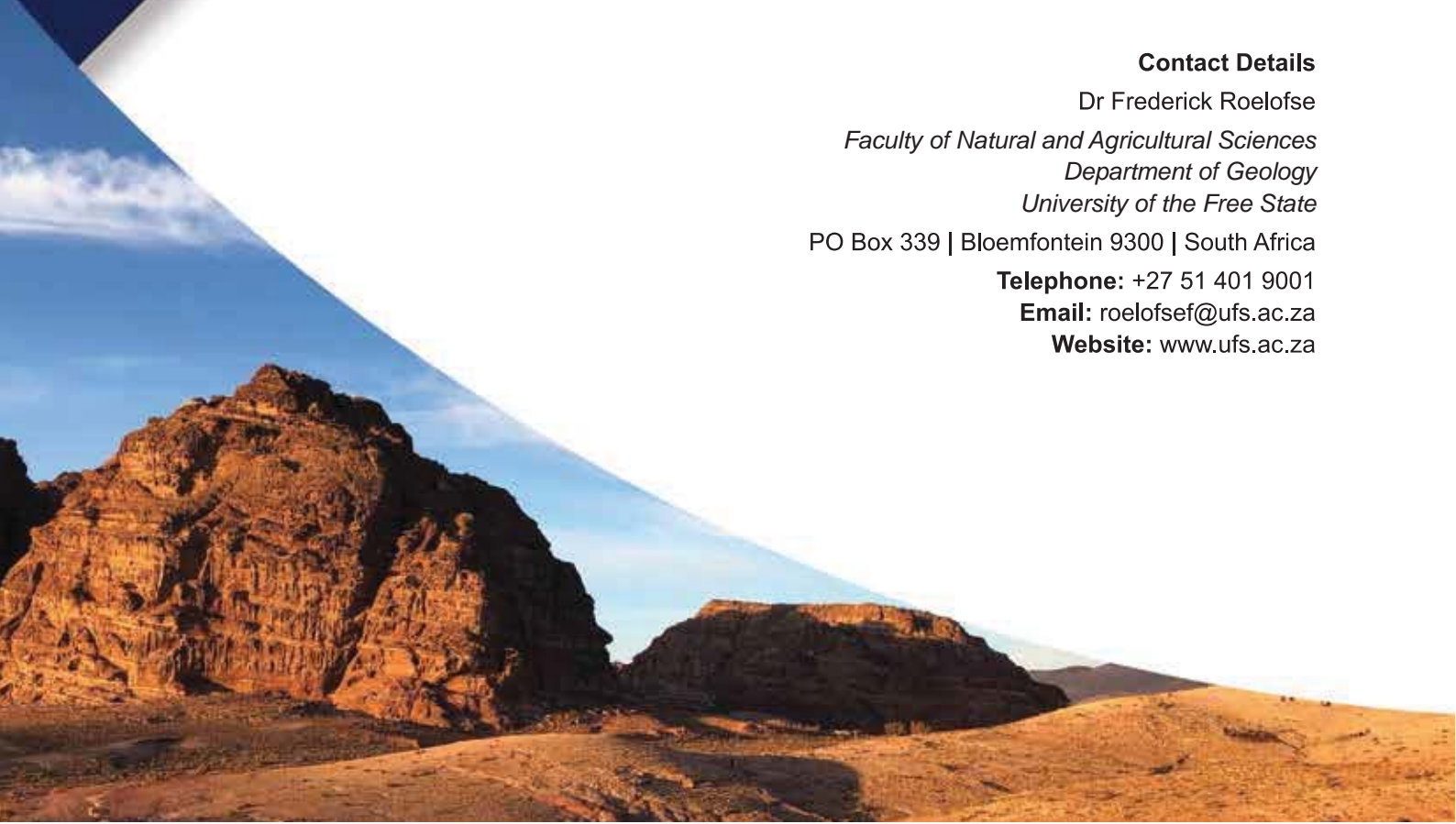
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## 2017 Overview

During 2017, we awarded a total of 63 degrees, with 46 students receiving BSc degrees, 11 honours degrees, four MSc degrees, and two master's in Mineral Resource Management degrees. The department was responsible for the presentation of six undergraduate and three honours programmes, as well as the MSc (Mineral Resource Management) degree, and supervised the continued research of 15 students in Mineral Resource Management, 12 MSc candidates, and six PhD candidates over the course of the year.

## ACHIEVEMENTS

### Staff Achievements



*The photo that won Dr Elizaveta Kovaleva the EGU photo contest*

Dr Elizaveta Kovaleva won the European Geosciences Union (EGU) photo contest in Vienna with a photo titled 'Movement of the Ancient Sand'. In September, the International Mineralogical Association Commission on New Minerals, Nomenclature and Classification honoured Prof Marian Tredoux for her contributions to our understanding of the Bon Accord NiO body in the Barberton greenstone belt by naming a newly discovered mineral from the Bon Accord body 'tredouxite'. The new mineral has the formula  $\text{NiSb}_2\text{O}_6$  and was proposed to the commission by an international group of scientists, including Prof Duncan Miller, affiliated Professor in our department. Dr Freddie Roelofse was elected to the Council of the Geological Society of South Africa; his visiting investigator appointment at the Department of Terrestrial Magnetism, Carnegie Institution for Science, was also extended until the end of 2018. Researchers in the department furthermore managed to secure R678 100 from the Iphakade Programme to support the research of postgraduate students in the department.

### Student Achievements

We are proud of former honours student and current student in the Centre for Environmental Management, Tshiamo Legoale, who was announced the Famelab International Champion at the Cheltenham Science Festival held in the UK in June 2017, for her research on the use of wheat to harvest gold from mine dumps. The Geological Society of South Africa announced Photis Kalpakiotis, Prof Wayne Colliston's student, as the winner of the Houghton Award for the best honours thesis from a South African university in 2016, with a thesis titled 'The Mapping and Structural Analysis of the Putsies Migmatite'.

### Activities

Arrangements for our Centenary Conference and Dinner, planned for April 2018, began in earnest during the year. The year also saw numerous field trips undertaken across the country. First-year students visited several sites around Bloemfontein to study sedimentary rocks and structures. They also



studied dolerite intrusions and the thermal effects that intrusive rocks have on the country rocks that they intrude. Second-year students undertook a series of visits to Austin's Post, southwest of Bloemfontein, to do mapping, and undertook a weeklong excursion to Barkly East where they were presented with additional opportunities to hone their geological fieldwork skills. Second-year students also visited a few landfill sites in and around Bloemfontein as part of their training in Environmental Geology. Third-year students undertook excursions to the Big Hole Museum in Kimberley to study the mining history of the town and the geology of kimberlites and diamonds, and to the Vredefort Dome to study the regional geology of the dome and the effects that regional and impact metamorphism had on the rocks exposed within the dome.



*Honours students updating their field notebooks at the Scotia talc mine in the Barberton greenstone belt, which was visited as part of their Economic Geology field trip*



*Third-year students posing for a group photo during their excursion to the Vredefort Dome*

Honours students took part in various excursions and field trips. During a nine-day field trip to study the economic geology of the Kaapvaal Craton, they also visited a variety of working and defunct mines on the Bushveld Complex, the Barberton greenstone belt, and the Phalaborwa Complex.



*Honours students during their Economic Geology field trip, taking notes while being instructed by Dr Matthew Huber on the geology of the Pilanesberg Complex*

Other shorter field trips were to the Northern Cape (Mineralogy), Jagersfontein (Geochemistry), the Council for Mineral Technology (Mintek) (Geochemistry), the Vanderkloof area (Sedimentology), and the Vredefort Dome (Structural Geology).

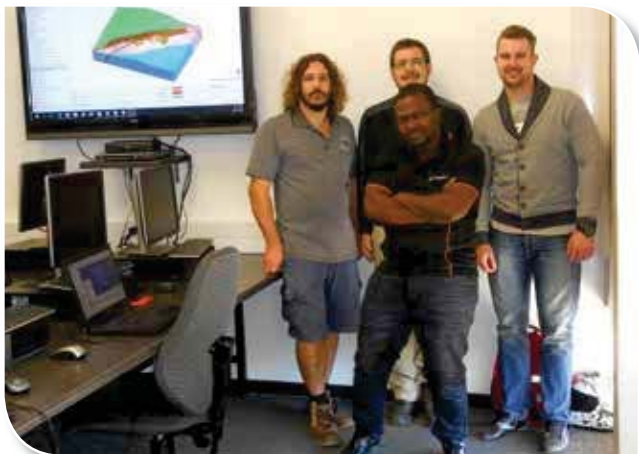
Staff members and students presented their work at several conferences, including the Igneous and Metamorphic Studies Group meeting hosted by the University of Johannesburg, the European Geosciences Union (EGU) General Assembly (Vienna, Austria), the Association of Southern African Professional Archaeologists (ASAPA) Conference hosted by the University of Pretoria, and the Goldschmidt Conference (Paris, France).

The following Kovesio GeoTalks were presented over the course of the year:

- 'Modern versus ancient controls on sedimentary systems – The present is not always the key to the past' presented by Prof Poppe de Boer, Utrecht University, the Netherlands.
- 'Chromitites and associated platinum-group elements in ophiolites: an overview' presented by Dr Federica Zaccarini, University of Leoben, Austria.
- 'Uralian-Alaskan complexes: a puzzling source of platinum' presented by Prof Giorgio Garuti, University of Leoben, Austria.
- 'Medical Geology – an interdisciplinary emerging field of science' presented by Prof Hassina Mouri, University of Johannesburg.
- 'The life of an exploration geologist' presented by Nathi Chabangu, RC Developments.
- 'Carbonates and carbonate melts in Earth's mantle' presented by Dr Igor Sharygin, VS Sobolev Institute of Geology and Mineralogy, Russia.

- 'Research life at sea' presented by Raimund Rentel.

During the year, we also hosted two short courses attended by staff and students. Stuart Bateman from Innov-X Systems showcased the latest developments in portable X-ray equipment, and Sizwe Nkehli presented an introductory Leapfrog course to staff and postgraduate students.



*Some of the participants in the Leapfrog course that was presented in August*

Jarlen Beukes, Prof Chris Gauert's and Dr Freddie Roelofse's PhD student, visited Dr Iain McDonald's laboratory at Cardiff University, where she obtained platinum group-element data on samples from the Northern Limb of the Bushveld Complex. She received travel support from the National Research Foundation.

Additionally, we hosted delegations from the University of Venda and the East China University of Technology to explore collaborative possibilities in teaching and research.



*The delegation from the East China University of Technology that visited our department in December to discuss aspects related to future collaboration in teaching and research*

## RESEARCH

### Community Service

The department, in particular Rinae Makhadi, again hosted the Free State leg of the Minquiz National Science Competition on 18 May 2017. A total of 18 schools (mostly from the Free State) took part in the competition, each represented by three learners. The

learners visited the Naval Hill Planetarium as part of the competition.

### National and International Collaboration

Staff in the department actively collaborated with researchers at the following national and international academic and research institutions over the course of the year: University of Gothenburg (Sweden), University of Leoben (Austria), Cardiff University (UK), Department of Terrestrial Magnetism (Carnegie Institution for Science, USA), Deutsches GeoForschungsZentrum (Germany), University of Saskatchewan (Canada), Vanderbilt University (USA), University of Brasilia (Brazil), University of Montevideo (Uruguay), Johns Hopkins University (USA), University of Vienna (Austria), University of Liverpool (UK), Martin Luther University of Halle-Wittenberg (Germany), University of Manitoba (Canada), Ludwig Maximilian University of Munich (Germany), Vrije Universiteit Brussel (Belgium), the Czech Academy of Sciences (Czech Republic), Charles University (Czech Republic), Czech Geological Survey (Czech Republic), University of Johannesburg, University of the Western Cape, University of the Witwatersrand.

## STAFF MATTERS

NRF intern, Susan Serfontein, who joined us in 2016, completed her internship early in 2017. She was, however, retained on contract basis for the second semester to help Adriaan Odendaal with lecturing responsibilities because he needed time to advance his PhD research. Dr Matthew Huber joined us as Senior Lecturer in Economic and Exploration Geology, following the completion of his postdoctoral research-fellow contract in mid-2017. Dr Elizaveta Kovaleva was retained as postdoctoral research fellow for a third year due to the excellent work that she conducted over the course of her initial two-year contract. Dr Hendrik Minnaar, previously from the Upington Regional Office of the Council for Geoscience, also joined us late-2017 as senior lecturer in Structural Geology. He was appointed as replacement for Prof Wayne Colliston, who retired as Associate Professor in Structural Geology in December 2017, after serving the department for 37 years. The year also saw Justine Magson promoted to Lecturer.

## RESEARCH OUTPUTS

### Research Articles

Adorno, RR, Do Carmo, DA, Germs, G, Walde, DHG, Denezine, M, Boggiani, PC, Sousa e Silva, SC, Vasconcelos, JR, Tobias, TC, Guimaraes, EM, Vieira, LC, Figueirdo, MF, Moraes, R, Caminha, SA, Suarez,



- PAZ, Rodrigues, CV, Caixeta, GM, Pinho, D, Schneider, G, and Muyamba, R. 2017. *Cloudina lucianoi* (Beurlen and Sommer, 1957), Tamengo Formation, Ediacaran, Brazil: Taxonomy, analysis of stratigraphic distribution and biostratigraphy. *Precambrian Research* 301: 19-35.
- Colliston, WP, Schoch, AE, and Cole, J. 2017. The Grenvillian Namaqua fold belt adjacent to the western Kaapvaal Craton: 2. Archaean Craton and supercontinent connections. *Precambrian Research* 300: 289-314.
- Cornell, DH, Meintjes, PG, Van der Westhuizen, WA, and Frei, D. 2017. Microbeam U-Pb zircon dating of the Makwassie formation and underlying units in the Ventersdorp Supergroup of South Africa. *South African Journal of Geology* 120: 525-540.
- Dixon, R, and Schouwstra, R. 2017. The role of forensic geology in the illicit precious metals trade. *Episodes* 40: 132-140.
- Giebel, RJ, Gauert, CDK, Marks, MAW, Costin, G, and Markl, G. 2017. Multi-stage formation of REE minerals in Palabora Carbonatite Complex, South Africa. *American Mineralogist* 102: 1218-1233.
- Huber, MS and Koeberl, C. 2017. Accretionary lapilli from the Sudbury impact event. *Meteoritics and Planetary Science* 52: 1257-1276.
- Kovaleva, E, Austrheim, HO, and Klötzli, US. 2017. Interpretation of zircon coronae textures from metapelitic granulites of the Ivrea-Verbano Zone, northern Italy: two stage decomposition of Fe-Ti oxides. *Solid Earth* 8: 789-804.
- Kovaleva, E, Harlov, D, and Klötzli, U. 2017. Complicated secondary textures in zircon record evolution of the host granitic rocks: Studies from Western Tauern Window and Otztal-Stubai Crystalline Complex (Eastern Alps, Western Austria). *Lithos* 284-285: 381-400.
- Kovaleva, E and Klötzli, U. 2017. NanoSIMS study of seismically deformed zircon: Evidence of Y, Yb, Ce, and P redistribution and resetting of radiogenic Pb. *American Mineralogist* 102: 1311-1327.
- Kovaleva, E, Klötzli, U, Habler, G, Huet, B, Guan, Y, and Rhede, D. 2017. The effect of crystal-plastic deformation on isotope and trace element distribution in zircon: Combined BSE, CL, EBSD, FEG-EMPS and NanoSIMS study. *Chemical Geology* 450: 183-198.
- Rodler, AS, Frei, R, Gaucher, C, Korte, C, Rosing, SA, and Germs, GJB. 2017. Multiproxy isotope constraints on ocean compositional changes across the late Neoproterozoic Ghaub glaciation, Otavi Group, Namibia. *Precambrian Research* 298: 306-324.
- Scheepers, R, O'Brien, R, and Schoch, AE. 2017. An occurrence of bavenite in the Cape Granite Suite, southwestern Cape Province, South Africa, and its implications on the formation of the host pegmatite. *South African Journal of Geology* 120: 223-230.
- Schoch, AE and Scheepers, R. 2017. The Saldanha Bay Volcanic Complex: Clarifying the Cambrian geology of the Postberg-Saldanha area, West Coast, South Africa: Comment. *South African Journal of Geology* 120: 271-272.
- ### Conference Contributions
- Beukes, JJ, Roelofse, F, Gauert, CDK, Grobler, DF, and Brits, JAN. 2017. *The petrogenesis of the Turfspruit Cyclic Unit and its hangingwall and footwall lithologies at Turfspruit, Northern Limb, Bushveld Complex, South Africa*. Igneous and Metamorphic Studies Group Meeting, University of Johannesburg, Johannesburg, South Africa.
- Huber, MS and Kovaleva, E. 2017. *Inhomogeneous distribution of clasts in the Daskop granophyre dyke, Vredefort impact structures, South Africa*. 48<sup>th</sup> Lunar and Planetary Science Conference, Houston, Texas.
- Huber, MS, Roelofse, F, and Wium, D. 2017. *Where do we look? Eye tracking in petrology*. Igneous and Metamorphic Studies Group Meeting, University of Johannesburg, Johannesburg, South Africa.
- Jacobson, L and Van der Westhuizen, WA. 2017. *Chemical characterisation of pottery from the Eiland Salt Works site: a preliminary study using XRD*. Association of Southern African Professional Archaeologists Conference, University of Pretoria, Pretoria, South Africa.
- Jacobson, L and Van der Westhuizen, WA. 2017. *How representative of the total compositional profile of a ceramic is a single sherd? An empirical study using XRF*. Association of Southern African Professional Archaeologists Conference, University of Pretoria, Pretoria, South Africa.
- Kovaleva, E and Huber, MS. 2017. *How lithology affects the development of pseudotachylitic breccia during large impact events*. Igneous and Metamorphic Studies Group Meeting, University of Johannesburg, Johannesburg, South Africa.
- Kovaleva, E and Huber, MS. 2017. *Pseudotachylitic breccia in mafic and felsic rocks*. European Geosciences Union General Assembly, Vienna, Austria.
- Kovaleva, E, Huber, MS, Somers, A, and Bateman, S. 2017. *The Daskop granophyre dyke: Inhomogeneous clast distribution and chemistry*. European Geosciences Union General Assembly, Vienna, Austria.
- Kovaleva, E, Kusiak, MA, Wirth, R, Habler, G, and Klötzli, U. 2017. *Seismically deformed zircon: crystalline Pb nano-spheres and other enigmas*.

Conference on Accessory Minerals 2017, University of Vienna, Austria.

Rodler, AS, Frei, R, Korte, C, Gaucher, C, and Germs, GJB. 2017. *Early Cryogenian Cr isotope stratigraphy, Otavi Group, Namibia* (poster). Goldschmidt Conference, Paris, France.

## STAFF

Professor: Prof WA van der Westhuizen.

Associate Professors: Profs WP Colliston, and M Tredoux.

Senior Lecturers: Drs M Huber, H Minnaar, and F Roelofse.

Lecturers: Dr RN Hansen, J Magson, and AI Odendaal.

Junior Lecturers: R Makhadi, T Mapholi, and R Rentel.

Affiliated Academic/Research Staff: Profs C Gauert, GJB Germs, DE Miller, R Scheepers, L Jacobson, RP Schouwstra, AE Schoch, Drs L Nel, H Praekelt, J Claassen, A Bisnath, H Prinsloo, JC Looock, PG Meintjes, M van der Merwe, Messrs AC Dunne, PJ Grobler, I Hunt, PG Laurens, PJ Viljoen, MJAR Vrijens, HCF Pretorius.

Postdoctoral Research Fellow: Dr E Kovaleva.

Secretary: PS Swart.

Administrative Officer: R Immelman and C van der Vyver.

Technical Support Staff: J Choane, A Felix, D Radikgomo, and Megan Purchase.

