GSSA
Geological Society of South Africa

geobulletin

QUARTERLY NEWS BULLETIN ~ JUNE 2010

VOLUME 53 NO.2

Barberton drilling program
Geology Museum opening, Museum Africa
The geotraveller, Oldoinyo Lengai, Tanzania

news

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Cover Photograph: The Ash Cone as viewed from the summit. (See article, pg 39)

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Contributions for the next issue should be submitted by:
13 August, 2010.

Geobulletin is provided free to members of the GSSA. Non-member subscriptions per four issue volume are R150.00 for South Africa, R175.00 for the rest of Africa and US$ 45.00 overseas. The views expressed in this magazine are not necessarily those of the GSSA, its editor or the publishers.

ADVERTISING RATES (Excl. VAT & Agency Commission): GeoBulletin is published by the Geological Society of South Africa (GSSA) and appears quarterly during March, June, September and December each year.

2010 RATES. Full colour ads priced for full-page (*R8385/•R8005), half page (*R6535/•R6170), and quarter page (*R5135/•R4945), with reduced rates for black & white only (R2835 off), or for 4-issue insertion commitments (approx. 10% off). Advertorials inserted at a rate of R85 per column cm, or R1775 for a full column (approx. 500 words). Professional Directory listings at R485 (corporate) and R345 (Individuals). Special Positions (inside front, outside back covers, and centre spreads available at separate prices). Loose inserts included for R3830.

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15 February (March issue), 15 May (June issue), 13 August (September issue) and 1 November (December issue).

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from the editor's desk

Steve Prevec

Salutations from Grahamstown, where water will soon be competing with oil for price per litre, as our drought continues. Should make for nice bouncy turf in the Eastern Cape-hosted soccer World Cup matches. In this issue of the Geobulletin, we feature a new contribution which we hope to make a biannual regular feature, which comprises an analysis of risks and developments in the mining sector, by Fiona Perrott-Humphrey, and which immediately precedes the Media Monitor. We have also been approached (although this does not feature in this issue) to have regular sections/columns on geological heritage, and on museums, which perhaps could comprise a regular column on the common theme of natural heritage.

In this issue, we are alerted to progress in one of two new programmes of geoscience research exploration drilling in the Barberton Greenstone Belt (the other programme, managed by Prof. Maarten de Wit, we hope to feature in a future issue). Other highlights of this issue include Tony Naldrett's visit to the Bushveld Branch to discuss, of all things, PGE and chromites; university news from Stellenbosch in particular, where significant developments in analytical capacity are reported which should be of interest to the national research community; and a report from Lew Ashwal on the celebration of "140 years" of geoscience in Africa between Kevin Burke (who turned 80) and Lew (60) late last year, marked with a robust geological symposium and field excursion (and a party). A memorial article to Ben Worst, a long-standing member of the southern African geosciences community, and past contributor to this bulletin on matters of Zimbabwean geology, has been thoughtfully provided by Tim Broderick. In this issue, our geotraveller reports on his visit to Oldoinyo Lengai in Tanzania, the world's only active carbonatite volcano.

A matter for some concern has been provided by Craig Smith, relating to new legislation concerning the prospective role of the Council for Geosciences as an entrenched player in mining in South Africa. Along with concerns over the current financial state of the Council, and recent (perhaps irrelevant, perhaps not) comments by young Mr Malema regarding the inevitability of nationalisation of the country's mining industry, I think this is an issue which deserves the attention and involvement of all geosciences sectors in the country, and of which I expect we'll be hearing more from the GSSA in future.

Til next time,

"Hey everyone, I think I found a magnetite layer"; the Editor at the Panzhihua iron mine, Sichuan, China

executive managers corner

Craig Smith

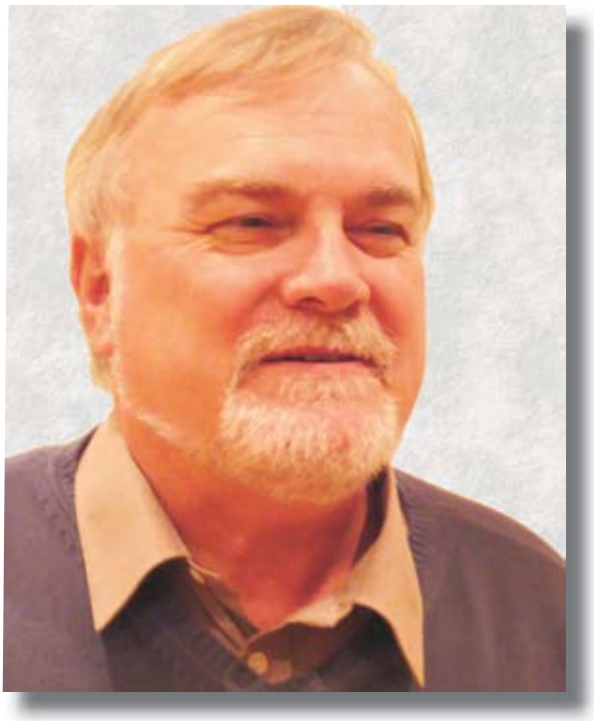
The View from Johannesburg

A number of events and issues are worth highlighting this quarter, as we find ourselves halfway through 2010. First, and perhaps most importantly, the second printing of the Geology of South Africa (the 'textbook') should be on the shelves by the time you read this. Our printers have given us a despatch date, and we have every reason to believe that it will be met. The second print is not a new edition, but it does have a number of errors in the first print run rectified. A note of thanks goes to Sonja Van Eck and Mike Johnson of the Council for Geoscience for their efforts in getting this out. We will be posting notification of this to the membership.

You have a new website. Yes, we realize that it has not gone smoothly and there are corrections and repairs required to get it working smoothly. Members do have access to Geoscience World, but will have to generate a new password to do so. The basic information is there, and will continue to improve in coming weeks. We welcome any suggestions or criticisms, which can be sent to Lully at info@gssa.org.za. For those of us who are 'long in the tooth' and would not be caught dead using Facebook, or a GPS to find our way around Sandton (for example), it's well known that if we want technology to work properly, we should consult a youngster. We have done that, and Byron Van Der Walt of UJ will be helping us out with the website, from time to time, in between completing his MSc.

In response to the tremendous public interest in things geological, the GSSA has partnered with the Origins Centre at Wits University, and hosted the first what we hope will be an ongoing Public Lecture Series in Johannesburg. John Rogers presented a lecture on Charles Darwin – the geologist, which has previously been well received in Cape Town. We are pleased to report that it was also very well received in Johannesburg, proving that Cape Town does not necessarily have the monopoly on things cultural. I personally was intrigued to learn that all this evolution stuff was just a sideshow to Darwin's numerous geological contributions.

The GSSA has also participated in the opening of the



geology section of Museum Africa in Newtown. Thanks are due to Diana Wall of the Museum, and to Bruce Cairncross for assisting them over the past few years. The geology section is small, but very well laid out and will be of great interest to the public. The showstopper is the mineral collection which is finally on display after years in the archives – and it is spectacular.

We would recommend both the Origins Centre at Wits and Museum Africa as important places to visits for residents and visitors interested in the earth sciences.

Geoheritage is high on our priority list, given the importance of geological sites to the scientific, natural and cultural heritage of South Africa. Our president has engaged with the National Heritage Council in a recent meeting in Cape Town. In our wanderings about South Africa, we see successes and failures, and an example of the latter has unfortunately come to light at the Tswaing Meteorite Crater, north of Pretoria. This is the world's most accessible crater, and is potentially of huge educational potential to the local populace. We are pleased to report that the crater itself is accessible,

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The visitors centre

and that the GSSA plaques and walking trails are in good shape. The visitors centre, however, is shown in the accompanying photograph. This was destroyed in the latter half of last year by fire, and there has seemingly been no effort by the Tshwane authority to rebuild. This is the impression that international visitors take away with them, many of whom likely see this and do not continue to the crater due to the poor state of the access road. The lesson is that it is not enough to assist in setting the facilities up, but ongoing management assistance and monitoring of geosites is required.

On the political front the GSSA has been engaged with providing feedback to the recently gazetted Geoscience Amendment bill. The amendment and comment are posted on the members' section of the website. In short, our objections are focused on the 'three C's', namely capacity of the CGS to be able to do what is envisioned without major budget increases, composition of the Board of Directors, and possible conflicts of interest for a body that could end up with both commercial and regulatory responsibilities. Our comments are in line with what others have said (Chamber of Mines, for example).

Going forward, we are planning the Annual General Meeting (to be held in Johannesburg on July 16), as well as the logistics around the 2010 Alex de Toit lecture tour in September. A number of branches have not returned preferred dates to the office, and we need to get that information as soon as possible. Finally, A few DPP courses are being added to the 2010 schedule, including a second basic drilling module and a course on modern mapping methods in September. More details of these events will be mailed to the membership and posted on the website. We will not hold a Geoforum event in 2010, but we are planning to join forces with sister societies, and hold an integrated earth science conference in late 2011. We will post more detail as it plans crystallize.

Until next time, enjoy the soccer, and may South Africa and the United States face off in the final.

Craig Smith

GSSA
Geological Society of South Africa

president's column

Marcia van Aswegen

During my term as President, Manco and the Past President have agreed that one year is too short to formulate as well as initiate GSSA projects. As soon as the course has been plotted and speed and attention are increasing, the finishing line appears. In order to prevent loss of impetus, I have agreed to continue to drive the GSSA strategy in my role as Past President. This will provide the continuity of a two year window to support GSSA transformation.

A non profit organisation (NPO) must exist for public benefit. During our strategic planning session, Robyn Woolley advised that a best practice direction for Public Benefit Organisations (PBOs) was to act as a bridge between its members and relevant institutions by facilitating in the provision of services and other benefits. The provision of these services should generate income to the society in order to provide a good percentage (about half) of its costs in funding non volunteer capacity.This non-volunteer capacity should provide membership services in return for member-ship fees. These membership fees together with additional revenue streams would fund the balance of the society's costs in such a way that it becomes sustainable and derives best value within the BBBEE compliance framework. Social responsibility and skills development are two easy value targets for the GSSA.

This adoption of this type of business model will cause a restructuring of the GSSA office and redefinition of the roles of the voluntary and non voluntary staff members. It will extend our vision to include external stakeholders. Current and future projects must be motivated and planned within this frame work.

Current initiatives include the new website; student focus; completion of the revised constitution and bylaws; continuous professional development (CPD); restructuring of the DPP to comprise 'large meetings', 'small meetings' and 'interventions for CPD'; strategy for membership growth and brand promotion and the delivery of the Richard Viljoen (SAJG) Collection CD and Coal Petrography CD.

Future initiatives which will be proposed to council can be grouped under the following headings; Sponsorship Drive to be lead by Fellows Committee;

Streamlining of GSSA Functions to allow Executive Manager to focus on Projects; Review of Publications (SAJG and Geobulletin); Publications from the GSSA Website; Fostering and Promoting Branch and Division Relationships and Geoheritage.

I was invited to attend the first meeting of the National Heritage Council 'nhc' in Pretoria at the beginning of April 2009. The vision of the nhc is to 'strive to be the leading agent for the preservation, protection and promotion of the South African heritage, both tangible and intangible, for sustainable development'. The scope of their mission includes: 'co-ordination of heritage management ...'; the development of heritage policies through consultations and partnerships with key sector role players; 'to promote, mainstream and foreground living heritage...'; 'provide a framework for the sustainable use of heritage resources ..' and 'facilitate the establishment of strategic partnerships with heritage stakeholders and role players, nationally, regionally and internationally'. [nhc 5 Years 2004 – 2009 Preserving Peoples Heritage booklet]. The conference looked at heritage versus development. The only reference to anything geoscientific was a presentation by Mary Leslie of the South African Heritage Resources Agency

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'SAHRA's' Archaeology, Palaeontology & Meteorites Unit. I followed up by inviting key people to our GSSA Geoheritage 2009 Conference which was held a month later. We have their attention and I attended the nhc policy development workshop in Cape Town at the beginning of May. The aim of this conference was to get stakeholder input on their policy framework entitled 'Mainstreaming Heritage in Development'. Dr Helene Vollgraaff is waiting for our input to this document. I am encouraged by their inclusive attitude and warm reception of the GSSA. It will not be difficult to align our Geoheritage Strategy with this framework. The organs of local, provincial and national government are crying out for data and heritage practitioners. We must get to grips with Ubuntu. This nhc project promotes heritage in terms of its 'contribution to social cohesion'. It promotes human rights by 'adding a strong element of social responsibility'. Living heritage includes 'an accumulation of intellectual capital for current and future generations'. [nhc Draft Discussion Framework April 2010]. They are willing and we are able.

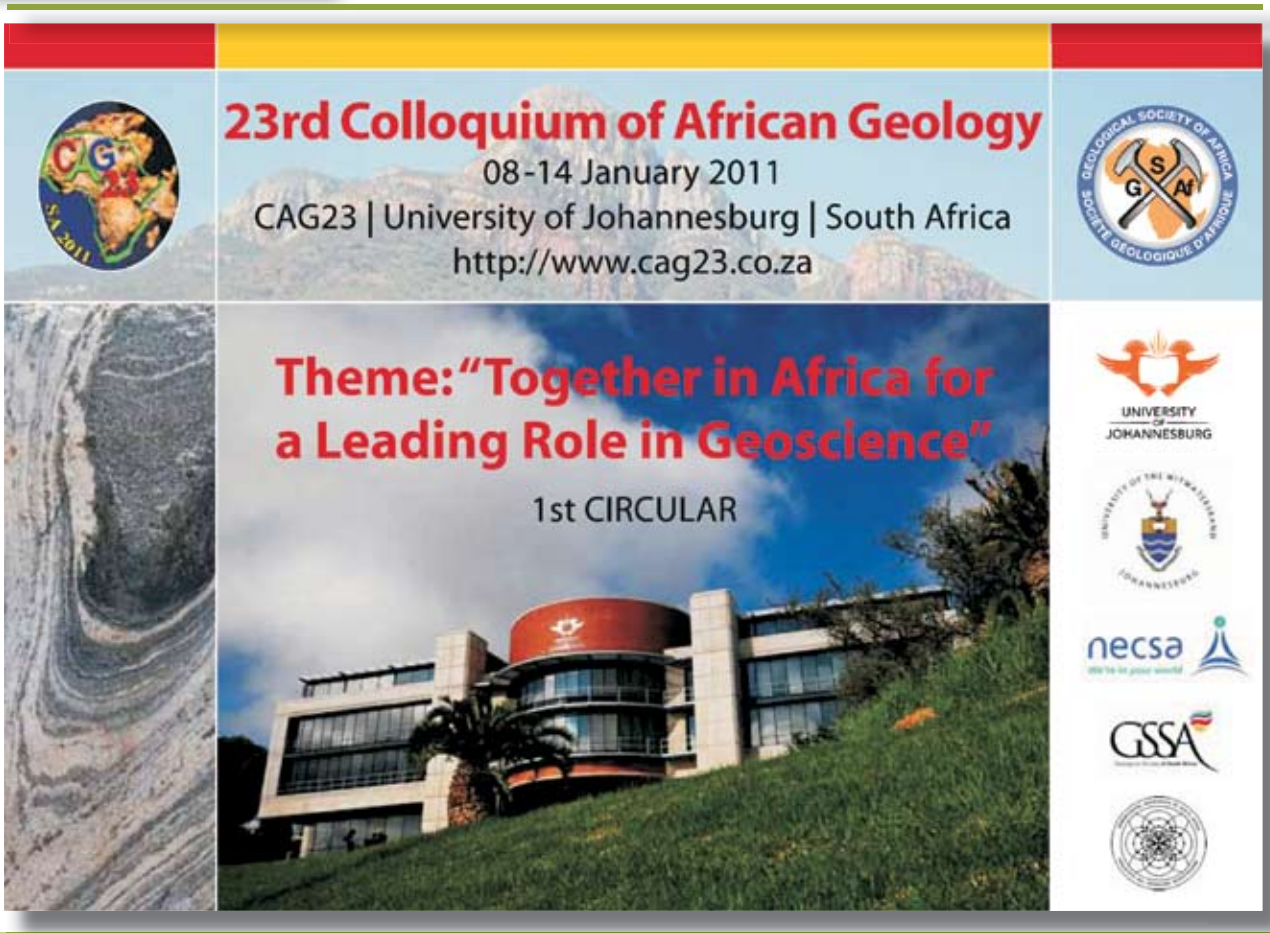
After a good braai with the Barberton Branch Die-Hards

I have enjoyed my term as President. It has broadened and stretched me and increased my love of this land and its people (geoscientific and other). My sincere thanks go to Craig Smith, Matt Mullins, the staff of the GSSA and all the VP's and Councillors who have supported me this year.

Catching up with young enthusiasts from the Bushveld Branch

I must acknowledge the staff and management of SABLE Data Works who held the fort when I was missing in action. A special vote of thanks go to Sandile Swana, Rajes Reddy and Nick Holleman. I believe that the GSSA is positioned to go from relevance to strength.

Marcia van Aswegen, 23 May 2010
marcia@sable.co.za



GSSA Events for 2010

Dates	Title	Venue
21st May 2010	Geochemistry: Applications in Exploration and Mining - II	Glenhove Conference Centre, Johannesburg
15th-16th July 2010	Introductory Drilling Course	Glenhove Conference Centre, Johannesburg
12-13th August 2010	Advanced Drilling Course	Glenhove Conference Centre, Johannesburg
September 2010	Mineral Asset Management Conference (in partnership with SAIMM)	Date and venue to be confirmed, Johannesburg
17th September 2010	Modern Mapping Techniques	Glenhove Conference Centre, Johannesburg
1st October 2010	Gold in Africa	Glenhove Conference Centre, Johannesburg
22nd October 2010	Mine and Ground Water Management in South Africa	Glenhove Conference Centre, Johannesburg

The dates above may change, please contact Paul Nex (pnex@umbono.co.za) Craig Smith (craig.smith@gssa.org.za) or Jann Otto at RCA (events@rca.co.za). for the latest information.

Other GSSA-involved Events

12th-14th May 2010	Introduction to Chemical and Mineralogical Analytical Techniques, Mineralogical Association of South Africa (MINSA) www.minsoc.org.za	Council for Geoscience, Pretoria
25th August – 4th September 2010	International Geoscience Educators Organization Conference web.wits.ac.za/NewsRoom/Conferences/GeoSciEd/ Contact: Ian McKay	Johannesburg: University of the Witwatersrand
8th - 13th January 2011	23rd Colloquium of African Geosciences (CAG) and 14th Conference of the Geological Society of Africa (GSA). www.cag23.co.za	University of Johannesburg
20th - 21st January 2011	3rd Annual Igneous & Metamorphic Studies Group meeting	Stellenbosch University
6-11th February 2012	10th International Kimberlite Conference 10ikcbangalore.com	Bangalore, India
2014	21st General Meeting of the International Mineralogical Association (IMA).	South Africa
2016	35th International Geological Congress	Cape Town, South Africa

National & International Events 2009 onwards		
4-6 May 2010	Physical beneficiation Conference SAIMM www.saimm.co.za	CSIR, Pretoria, South Africa
14-22 May 2010	Geological Society of Nevada Symposium Great Basin Evolution & Metallogeny www.gsnv.org/Default.aspx?alias=www.gsnv.org/symposium	Nevada, USA
27 May 2010	Junior Coal Mining Ventures V, Fossil Fuel Foundation of Africa www.fossilfuel.co.za	Glenhove, Johannesburg, South Africa
9th-10th June 2010	Spontaneous Combustion Re-visted, Fossil Fuel Foundation of Africa www.fossilfuel.co.za	Glenhove, Johanesburg, South Africa
10 June–10 July 2010	Football World Cup	South Africa
21-24 June 2010	11th International Platinum Symposium 11ips.laurentian.ca	Sudbury, Canada
27-30 June 2010	44th US Rock Mechanics Symposium www.armasymposium.org	Salt Lake City, Utah, USA
4th-5th August 2010	Second Hardrock Safety Conference SAIMM & AMMSA www.saimm.co.za	Emperors Palace, Johannesburg, South Africa
21-27 August 2010	20th General meeting of the International Mineralogical Association (IMA) www.ima2010.org	Budapest, Hungary
5-9 September 2010	5th International Archean Symposium www.5ias.org/	Perth, Australia
5-10 September 2010	11th Congress of the International Association for Engineering Geology and the Environment (IAEG) www.iaeg2010.com	Auckland, New Zealand
17-19 September	ZINC 2010 Irish Association for Economic Geology (IAEG) www.zinc2010.com	Cork City, Ireland
2–5 October 2010	The Challenge of Finding New Mineral Resources, Society of Economic Geologists (SEG) www.seq2010.org	Keystone, Colorado, USA
11-14 October 2010	Platinum in transition: 'Boom or Bust' Fourth International Platinum Conference SAIMM, www.saimm.co.za	Sun City, South Africa
17-22 October 2010	International Exposition and Annual Meeting Society for Exploration Geophysicists (SEG). www.seg.org	Denver, Colorado
21-25 October 2010	International Symposium: A 100 years of contributionsto Geology in commemoration of the Geological Survey of Zimbabwe's 100th Anniversary. Email: gsz2010conf@gmail.com	Harare, Zimbabwe
24-27 October 2010	22nd International Council for Science: Committee on Data for Science & Technology (CODATA) conference "Scientific Information for Society: Scientific Data and Sustainable Development. Hosted by NRF and ICSU regional Office for Africa. www.codata2010.com/	Stellenbosch, South Africa
31 October - 3 November 2010	Annual Meeting Geological Society of America (GSA) www.geosociety.org	Denver, Colorado

National & International Events 2009 onwards		
14th - 19 November 2010	3rd Regional West-Africa Deepwater Conference & Exhibition (DOWAS 2010). Nigerian Association of Petroleum Explorationists (NAPE) & American Association of Petroleum Geologists (AAPG) regions. aapg.org/africa/ Abuja, Nigeria	
20th November 2010	National Mineral Symposium 2010 (mineralman@telkomsa.net)	Pretoria, South Africa
21-25 March 2011	MINEFILL 2011, International Conference on Mining with Backfill, SAIMM www.saimm.co.za	Cape Town, South Africa
27th June – 8th July 2011	International Union of Geodesy and Geophysics (IUGG) General Assembly Conference. www.iugg2011.com	Melbourne, Australia
27-30 September 2011	11th Biennial Conference Society for Geology Applied to Mineral Deposits (SGA)	Antofagasta, Chile

letters

Comment on the Geoscience Amendment Act, 2009

On March 12, a proposed bill, Amendments to the Geoscience Act, was gazetted, with a request that comments be submitted to the Department of Mineral Resources within one calendar month. We did not learn about this until close to the end of March, but Manco and Council felt it important to comment on the draft, since the Act governs the activities and management of the Council for Geoscience (CGS). The CGS is one of South Africa's important geological institutions, the GSSA currently nominates one of the Board members, and we are in partnership with CGS in the staging of the International Geological Congress in 2016. What happens at the CGS is important to us! What happens in the regulatory environment affects earth scientists working in South Africa, in industry and academia.

The amendment and the formal comment can be found on the GSSA website. In effect, the amendment as tabled has the potential of changing the way the CGS is governed, as well as the way it operates. We chose not to comment on the proposals for increased CGS involvement in engineering geology oversight, or on the possible effects to the way the oil and gas industry operates and is governed. The GSSA concerns are focused on the 'Four C's' – capacity, codes, composition of the board, and the development of possible conflicts of interest.

The proposed changes would require serious capacity development because the additional responsibilities proposed are certainly beyond the current capacity and budget of the CGS. There is a section concerning oversight of geotechnical reporting, and it's not clear if that extends into other reporting areas already covered by SACNASP, and South Africa's mineral resource and reserve reporting codes (SAMREC-SAMVAL) which the GSSA and the Southern African Institute of Mining and Metallurgy (SAIMM) have been heavily involved in for several years. We have concerns that change in the way the board might be appointed not only excludes the GSSA and Chamber of Mines, but more importantly seems to open the door for a board needing little or no earth science representation. Finally, the increased responsibilities proposed for the CGS could see it being the archivist of all technical information from the private sector (which to some degree is one of its current roles), but additionally could be construed to mean the CGS would be required to act as a competitive player in some areas. We see this as a fundamental conflict.

For more detail, please see the documentation on the website.

Craig Smith
Executive Manager, GSSA
June, 2010

bushveld branch:
Naldrett, PGE & Chromites

On the 3 March 2010, the Bushveld Branch had the privilege of hosting Professor Tony Naldrett as guest speaker for the evening. Tony Naldrett's talk for the evening was titled "PGE in the Lower and Middle Groups of the Bushveld Complex: Why are some Pt and Pd rich and others are not."

We were also joined by the President of the GSSA, Marcia van Aswegen, GSSA Executive Manager, Craig Smith. Marcia gave a brief presentation about projects that the GSSA is currently involved in as well as other news and developments within the Society and the Geological fraternity. The feedback received from members regarding the presence of the GSSA at the meeting was positive and appreciated by all.

From left are Marcia van Aswegen (GSSA President), Johan Marais (Bushveld Branch Chairman), Prof. Tony Naldrett, Alfred Mabelane and Nicole Wansbury (Bushveld Branch Treasurer).

Tony Naldrett has a long list of achievements throughout his career. Tony's research has covered most of the world's magmatic sulfide ores, including those at Sudbury, the Abitibi Belt, the West Australian komatiite-hosted deposits, the Zimbabwe Ni deposits, deposits of the Raglan and Thompson Nickel belts, Noril'sk, Pechenga, Jinchuan, the Duluth Complex, and PGE in the Bushveld and Stillwater complexes, the Great Dyke, and at Lac des Iles. He has also taken an interest in chemical processes related to magmatic sulfides, including work on the Fe-S-O and Fe-Ni-S systems, sulfur solubility in silicate melts, the activities of divalent cations in mafic melts, partitioning of Ni, Cu, Co and PGE between sulfide and silicate melts and between mss and sulfide melts. He "retired" from the University of Toronto in 1998, but retains a position as University Professor Emeritus, and continues his research on magmatic sulfide deposits, most recently as Honorary Professor in the School of Geosciences, University of the Witwatersrand, South Africa.

The key points arising from the presentation were to explain the aspects of the association of PGEs with the Lower and Middle Groups of the Bushveld Complex and the chromite compositions and PGE contents of most chromitite layers from the different localities in the Bushveld Complex. The objective of the study was to try and get an understanding of the processes causing the PGE association with chromitite. Brief highlights and take home points from the presentation are given below:

For this study, samples were taken from 6 sectors of the Bushveld Complex. Samples taken were massive chromitites with little waste and silicates included and were chosen to get as broad a coverage as possible. Samples were taken from the Lower group (LG), the Middle Group (MG) and the Upper group (UG). The Lower group chromitites consist of 5 to 8 cyclic units of chromitites, harzburgites and pyroxenititc cumulates. The group consists of up to 7 layers (LG-1 to LG- 7), individually up to 1 m thick, hosted in feldspathic pyroxenite. The Middle Group chromitites comprise four principal chromitites, although multiple layers of each may develop (2a,b,c; 3, 3a; 4, 4a). The Upper Group chromitites consist of two chromitites, UG-1 and UG-2, in the western limb, whereas the UG-3 and UG-3a and UG-3b layers are also recognized about 10 m above the UG2 in the eastern Bushveld. The Upper Group chromitites will be the focus of the sequel paper and weren't discussed further. 456 samples from the 19 chromitite horizons between the LG-1 and UMG-2 were analysed for this study. Tony took the audience through the modeling and thought process followed during the study.

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Chromite composition

The chromite compositional trends of Mg/(Mg+Fe2+) versus Cr/(Cr+Al) were plotted and the following conclusions made:

Two prominent trends were observed, (A) and (B). The LG-1 to LG-4 and MG-3 to UMG-2 show an increase in Cr3+/(Cr3++Al3+) with decreasing Mg2+/(Mg2++Fe2+) (trend A) and the LG-5 to MG-2 show a decrease in Cr3+/(Cr3++Al3+) with decreasing Mg2+/(Mg2++Fe2+) (trend B).

From the variation in Mg/(Mg+Fe2+) vs Cr/(Cr+Al) and TiO2 content of the chromites, it was concluded that the trends conform to Eales et al's (1988) interpretation of the variation in En data in orthopyroxenes during crystallization of the Critical Zone, that stage 1 (LG-1 to LG-4) was a period during which the composition of the resident magma in the chamber was largely influenced by rapid influxes of fresh primitive magma. Stages 2 (LG-4 upwards) and 4 likely also experienced influxes of fresh magma, in this case crustally contaminated, but the composition of the magma in the chamber was dominated by fractional crystallization, that led to a gradual build-up of both Al2O3 and TiO2. Thus the whole of the Critical Zone up to the level above the UMG-2 appears to have had a complex history of coeval fractional crystallization, contamination and influxes of new primitive magma.

Trend A is influenced by the result of the reciprocal exchange substitution of Cr and Fe2+ for Mg and Al between Spinel and liquid affecting the Mg-Fe2+ Spinel-liquid Kd. Trend B is the result of the progressive increase in the chemical potential of Al2O3 as a result of fractional crystallization of orthopyroxene.

PGE content of chromitites

The LG-1 to LG-4 chromitites have a low (Pt+Pd)/(Rh+Ru+Ir+Os) ratio (0.1 to 0.3), while the LG-5 and above have higher ratios (0.9 to 10). Total PGE content of the chromitite also increases abruptly at the same level. Analysis suggests that Pt and Pd were controlled by a different process to that responsible for much of the Rh, Ru, Ir and Os concentration.

Polished section observations, analytical data on the more S-rich chromitites and S/Se ratios supports the argument by Naldrett and Lehmann, that at temperatures between 1597o (melting point) and 900oC, magnetite is non-stoichiometric, and contains a considerable number of vacant Fe2+ sites in the magnetite structure. On cooling from a typical mafic magma liquidus temperature (~1250oC) to 900oC magnetite would have to gain additional Fe to fill the Fe2+ vacancies leading to a loss of Fe to chromite.

The authors conclude that the Pt and Pd were concentrated by sulphide that was subsequently destabilised by the loss of Fe to chromite, while Rh, Ru, Ir and Os were concentrated while chromite formed.

Concluding remarks

The explanation for the difference in profiles between the LG-1 to LG-4 (Stage 1) chromitites and those occurring above the LG-4 (Stages 2–5) is that the former developed without associated sulphide while the latter developed with varying amounts of sulphide. The LG-1 to LG-4 chromitites did not have associated sulphide liquid, because the replenishing silicate magma during this period had a low S content due to its rapid ascent from depth. From the LG-5 upward, the replenishing magma was richer in S due to crystallization during a slow ascent, and, on mixing with magma in the chamber, gave rise to an immiscible sulphide liquid.

Tony explained that work on this study is ongoing and aspects not covered will be the focus of a sequel paper.

After a few questions by the audience, everyone had a chance to mingle and network over some refreshments. The evening was kindly sponsored by SABLETM Data Works and everyone that attended enjoyed it immensely. The next Bushveld Branch event will be a field trip to Wesizwe Platinum's Frischgewaagd project on the 15 May 2010.

References

Naldrett, A.J., Kinnaird, J., Wilson, A.,Yudovskaya, M.,McQuade,S.,Chunnett, G. and Stanley, C.(2009): Chromite composition and PGE content of Bushveld chromitites: Part 1 – the Lower and Middle Groups. Applied Earth Science (Trans. Inst. Min. Metall. B) 2009 VOL 118 NO 3/4.

Contributed by Nicole Wansbury,
Bushveld Branch Treasurer

all the news fit to print

This quarter features all the news fit to print from Rhodes, Stellenbosch, the University of Johannesburg and Wits.

RHODES UNIVERSITY
Where leaders learn

Rhodes University, Department of Geology

The second term has proceeded with the usual amount of unmitigated joyous learning and togetherness, for staff and students alike. We also appointed a new junior technical officer to our thin section laboratory, Mr Thulani Royi, who we anticipate will be an immense help in the capacity building of the facility.

John Moore big shoes (and hair) to fill.

In international news, Dr Andy Moore (a Research Associate of our department), with Woody Cotterill, Darrel Plowes and Tim Broderick earned the Society's 2009 A.E. Phaup Award for their S.A.J. Geol. paper on landscape evolution in Zimbabwe at the Geological Society of Zimbabwe's AGM in February. Dr Roger Scoon was also appointed as a Research Associate of Rhodes Geology during this past quarter, and we look forward to future research collaborations on the Bushveld through Roger and his colleagues. Lastly, Prof. John Moore has officially retired as of May 1, 2010 (courtesy of medical boarding), although he remains active in the Department assisting with teaching and research. The post of Director of the Exploration M.Sc. Programme remains vacant still, and a further search is planned. It is evident that this particular teaching niche requires a skill set which is both specialized and is marketable generally, and so our search for a "particular" individual continues.

Contributed by Steve Prevec

UNIVERSITEIT STELLENBOSCH UNIVERSITY

Stellenbosch University, Department of Earth Sciences

The Department at Stellenbosch has had no major changes during the period following the last bulletin. We would, however, like to remind readers that the next IMSG (Igneous and Metamorphic Studies Group) meeting is scheduled for January 20 and 21, 2011. This is the Thursday and Friday following the CAG23 meeting at University of Johannesburg. Further details will be forthcoming later.

There have also been some recent interesting developments in the provision of analytical services by the Central Analytical Facility (partly housed within our building and closely associated with the Department).

(LA)-ICP-MS UNIT

The CAF ICP-MS laboratory has been expanded by the purchase of an Agillent 7700 ICP-MS for solution-based geochemistry. The existing Agillent 7500 ICP-MS is now permanently coupled to a New Wave 213 nm laser sampling system equipped with a small-volume sample cell designed to maximize signal stability and sample throughput. In addition to trace-element analysis of minerals and glass disks, the LA-ICP-MS facility has been expanded to include the provision of zircon U/Pb geochronology. To maximise its capability in this field, SU recently appointed Dr. Dirk Frei, as the head of the Unit. He will be arriving in South Africa towards the end of 2010. In the interim, the facility is being run by Dr. Cris Lana of Earth Sciences.

The analytical protocols for zircon U/Pb dating have been tested in terms of reproducibility, accuracy and precision through analysis of zircon control standards (see the figure below the U/Pb data from a zircon

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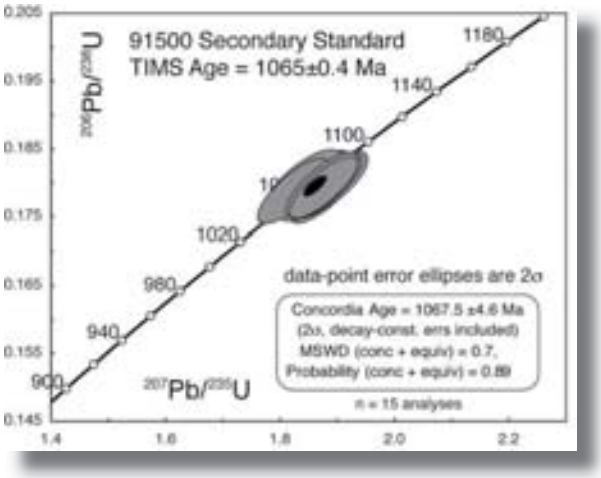
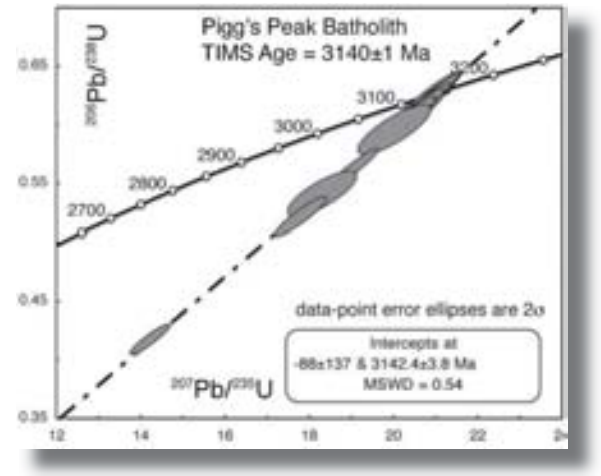
secondary (control) standard 91500, and data from a sample of the Piggs Peak Batholith, both measured in an analytical session in 2010). Zircon is typically analysed using a 30-60 micron ablation spot – suitable for detrital zircon provenance studies or dating of magmatic zircon. Given the sizes of metamorphic zircon domains, spot sizes at the low end of this range may, under ideal circumstances, be able to be used for dating metamorphism.





The LA-ICP-MS zircon U/Pb unit will serve two types of clients:

1) University/Geological Surveys: normally research work to be undertaken with the CAF scientist, and leading to co-authored publications.

2) Industry: service work provided by the CAF scientist, who is responsible for sample preparation, analysis and data reduction, and preparation of a report to the client.

Please contact Cris Lana (lana@sun.ac.za) if you have queries or would like to access this facility.

The Environmental Laboratory

This unit undertakes analysis of soil, sediment, rock, water and plant materials for environmental, ecological, geological and agricultural investigations. The laboratory is equipped with a range of equipment for atomic absorption spectrometry, ion chromatography, elemental combustion analysis (CNH), UV-visible spectrometry, titrimetry, pH, Redox, Electrical conductivity measurements and X-ray fluorescence spectrometry, with a new Panalytical Axios 2.4 kWatt spectrometer.

XRF is ideal for rapid and accurate whole bulk elemental analysis in rock or soil samples. The gas-flow proportional counting detector and scintillation detector, or a combination of the two, are used to cover elements from fluorine to uranium. Major elements are analysed on a glass bead, prepared by an automatic fluxer, and trace elements are analysed on a powder briquette. A wide range of international (NIST®) and national (SARM®) standards is used in the calibration procedures and quality control (precision and accuracy) for both major and trace element analyses. Detection limits for the elements quoted, depending on the matrix (combination of elements present), are typically 0.5 ppm. The laboratory performs routine analysis on the typical geological major and trace elements, Cr, Fe and Mn ore materials and Cu-Ni-S mattes.

Loss on Ignition (LOI) is a test used in XRF major element analysis which consists of strongly heating a sample of the material at a specified temperature, allowing volatile substances to escape or oxygen is added, until its mass ceases to change. The L.O.I. is made of contributions from the volatile compounds H_2O+, OH-, CO_2, F, Cl, S; in parts also K, Na (if heated for too long); or alternatively added compounds O2 (oxidation, e.g. FeO to Fe_2O_3), later CO_2 (CaO to $CaCO_3$). In pyro-processing and the mineral industries such as lime, calcined bauxite, refractories or cement manufacture, the loss on ignition of the raw material is roughly equivalent to the loss in mass that it will undergo in a kiln, furnace or smelter.

For further details, readers can contact Esmé Spicer (e-mail: spicer@sun.ac.za, tel: 021 8084788).

Contributed by John Clemens and Ian Buick

Some of the UJ staff showing off their support for Bafana Bafana on a Friday afternoon.

UNIVERSITY OF JOHANNESBURG

University of Johannesburg, Department of Geology

The PPM [Palaeoproterozoic Mineralisation research group] annual research report for 2009 was published slightly earlier this year – usually it comes out to coincide with the PPM annual research colloquium held in November of each year. Those who are interested in getting hold of a copy can do so by contacting the department or during the 2010 annual research colloquium held on 3rd November at the UJ hotel school.

Irrespective of the Icelandic volcanic ash cloud hovering over the European skies, Dirk van Reenen and Andre Smit managed to attend the session in memory of the late Prof. Leonid Perchuk (titled "Interplay of magmatism, metamorphism, and geodynamics: A symposium in memory of Leonid L. Perchuk") as part of the 2010 edition of the EGU General Assembly in Vienna. Both Dirk and Andre, who were participating by invitation, presented results of their joint research work with Leonid on the Limpopo Belt to a well-attended audience comprising Leonid's colleagues and a plethora of students.

Just as we (the academic staff) were gearing up with our department-sponsored Bafana Bafana T-shirts, along came Bryony Richards in her barmy army attire. Bryony joined the department for post-doctoral research focusing on the genesis of kimberlites and their xenoliths using petrographic, geochemical and thermochronological means. She was recently awarded her PhD from the University of London for her work on tectonomagmatic events related to the initiation of the breakup of Mesozoic Gondwana and crustal growth in subduction zones, including the genesis of adakites. She is getting involved with Jan Kramers in the thermochronology 'wing' of SPECTRAU.

Compiled by Rajesh

Frank Gregory (left, of the Mineral Corporation) and Bruce Cairncross (right, HOD UJ Geology) holding the uncut 507 carat Heritage Diamond. Frank organized to view this fantastic diamond and kindly invited Bruce along to take some photos (photo by Howard Bell).

UNIVERSITY OF THE WITWATERSRAND
JOHANNESBURG

WITS, SCHOOL OF GEOSCIENCES

Major excitement at Wits recently has been centered on the Australopithecus sediba fossil find made by Prof. Lee Berger, which was announced to the world on 8 April ahead of the release of two Science papers on the find. The first paper, by Lee and an international team of coauthors, describes a new species of hominin, which is represented by two individuals uncovered at the site, an adolescent male and an adult female. By the time of going to press, the team had already exposed more bones from the calcified clastic sediments, with many more to come. Paul Dirks and co-authors published an accompanying paper documenting the geological setting and age of the fossil deposits. Ex-Witsie Robyn Pickering and Honorary Professor Jan Kramers independently dated a flowstone underlying the fossils that establishes an age slightly younger than 2 Ma. The fossil has so far been on display at Maropeng in the Cradle of Humankind, the Iziko Museum in Cape Town and the Origins Centre at Wits, but is now back under lock and key for further study at Wits.

Sue Webb (who recently completed her Ph.D.) was selected by the Society of Exploration Geophysicists as the 2010 Honorary Lecturer for Africa and the Middle East. She will be delivering her lecture "Deep Gravity – Long Wavelengths and Measured Moho" during the second half of 2010, in many different countries including Nigeria, Ghana, Namibia, Botswana, Oman, UAE, Qatar, Kuwait, Egypt and of course South Africa. The lecture series kicked off in Capri, Italy, at the Electromagnetic, Gravity and Magnetic Conference hosted by the Italian section of the EAGE (European Association of Geoscientists and Engineers). She was stranded in Europe for a week in an ash-fall from the Icelandic volcano. She made the most of it and gave her lecture at the Ludwig-Maximilans Universitat, in Munich after being graciously rescued by Stuart Gilder!

Lucinda Backwell received the FEI prize (Life Sciences) for the best paper on electron microscopy published in an international journal in 2009. Her paper, which describes probable human hair found in a fossil hyaena coprolite at Gladysvale cave, was the sixth-most-downloaded paper in the first quarter for Journal of Archaeological Science.

Tamiru Abiye has been shortlisted for the Italian ENI Award in the category of renewable energy for his paper on the geophysics of the Boku geothermal area in Ethiopia, published in Geothermics.

Emeritus Prof. Tom Clifford received the Jubilee Medal of the GSSA for his paper in the South African Journal of Geology in 2008.

The Honours Geophysics class gave the best presentation at the SAGA Conference in Swaziland with Ashley Anthony and Oleg Brovko presenting a powerpoint on behalf of the class entitled "AfricaArray International Field School, 2009". This was followed by a short video produced by David Ngobeni entitled "PG13". These presentations really captured the geophysics and fun of the annual field camp.

Prof. Spike McCarthy will be the Alex du Toit lecturer for 2010.

Recent visitors to the School of Geosciences included Dr. Jörg Ebbing and Melanie Mesli (Geological Survey of Norway, Trondheim), who were working with Dr. Sue Webb on developing a new 3-D gravity interpretation of the Karoo Basin and the Barberton Greenstone Belt. Jörg and Melanie, who obviously love everything about South Africa, were here for a 4 month sabbatical and returned to Norway in time for their summer. They are planning a return visit for January.

John Mavrogenes and Richard Arculus (Australian National University, Canberra) visited us during May to collect samples of the Bushveld Complex, in collaboration with Lew Ashwal.

A report on the birthday celebrations of Lew Ashwal and Kevin Burke held at Wits during November 2009 is included separately in this issue. (pg 19 & 20) ⇨

At Wits we have not seen the downturn in student numbers reported by other universities in the last Geobulletin, although for now the university is allowing us to cap our class sizes. For 2010 our class numbers are: 110 (1st year), 60 (2nd year), 47 (third year), 44 (Honours, including 25 full-time and 8 part-time geology, 6 geophysics and 5 palaeontology).

contributed by Lew Ashwal & Roger Gibson

barberton drilling program

Scientific Drilling in the Barberton Greenstone Belt

N.T. Arndt, A. Wilson, A. Hofmann, P. Mason, M. Bau, G. Byerly, G. Chunnett

The Barberton Greenstone Belt in South Africa is one of the best-preserved successions of mid-Archean (3.5-3.2 Ga) supracrustal rocks in the world, and, as such, a remarkable natural laboratory where conditions and processes at the surface of the Archean Earth can be studied in detail. Despite generally good outcrop, nowhere in the Barberton belt are complete field sections preserved, and crucial features such as the contacts of lava flows and continuous successions of critical sedimentary rock sequences are not exposed. Only through diamond drilling will it be possible to obtain the continuous sections and relatively unaltered samples through the volcano-sedimentary successions.

Two scientific drilling programs are planned in the Barberton Greenstone Belt in coming years. The International Continental Drilling Program (ICDP) has approved one of them and drilling is expected to start in July of this year. This project is directed by the international team whose composition is given in Table 1 and is supported by "Archean Environment: the Habitat of Early Life", a research networking program of the European Science Foundation. The planning of this project - the choice of targets, drilling strategies and scientific goals - started in October 2006 at a meeting at the University of the Witwatersrand in Johannesburg (October 2006), and continued during meetings at San Francisco (December 2006), Berlin (March 2007), Vienna (April 2008) and a one-week field conference in the Barberton belt in September 2007. Summaries of these meetings, which were open to all interested scientists, are given on the website:
http://archenv.geo.uu.nl/.

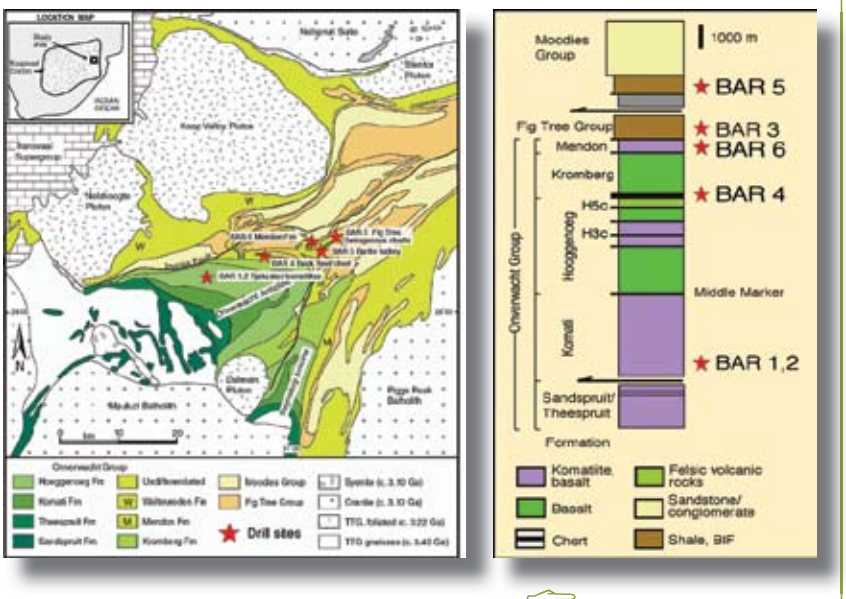
Two main drilling targets were identified.
(1) Sedimentary sequences, which will provide information about erosion and sedimentation on the early Earth, the composition and temperature of Archean seawater, and one possible site where life may have emerged and evolved. Study of tidal sequences will provide information about the dynamics of the Earth-Moon system, and the investigation of spherule layers (including impact debris) provide information about the nature and magnitude of meteorite impacts on the early Earth.

(2) Successions of ultramafic to felsic volcanic rocks, which will provide new insights into volcanic processes, dynamics of the crust and mantle, interaction between oceanic volcanic crust and the hydrosphere and biosphere.

Drilling in July-August will start at two sites. The first, BAR1 and 2, is in the southern part of the belt at 25°58'50.35''S; 30°50'37.28''E. Two holes are planned here. The first, 600 m in length, will intersect komatiitic and basaltic lava flows of the Komati Formation; the shorter (150m) second hole will sample an unusual tumulus structure composed of particularly magnesian, vesicular komatiite. Allan Wilson, Nick Arndt and Gary Byerly are in charge of this site.

Figure 1. Left: Geological map of the Barberton greenstone belt (modified from Hofmann, 2005) and locations of drill sites (the prefix BAR is excluded).
Site BAR 1a and 2 – Komati Formation komatiites;
Site BAR 3 – Middle Fig Tree Group sedimentary rocks;
Site Bar 4 – Lower Fig Tree Group sedimentary rocks, Barite Valley;
Site BAR 5 Sedimentary rocks of the Buck Reef Chert;
Site BAR 6 – Mendon Formation komatiites and cherts. The positions of sites BAR 1-1 to BAR 1-3 cannot be distinguished at the scale of the map and are shown schematically.

Right: Schematic stratigraphic section showing the positions of the sections that will be cored.



The second site, BAR3, is in the eastern part of the Barberton greenstone belt (25°54'24.55"S; 31°06'18.82"E). It will intersect 520 m of turbiditic graywackes, mudstone, sideritic banded ferruginous chert, and banded iron formation (the Manzimnyama Jaspillite Member) of the middle Fig Tree Group. Mike Tice (Texas A&M University) and Don Lowe (Stanford) are in charge of this site.
Drilling at three other sites, two in sedimentary sequences and the third in komatiites, will follow later in the year.

The drilling operation will be conducted using a standard rig and conventional technology under the supervision of Gordon Chunnett, a very experienced South African geologist. He will work with Allan Wilson and Axel Hofmann, in cooperation with Thinus Cloete of the South African Council for Geoscience, to handle the logistics. The distribution of samples and post-drilling research will be coordinated by a steering committee comprising representatives from all major participating countries. Once the core has been described and archived, a call will be made for proposals to work on the core. The call will be open to all scientists but priority will be given to those involved in the drilling or working in South African institutions.

Table 1. Compositions of science teams

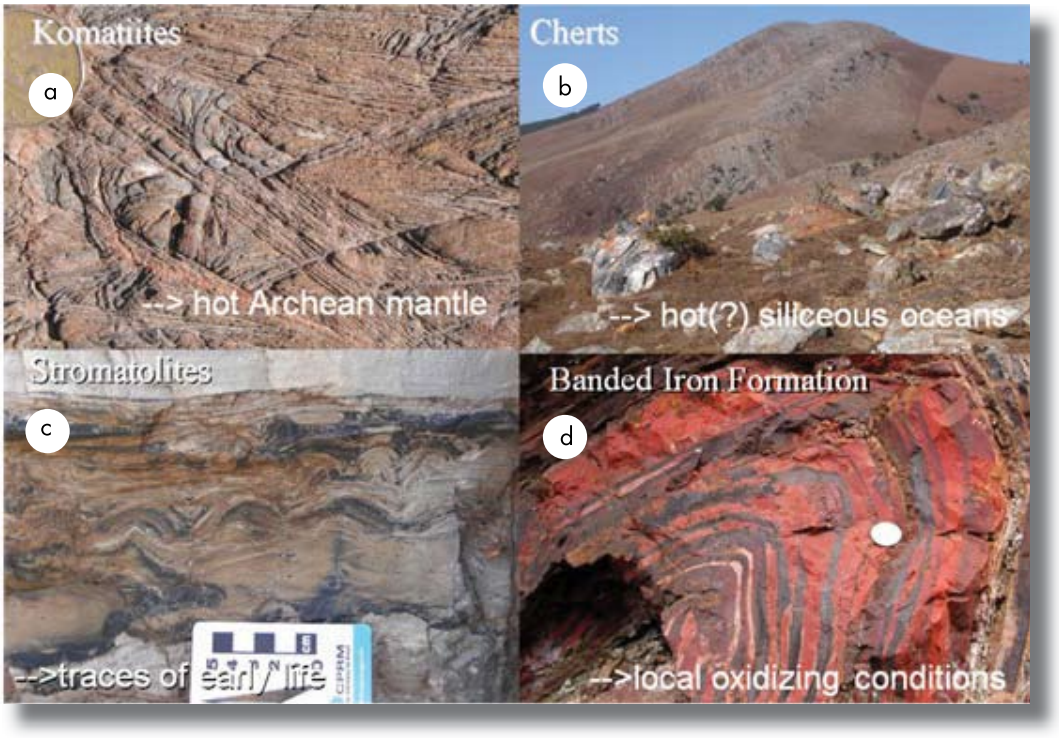
BAR 1 and 2
- Allan Wilson, University of the Witwatersrand, South Africa
- Nick Arndt, Université Joseph Fourier, 38400 Grenoble, France
- Gary Byerly, Louisiana State University, Baton Rouge, LA 70803, USA
- 2 PhD students

BAR 3
- Mike Tice Texas A&M University, College Station, Texas 77843, USA
- Don Lowe, Stanford University, 450 Serra Mall, Stanford, California 94305, USA
- Nic Beukes, University of Johannesburg, South Africa
- 2 PhD students

Bar 4-6 – yet to be decided

Steering Committee
- N. Arndt, University Joseph Fourier, 38400 Grenoble, France
- P. Mason, University of Utrecht, Netherlands
- A. Wilson, University of the Witwatersrand, South Africa
- A. Hofmann, University of Quazulu-Natal, Durban, South Africa
- G. Byerly, Louisiana State University, Baton Rouge, LA 70803, USA

Advisory Committee
- N. Beukes, University of Johannesburg, South Africa
- T. Cloete, Council for Geoscience, Pretoria, South Africa
- R. Buick, University of Washington, Seattle, WA 98195-1301, USA
- D. Lowe, Stanford University, 450 Serra Mall, Stanford, California 94305, USA
- G. Chunnett, Johannesburg, South Africa



Drilling targets: (a) spinifex-textured komatiite (BAR1,2); (b) Buck Reef chert (BAR5); (c) stromatolite (BAR4?); (d) banded iron formation (BAR3)

geology museum

Opening of the Geology Museum new displays, Museum Africa

MUSEUMAFRICA

The Geology Museum in Museum Africa opened new displays on Friday 30 April 2010.

The Geology Museum has a long history and was founded by the Witwatersrand Chamber of Mines in 1890 just four years after the founding of Johannesburg. At first it was used as a resource for prospectors and miners, but by 1898 was already available for the public to enjoy (7,000 came in that year). Since 1927 it has been a public museum in the care of the City of Johannesburg, and with the opening of the new displays will once again be available for the delight and inspiration of all.

Visitors will learn that South Africa is fascinating from a geological point of view and the exhibits at the Geology Museum will show this. The displays have these exciting themes:

Earth's place in the Universe

This theme will show that South Africa is host to the Southern African Large Telescope (SALT), an array of technically advanced telescopes near Sutherland, in the Karoo. SALT is helping scientists understand Earth's place in the Solar System and the Universe, and is yielding clues to the very beginnings of the Universe.

The very first continents, leading to the formation of Africa as it is today

One of the best places in the world to study the clues to the beginnings of the first continents is in the rocks near Barberton in Mpumalanga, which are also known for their evidence of the very earliest life. (There are older rocks but they are in inconvenient and inhospitable environments such as Greenland).

The riches of South Africa: Gold, manganese, platinum, diamonds, coal, fossils - how and why they formed as Africa formed – the geological evidence

- South Africa has the greatest concentration of gold anywhere in the world in the Witwatersrand Basin.
- Over 80% of land-based manganese (essential for steel-making) is found in the Kalahari Manganese Field.
- The Bushveld Complex is the largest deposit of platinum (and related metals) anywhere in the world.
- The fossils found in the Karoo sediments form an unbroken record over millions of years. They also contain fossil evidence of how continents have drifted apart and come together again and apart again over millions of years.
- The largest diamond ever found is South African. It was The Cullinan found in 1905 at the Premier Mine near Pretoria. A model of it is on display. Kimberley is synonymous with diamonds.
- The Cradle of Humankind near Mogale City has the oldest hominid fossils.
- The Vredefort Impact Structure near Parys is the oldest and largest meteorite impact crater in the world. Most of it has eroded away after millions of years, but the upended rocks of Johannesburg's Hospital Hill that are part of the structure can still be seen.

Economic Minerals

Apart from the big names; gold, diamonds, platinum, coal; South Africa is rich in a surprising number of minerals, with a surprising number of uses. Aluminium, antimony, asbestos, chromium, copper, corundum, dimension stones (so-called granites), iron, fluorite, lead, zinc, manganese, phosphate, tin, titanium, zirconium and vermiculite are the main economic minerals shown.

Some of these were mined and used centuries before the colonial era. The three main copper mining areas, Okiep, Palaborwa and Musina were all mined by indigenous peoples hundreds of years before Europeans arrived. Palaborwa means "it's better here" – meaning better for iron ore. Iron mining, smelting and trading also has a long precolonial history. Tin was mined in the 16th century at Rooiberg, where about 18, 000 tons

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of ore are estimated to have yielded up to 2,000 tons of tin. Mapungubwe, site of an ancient 1000- year- old civilization, is well known partly because of the amount of gold found there. Thulamela in the Kruger National Park has evidence of gold smelting about 500 years ago in that area.

The Treasure Room

A display of rare, valuable and beautiful mineral specimens and gems has been selected form the Geology Museum's international collections. Some of these specimens are for the true connoisseur; all of them are beautiful objects of geological heritage, collected from around the world.

The Freak Show

Some rocks and minerals are just amazing and weird. Did you know some rocks glow in UV light? Meet fluorite and a range of others that glow in strange fluorescent (of course) colours. You've heard of the healing powers of a crystal worn around your neck, but how about one big enough to sit on? And then there are rocks and minerals it is best to avoid – the poisonous ones. Floating rocks? You won't lose volcanic pumice stone in your bath.

Geological processes

Geology is all around us, and the processes that form our familiar landscapes (and the ones deep beneath the Earth's crust) are explained using African examples. Showrock Holmes, rock detective, helps explain some of the clues to be seen in the rocks about us. For instance the layered and sinuous metamorphic rocks of the Beitbridge Belt near Musina tell of a range of mountains in the distant past that were as high as the Himalayas. The sandstones of the Golden Gate National Park are the remains of a desert that covered all of what is now South Africa and continued a long way beyond. The spectacular Drakensberg Mountains are what remain of the molten lava that flowed out to cover that sand when the Earth's crust began to rift.

One main lesson you should have learned after a visit to the Geology Museum is that our Earth is NOT rock solid, but continuously changing, and the clues to that fascinating story have been put together by geologists.

Museum Africa
121 Bree Street
Newtown
Johannesburg

Tel: 011-833-5624
Fax: 011-833-5636
e-mail: museumafrica@joburg.org.za

Opening hours: Tuesdays to Sundays 09:00 to 17:00, entrance free
Closed Mondays, Good Friday, between Christmas and New Year

Enquiries:
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e-mail:
dianaw@joburg.org.za

Hematite with red andradite garnet, Kuruman district.

out of africa:

140 Years with Kevin Burke and Lew Ashwal

Many of us, as we get older, think about our birthdays with some sense of unease, I guess in part because of the thought of the final one looming ever closer. But my 60th turned out to be far more enjoyable than the 59 others that I can remember. There are many reasons, but an important one is that this landmark coincided (within 3 days) with Kevin Burke's 80th, and our good friends organized things so we could celebrate together. The festivities took place during the 3 week period 13 November – 5 December 2009, and were one of the great honours of my life; I am deeply grateful to Trond Torsvik, Sue Webb and Susanna Buiter for organizing and paying for almost everything. Kevin said he was deeply touched by all of the attention, and of course, I was too.

The first activity was a big party at my house on Saturday night, typical of the ones we frequently have there. Kevin, Tom Jordan and most of the Norwegian delegation arrived a day early in preparation for this, and I got lots of single malt and cigarettes as gifts, much of which was consumed that night. The Jacuzzi was bubbling, and wound up to be one of several centres of shamelessness. I can't remember how this party ended.

The next day was devoted to recovery, in preparation for the ice breaker that evening, held at the Kitching Museum of Palaeontology, at Wits, where over 100 participants from 12 countries (USA, UK, RSA, Norway, India, Netherlands, Denmark, Germany, Turkey, Italy, Botswana and Sweden) began to arrive for the 2-day conference. I and many others were delighted to see Steve Haggerty, who taught me ore microscopy in 1972-3 at the University of Massachusetts. There were lots of heart-warming speeches honouring Kevin and me, and Maarten de Wit showed a video of the both of us chairing sessions at a 1986 conference in Houston on greenstone belts - this is where Kevin and I first met Maarten. Sue Webb organized for us to be entertained by the Wits University choir. A small group of us stayed up very late that night.

The 2-day conference, designated "Out of Africa: 140 years with Kevin Burke and Lew Ashwal" really was the highlight of all these events. I was genuinely impressed by the high quality of all the talks, given by so many very smart people, seemingly from everywhere in the world. Keynote lectures were given by Tom Jordan (the strong isopycnic hypothesis for cratons), Maarten de Wit (architecture of the Barberton greenstone belt), Kevin Burke (is plate tectonics being forgotten?) and Celâl Sengör (Palaeo-Tethys and Permian extinction). I was especially impressed by the level of the talks given by my present and former students, some of whom travelled a long way to attend. The full programme and abstract volume can be viewed and downloaded at: http://www.geodynamics.no/outofafrica/.

Monday night, my actual 60th, we all had a celebratory dinner on the 17th floor of the Hotel Devonshire, in downtown Joburg. Maarten was the master of ceremonies, and (wearing an honourary baseball cap) he related touching and embarrassing stories about me. Selected others were invited to do the same- Tom Jordan, Steve Haggerty, Grant Bybee & Trishya Owen-Smith, and my daughter Jennie. I think it must have been Trond who put together a slide show of photographs of me (including baby pictures) that ran continuously during the evening. He also gave me a nice Arsenal jersey, which I wore during dancing to the loud rock-n-roll supplied by a professional DJ.

After the second day of talks (equally as impressive as the first), we celebrated Kevin's birthday at a far more elegant and sedate setting in the Johannesburg Country Club. Sue hired the Lyric Ensemble String Quartet string quartet to entertain us, which was a superb touch. This time Trond served as the master of ceremonies, and he tried to limit tributes to Kevin to speeches of 5 minutes. Celâl's went on for seventeen; shorter ones were given by Wikkie Royden, Nico de Koker and me. In mine I explained the two most endearing of Kevin's qualities:

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Kevin and Lew

science and fun, and I recalled that 5 years earlier, at Kevin's 75th birthday in Houston, Celâl said in his speech that "Kevin Burke is the greatest living geologist in the world today". People applauded.

The next day, a field trip to Vredefort was scheduled. I was slated to lead it, but bailed out, feeling more than a bit under-the-weather from the previous 5 days of merriment. Marian Tredoux heroically stood in for me, and I was told that everyone had a great time looking at the world's oldest and largest meteorite impact crater. I had another good excuse—that afternoon, Sue Webb was to formally receive her Ph.D. at the Wits graduation ceremony. We had arranged for Tom Jordan and Trond Torsvik, both of whom were important participants in Sue's geophysical work over the years, to attend as special guests, on stage, and in full academic regalia. This was a momentous occasion for all of us, and about a dozen of Sue's fans celebrated afterwards at a nice Italian restaurant in Melville.

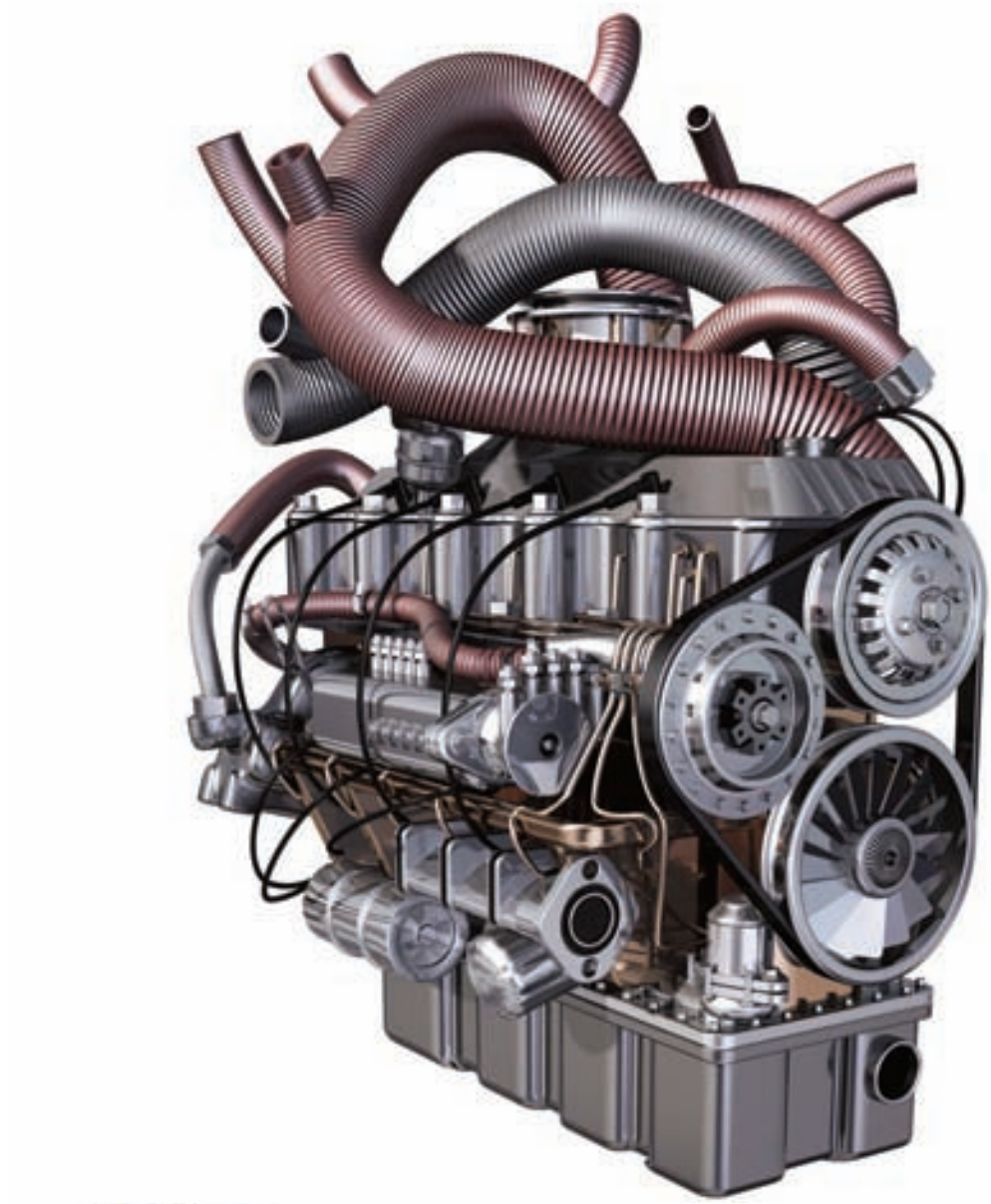
We had one day of rest before a group of 12 of us left for Windhoek, on a 10-day field trip and holiday to sample the Etendeka basalts, mainly for palaeomag. We met up with Roy Miller, who was an indispensible guide to this place. We were all very comfortable at the Etendeka Mountain Camp, which I recommend highly. Our Norwegian friends and colleagues paid for everything. Trish will work on these samples as part of her M.Sc.

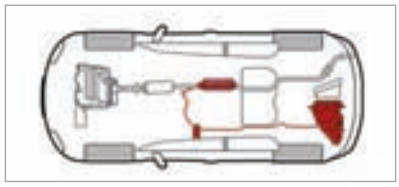
It isn't quite over. Douwe van Hinsbergen, Susanne Buiter, Trond Torsvik, Sue Webb and Carmen Giana have organized a special volume in our honour entitled "'Out of Africa - a synopsis of 3.8 Ga of Earth History", to be published by the Geological Society of London. Somewhere between 40 and 50 papers are expected for the book, which I guess will appear late this year or early next. I am looking forward to this.

All of these gifts, and especially the company of all of these great people, represent birthday presents that Kevin and I are both overwhelmed by, and we are deeply appreciative. It took me a long time to recover from all of this, but I think I am almost back to normal now. To all of the people who participated, and to all those who could not attend but sent greetings and best wishes, we thank you. We thank you very much indeed.

Lew Ashwal

Kevin at the party





PLATINUM CAN HELP SAVE THE PLANET.

Imagine if a metal was that useful. That precious. Platinum is used in catalytic converters, which help reduce harmful emissions from automobiles, lowering the harm to our planet. It also assists in breaking down the pollutants in detergents, creating cleaner air. Platinum is key in new technologies. It's used in cancer treatments, and in pacemakers to keep hearts beating. Imagine the possibilities of Platinum – a metal of the future.

PLATINUM. A PRECIOUS METAL FOR A PRECIOUS PLANET.

ANGLO PLATINUM

World leader in platinum

in memoriam:
Dr Ben Worst

Dr. Ben Worst (alumnus, 1939-1957): passed away over the weekend of 10-11 April, 2010

Dr. Ben Worst, one of our more prominent alumni and as far as we know our "second oldest alumnus", unfortunately passed away over last weekend. Ben's time in the Dept. of Geology at UP goes back to 1939 and he thus knew Prof. LC de Villiers our first full head of department as well as many other famous figures from our history, such as Profs. Ben Lombaard and "Mackie" Willemse. Dr. Worst made his name through his seminal work on the Great Dyke of Zimbabwe, and was also amongst those involved in the first application of geophysics to a South African geological problem. He also contributed most generously to the departmental history book published on our 100th anniversary in 2008, and several quotes from those contributions are shown below. Ben will be missed by all who knew him, especially his regular appearances at the annual alumnus get-togethers. We express our sincere condolences to his family.

Foto geneem deur Prof. Ben Lombaard, op ekskursie Barberton-toe in 1941.
Agterste ry, van links na regs: Andries Lombaard, Ben van Graan, D.B.Boardman, Ben Worst, M.P. Theunissen, G.P. Fourie, Booysen, onbekend, Julies Cronje, "Pluto" van den Berg, onbekend, die twee dames by wie hulle vleis gebraai het, Simon Zagt, onbekend, "Pyp" Hugo (lector in aardrykskunde).
Voorste ry, van links na regs: J.M. van der Westhuizen, John Berning, Joe Liebenberg, Pikkie Boshoff (later dosent en het rugby vir Noord-Transvaal gespeel), Roos, van der Hoven.

Dr. Ben Worst (oudstudent, 1939-1957): oorlede oor die naweek van 10-11.04.2010

Dit is met leedwese dat ons bekend moet maak, dat Dr. Ben Worst die vorige naweek oorlede is. Hy het sy Geologie-studies aan die UP in 1939 begin, en het sy B-graad einde 1941 behaal, gevolg deur 'n MSc en 'n Doktorsgraad (voltooi in 1957). Ben was ons "tweede oudste oudstudent" en was 'n gewaardeerde gas by die honderdjaar feesvieringe van die Tukkies Departement Geologie. Ons herinneringe gaan terug tot die laatjare van die eerste departementshoof, Prof. LC de Villiers en het dan verder gestrek oor al sy opvolgers. Hy was veral bekend vir sy seminale werk op die Groot Gang van Zimbabwe, wat hy immers na verwys het as die "Groot Plaat", asook sy betrokkenheid by die eerste aanwending van Geofisika in SA. Dr. Worst het ook 'n groot bygedrae gelewer tot die departementele geskiedenis boekie (uitgegee deur die Dept. Geologie, UP, 2008) en 'n paar verkorte aanhalings daaruit word onder weergegee.

"Toe ek 'n student was aan U.P., vanaf 1939 tot 1943, was die Departement gehuisves op die tweede vloer van die Wetenskapgebou. Dit moet onthou word dat hier gepraat word van 66 jaar gelede, gedurende die oorlogsjare. Die professore was L.C. de Villiers en B.V. Lombaard, l.g. het Prof. Scholtz opgevolg toe hy in 1937 verhuis het na Stellenbosch. Prof. L.C. het vir ons Pal-Strat. gegee en Prof. Lombaard Pet-Min. Prof. L.C. was altyd baie vriendelik en hulpvaardig en het sy vak geken. Hy het daagliks tennis met sy studente gespeel. Ons het ons jaar eindeksamen altyd in die saal op die tweede vloer van die Ou Lettere Gebou geskryf. Die totale studentegetal van die Universiteit was om en by 2000 gewees. Anton Rupert was toe V.S.R. voorsitter.

Die studente soos ek hulle onthou het, was die eerste groep: Pikkie Boshof (hy het losskakel vir UP gespeel en later ook vir Noord Transvaal) (senior MSc student in 1939), Hans Nel (senior MSc student, 1939), later lektor, en Schwellnus (DSc student, 1938), Preller (derdejaar student 1938), en Henry le Roux (derdejaar student 1937?). Die volgende groep was (hier word verwys na van die 15 derdejaar studente van 1939) Pluto van den Berg (sy vrou het hom vermoor), Simon Zagt, later lektor, John Berning, Joe Liebenberg (singsong leier van die Universiteit) en Boardman. My groep (derdejaar groep van 1941) was Andries Lombaard (neef van Prof. Lombaard), van der Westhuizen (vroeg dood in 'n vliegtuig ongeluk), G.P. Fourie, Ben van Graan (derdejaar in 1940), Iris Malan, Koos Bronkhorst, en Tielman van den Vyver (derdejaar 1942). Die groep (hier word effektief verwys na die derdejaar groepe van 1943 en 1944) na ons was: R.A.P. Fockema, Dick Groeneveld, van den Hoven, Julius Cronje, Peer de Villiers, en Louis, seun van Prof. L.C. de Villiers – hy het later medies geloop. Gedurende hierdie tyd het Pikkie vir ons Petrologie en Pluto Paleontologie gegee.

Na ek my MSc graad behaal het, het 'n groep van ons in 1944 na Bultfontein in die Vrystaat gegaan om geofisiese opmetings te gaan doen vir Oscar Weiss, om die Witwatersrand lae te gaan vasstel onder die Karoo sedimente. In die groep was, ek, van der Westhuizen, John Berning, Dick Groeneveld, van den Vyver, Fockema, Fourie en de Villiers. Daar was gedurende die oorlog geen werk vir geoloë nie en het ons die twee jaar in die Vrystaat gewerk in die omgewing van Wesselsbron, Bothaville, Odendalsrus, Brandfort en Verkeerdevlei. Geofisika was toe iets nuuts en ek het dit later in ander dele van suidelike Afrika toegepas.

In 1957, het ek my doktersgraad verwerf onder Prof. Willemse. Hy het my besoek in Rhodesië om self na die "Great Dyke" te kom kyk; my kamp was toe naby Hartley. Op 'n stadium het ons ondergronds gegaan in 'n chroom myn. Omdat die chroomlae baie dun is, is die afbouing ook baie smal en moes ons op ons mae van een vlak na die volgende een seil. Met die uitkom kon ek sien dat Prof. Willemse dit nie geniet het nie. Nieteenstaande was dit deur hom dat 'n groot deel van my tesis gepubliseer is in die "Transaksies". Ek is trots daarop dat ek my geologiese opleiding van die Universiteit van Pretoria ontvang het."

Contributed by Tim Broderick

the view from the floor

Challenges To Mining Profitability

Despite considerable concerns about the short demand for metals in wake of the global financial melt-down and its impact on economic growth, we remain in an environment in which most industry commentators believe that commodity prices for the next few years will continue to average significantly higher levels than historic long run prices. They base this view on three key assumptions:

- the apparently insatiable demand for raw materials from China and (increasingly) India, as they move their economies from a largely rural base to become industrial giants

- potential supply shortages of large, higher grade deposits in a number of key metals required to feed this demand

- relentlessly rising costs of mining pushing up the marginal cost of production (see below for many of those cost drivers), and hence underpinning metal prices

This would suggest a rosy outlook for mining group profits, cashflows and dividends, and hence a strong performance from the shares of those mining groups that are listed. But in reality, investors worry that may not be the case, as the positive medium term macro factors may not drop directly through to the bottom line.

There is good reason to believe that the so called "gold share disease" (the gold price rises but margins remain static as costs rise by at least a similar amount) could be a feature of a number of other commodity sub-sectors in the future. In fact, there is some evidence to suggest that the trend has already started – over the past ten years, the HSBC Global Mining Index (of listed shares) has underperformed a basket of commodity prices by around 30%.

The trends currently running through the sector that could be a challenge to future profitability include:

- Rising economic rents demanded by governments e.g. the Henry tax in Australia, (or so called "super-tax on mining companies), which has received verbal approval from a range of resource-rich nations that suggests a degree of contagion to other countries in the foreseeable future; the Chilean earthquake tax; recent changes in tax regimes in sub-Saharan Africa; and royalty taxes plus debate around rising BEE requirement in South Africa).

- Changes in the pricing structures of many metal markets (e.g., recent fracturing of the annual benchmark iron ore pricing mechanism which could lead to increased volume and price volatility over the cycle in the currently very high margin iron ore markets. This move from long term contracts to spot pricing has already occurred to a large extent in both the thermal and met coal markets. Some ten years back, Rio Tinto attracted a premium rating because the less volatile revenue and profit stream from the so called "bulk commodities" offset the volatility of its LME-market base metal stream. Going forward, all commodity streams could be more volatile, with consequent implications for the premium ratings for the diversified miners.

- Lower grade deposits (often requiring untested or more complex metallurgy, and often at lower depths), and very often in more challenging jurisdictions; for example, even a large, diverse group like Rio Tinto's next generation of large projects is dominated by Oyu Tolgoi in Mongolia (Cu/Au – high levels of political risk and infrastructure challenges); Simandou (iron ore in Guinea – many times the annual rainfall of Brazil, so many rivers to cross in developing the infrastructure), and Resolution (Cu/Au), 1300 kilometres down in hot rock in the US.

There are even more significant challenges to some single product companies such as diamond producers, where accepted wisdom is that the only really large, mineral rich deposits to supply future projects are to be found in Angola/DRC or in areas of extreme cold temperatures (Canada and Russia).

- Challenges to attaining / retaining next generation mining licences. Traditional mining groups face

growing competition from (often quasi-state owned) Chinese groups who offer to the governments auctioning the new exploration/mining licences the promise of infrastructural investment in addition to the asked-for price of the permit.

- Upward pressures on capital costs. All of the factors discussed above are pushing up the absolute size of investment required for major new projects, at a time when the same factors are suggesting that returns from some of these projects will be less attractive than those from some of the large, low cost discoveries of the past (e.g. the rich Chilean copper discoveries of the 1970's). In addition, during the five year commodities boom up to 2008, shortages in a range of inputs caused mining companies to point to an inflation rate within the industry that was significantly higher than the national averages (e.g. drilling rig availability, contractor terms, cost and availability of skilled personnel, and even tyres for large capital equipment)

- Upward pressures on operating costs. These trends are particularly evident in Southern Africa, in terms of rising costs of power, labour, plus indirect costs associated with the implementation of stricter safety and environmental regulations.

This is a daunting set of challenges facing the mining industry. But let us not end on a defeatist note. Management in the mining companies is seeking new approaches to the workplace all the time, and just a few examples of the strategic directions they have adopted are:

- working "clever" (mechanisation/outsourcing/ new technology/smaller but more focussed exploration budgets/faster turnover of prospective properties/centralised procurement/reviewing exposure to rising power costs)

- working "together" (more willing to consider joint ventures with competitors or state entities to reduce capital cost risks / still looking to partner juniors to reduce political risk exposures in early stage greenfield projects)

What has not yet emerged, however, is the industry's response to proposed higher levels of taxation that could significantly undermine how much profit falls to the bottom line even when prices are strong. We will, as they say, have to watch this space….

Biography:
Dr. Fiona Perrott-Humphrey

Born in Egoli, South Africa "the City of Gold", Fiona moved to the UK in 1986 and devoted the next 15 years to working as an investment mining analyst for major financial institutions in the City of London.
Prior to this, she spent six years in financial journalism and academia in South Africa.

In 2003, Fiona left her position as head of mining research at Citigroup to set up her own consultancy so she could continue her favourite aspects of a mining analyst's job and "dump the less enjoyable aspects of working in the City".

In 2006 she formed AIM Mining Research with ex-AngloGoldAshanti C.O.O. David Hodgson and geologists Gordon Wylie, Peter Mellowship and Jan-Marten Huizenga. They have published "Understanding Junior Miners" to help investors, fund managers and AIM mining companies understand the specialist geological and mining issues facing early stage juniors in order to interrogate and analyse them.
Fiona fits in her consulting work, including two days a week with NM Rothschild's mining team, around hiking, gardening and travel (much of it to southern Africa).
BA(Natal) - MBA(Wits) - DBL(UNISA)

media monitor

CORPORATE MOVEMENTS

Transactions

Anglo American agreed to sell its zinc assets to Vedanta Resources plc for US$1.338 billion. The assets comprise the Skorpion mine in Namibia, the Lisheen Mine in Ireland, and a 74% interest in Black Mountain Mining, which owns the Black Mountain mine and Gamsberg project in South Africa. Anil Agarwal, Vedanta's chairman, said that the company intended to rapidly develop Gamsberg, which is one of the largest high-quality zinc projects in the world.

Eurasian Natural Resources Corporation (ENRC) continued its expansion into Africa with the purchase of a 12.2% stake in Northam Platinum from Mvelaphanda Resources for R2.2 billion (approximately US$296 million) in cash. ENRC said that the acquisition was in line with its strategy of diversifying its commodity portfolio and geographic exposure. The company recently acquired Central African Mining & Exploration Company (CAMEC) for £584 million and entered into an agreement to purchase a 90% interest in Zambian copper and cobalt producer Chambishi Metals.

INDUSTRY TRENDS

Global spending on exploration for nonferrous minerals fell to US$7.32 billion in 2009 compared with the record US$12.6 billion in 2008, according to Metal Economics Group's special report for the PDAC 2010 Convention. This marks the largest year-on-year decline in two decades. With the inclusion of uranium and estimates for budgets that MEG could not obtain, the total spending is estimated at US$8.4 billion. Latin America remained the most popular exploration destination, increasing its share of overall expenditure to more than 26%, while the "rest-of-world" region moved up to second place to replace Canada. Africa dropped to fourth position, and Australia remained at fifth, followed by the USA and Pacific/SE Asia. Gold was the top exploration target (48% of aggregate expenditure), with base metals falling to second place, and uranium third. PGM exploration fell to just 2% of the total, down from a 2003-2003 high of 6%, with about half of that amount destined for South Africa. MEG said that with the improvement in metal prices since early 2009, many companies are planning "moderate to substantial" increases in their exploration budgets for 2010.

The platinum surplus surged by 47% to 849 000 ounces in 2009, according to estimates by GFMS. The London-based consultancy said in its Platinum & Palladium Survey 2010 that global demand fell by 14% or 1.07 million ounces to 6.41 million ounces, with autocatalyst demand dropping to an eight-year low of 2.60 million ounces. Platinum mine supply fell by just 2% to a six-year low of 6.04 million ounces. GFMS said that the palladium market was in near balance in 2009, with a 259 000 ounce decline in supply being outstripped by falling demand, resulting in a deficit of just 12 000 ounces.

World mine production of gold rose by 163 t (6.8%) in 2009, the first annual increase for three years, according to the GFMS publication Gold Survey 2010. The major gains were in Indonesia, China, Russia and Ghana, with the largest falls in South Africa and the USA. GFMS forecast that mine supply will continue to increase in 2010, but at a slower pace, and that fabrication demand will recover, while investor interest is expected to remain strong throughout the year and potentially into 2011.

MINING AND EXPLORATION NEWS

Copper and cobalt

Discovery Metals lifted the total mineral resource at its Boseto copper project in Botswana to 1.422 Mt of contained copper, an increase of 68%. Measured and Indicated resources have increased by 92%, to 22.5 Mt at 1.5% copper and 18.7 g/t silver. Discovery is reviewing the technical reports for the Boseto bankable feasibility study, and expects to release additional information shortly.

Hana Mining announced a near-doubling of the Inferred resource at its Ghanzi copper-silver project in Botswana to 3.93 billion pounds of contained copper and 62.13 million ounces of silver. The increase results from a 41 770 m drilling campaign on the Banana Zone, which accounts for just over 60% of the total resource (73.5 Mt at an average 1.47% copper), and a new section referred to as the Chalcocite Zone The company said that high-grade areas within the Banana Zone represent an opportunity to locate starter pits and improve early cash flow, while the Chalcocite Zone would be amenable to bulk mining and lower-cost processing techniques

Gold

Vantage Goldfields (previously Eastern Goldfields Ltd) plans to raise between A$20 million and A$30 million in an initial public offering prior to listing on the Australian Stock Exchange in May. The company holds mining and exploration rights to a large area in the Barberton goldfield in Mpumalanga Province, including an 85% interest in the operating Lily gold mine and a 74% interest in the dormant Barbrook and Worcester mines. Vantage plans to expand the Lily operation at an estimated capital cost of A$22.5 million to produce 35 000 ounces of gold per annum from 2011. The company also plans to resume production at Barbrook, and undertake feasibility studies into expanding production at Barbrook and re-starting operations at Worcester.

Gold Fields and Compañia de Minas Buenaventura announced a major gold-copper-silver discovery at their Chucapaca joint venture in southern Peru. The Canahuire deposit has an Inferred mineral resource estimate of 83.7 Mt at1.9 g/t gold, 0.09% copper, and 8.2 g/t silver for a total of 5.6 million gold equivalent ounces. An interim scoping study is on track for completion by June 2010, and subject to a positive economic outcome, will be followed immediately by a pre-feasibility study.

Iron ore

Vale SA is paying at total of US$2.5 billion in cash for a 51% interest in BSG Resources' iron-ore properties at Simandou in Guinea. A joint venture established by the two companies will implement the Simandou South (Zogota) project and conduct a feasibility study for Blocks 1 and 2. In order to create a logistics corridor for shipment through neighbouring Liberia, the joint venture has committed to renovate 660 km of the Trans-Guinea railway. In March, Rio Tinto and Chinalco agreed to jointly develop and operate Rio's iron-ore concessions at Simandou. Chinalco will acquire a 44.65% interest in the project by sole funding US$1.35 billion in development expenditure, and Rio's interest will reduce to 50.35%, with the International Finance Corporation holding the remaining 5%.s

African Aura Mining will start a 60 000 m resource expansion drilling programme at the Putu iron-ore project in eastern Liberia in the second quarter of 2010. A pre-feasibility study is expected to be completed in 2012, with a definitive feasibility study to follow eighteen months later. Putu currently contains a resource of 1 080 Mt at a grade of 37.6% Fe.

Aquila Resources announced an initial JORC Inferred resource of 21.9 Mt of 63.2% Fe direct shipping hematite ore at its 74%-owned Meletse iron-ore project near Thabazimbi. The company said that the ore contains low levels of impurities and is expected to yield a product comprising at least 60% high-grade lump material. Aquila is considering the development of a 2–3 Mt/a open pit operation.

Manganese

Perth-based Jupiter Mines is to acquire a 49.9% stake in the Tshipi manganese project in South Africa's Kalahari Basin from Pallinghurst Resources and its co-investors. The A$245 million all-share transaction will result in Pallinghurst, AMCI, Investec, Midstream & Resources and Posco together owning approximately 85% of Jupiter, which intends to position itself as a focused steel feed raw materials company. Tshipi, which is 51.1% owned by Ntsimbintle Mining, contains a current total mineral resource estimate of 163 Mt at 37.1% manganese. The mineralisation is a direct extension of the Mamatwan orebody, which produces about 3 Mt of manganese ore per annum. According to the 2008 feasibility study, the project could produce approximately 2.4 Mt of run-of-mine ore per annum over a life of 28 years, at an estimated capital cost of US$200 million. Mine development is expected to start in 2010, with first production by early 2013.

Drilling at Aquila Resources' Avontuur manganese

project in the Northern Cape Province has increased the high-grade resource by 96% to 66.7 Mt at 39.3% manganese, with 25% of the resource now in the Measured and Indicated categories. Drilling is continuing with five rigs to expand the resource, and a further drilling programme is planned for the basin edge to the south of the existing drilling, where historic exploration intersected high-grade manganese

Mineral sands

Tiomin Resources agreed to sell its Kwale mineral sands project in Kenya to Australian company Base Iron for US$3 million in cash plus a 2% revenue royalty. Base will also have an option to acquire Tiomin's three exploration projects in Kenya for a further US$3 million. Base said that its technical review confirms a world-class project, with an estimated capital development cost of US$180 million generating a post-tax operating surplus of US$570 million over 11 years. An enhanced bankable feasibility study will be completed by the end of 2010.

PLATINUM GROUP ELEMENTS

The board of Northam Platinum approved an initial capital expenditure of R340 million to fund an early works programme at the Booysendal project in the eastern Bushveld Complex. This will entail construction of roads, pipelines and other infrastructure ahead of mine construction, which is expected to start in July 2010 pending the approval of amendments to the environmental management programme.

Jubilee Platinum appointed Snowden Mining Industry Consultants to manage the feasibility study for the Tjate project in the eastern Bushveld Complex. A preliminary feasibility statement is expected by the end of 2010. Tjate's "first mine" resource area hosts a SAMREC-compliant Indicated plus Inferred resource of 132.5 Mt (after geological losses), containing 25 million ounces of 6PGM plus gold at a combined grade of 5.93 g/t in the Merensky and UG2 reefs.

Uranium

Deep Yellow appointed SNC-Lavalin (South Africa) to conduct the pre-feasibility study on the Omahola uranium project in Namibia. The estimated completion date for the study is September 2010. Omahola consists of two deposits with a total preliminary resource of 18.9 million pounds of U_3O_8. The INCA deposit contains 16 Mt at a grade of 400 ppm eU_3O_8 for 14 million pounds – 9 million pounds of which is in the Indicated category and the remainder classified as Inferred. The mineralisation appears to be open in at least three directions and at depth. The 13.8 Mt Tubas Red Sands deposit is of a lower grade at 160 ppm eU_3O_8, but is located below only 1–2 m of cover, and the loosely consolidated material can be upgraded by simple physical methods..

Resource Star signed a joint venture agreement with Globe Metals and Mining on the Livingstonia uranium project in Malawi. The company can earn an initial 20% interest by sole-funding continued exploration to completing an initial resource estimate, and up to 80% by establishing a JORC resource of at least 10 kt of contained U_3O_8 and completing a feasibility study. Livingstonia is a sandstone-hosted project in a geological setting equivalent to Paladin Energy's Kayelekera mine.

Impact Minerals began a drill programme of up to 18 000 m to test three priority targets at its Botswana uranium project. Up to 6 000 m of RC drilling will test geochemical and radiometric anomalies at the Kodibeng North prospect. At the Lekobolo prospect, where reconnaissance drilling has intersected shallow uranium mineralisation in Karoo sediments over an area of 3 000 m by 500 m, up to 2 000 m of infill drilling will start in early June to define a resource. Up to 10 000 m of aircore drilling at the Sua propect will test uranium-in-soil anomalies.

SOURCES

African Aura Mining Inc, African Minerals Ltd, Anglo American plc, Aquila Resources Ltd, Base Iron Ltd, Cape Lambert Resources Ltd, Deep Yellow Ltd, Discovery Metals Ltd, DMC Mining Ltd, Eurasian Natural Resources Corporation plc, GFMS Ltd, Gold Fields Ltd, Gold One International Ltd, Hana Mining Ltd, Impact Minerals Ltd, Jubilee Platinum plc, Jupiter Mines Ltd, Metals Economics Group, Northam Platinum Ltd, Platinum Group Metals Ltd, Resource Star Ltd, Rio Tinto plc, Vale SA, Vantage Goldfields Ltd, Wesizwe Platinum

Antony Cowey, Mintek

THE GEOTRAVELLER

Oldoinyo Lengai, Tanzania.

Oldoinyo Lengai, Tanzania: Earth's Only Active Carbonatite Volcano

The cylindrical cone of Oldoinyo Lengai (2,880 m) rises spectacularly above the Gregory Rift Valley, northern Tanzania. Lengai is Earth's only known active carbonatite volcano and has been widely studied as it includes chemically unique lava flows (Dawson et al., 1990). The mountain is situated wholly within the rift, close to the prominent, western escarpment (Fig. 2). The rift valley in this area is a rugged, sparsely populated region, part of the traditional tribal area occupied by the Maasai who named the volcano "Mountain of God". From a distance, the pale grey-white lavas and ashes that cloak the uppermost slopes resemble the ice capped summit of Kilimanjaro, visible some 150 km to the southeast. The climate in this part of the rift valley is hot and dry almost all year round; the semi-desert environment contrasts with the fertile plains and forested slopes associated with volcanic peaks on the adjacent plateaus.

The trek to the summit of Lengai is generally completed in one day as there are no huts or established camp sites. Even with a pre-dawn start the ascent is strenuous and a guide is recommended as the flanks of the cone reveal a radial erosion feature with steeply-incised, U-shaped gullies. Much of the ascent is undertaken on deeply weathered material with only a few sections revealing rock sections. The mountain slopes are in part covered by scrub and grass, but the valley floor is rocky and scree-filled. The barren peaks and slopes of the extinct volcano of Gelai on the opposite side of the valley give the impression of a lunar landscape. The highlight of the ascent is entering the active, northern crater, although because of the spiritual significance this should be negotiated prior to the ascent. The slightly higher, but smaller southern crater is extinct.

The geological framework of the area is dominated by the Neogene volcanic province (the crystalline basement is only exposed on the Serengeti plains). The valley is dominated by innumerable extinct volcanoes, mostly of alkali basalt and phonolite lineage. The prominent peak of Kerimasi (active between 0.4-0.6 My BP: Hay, 1976) to the south of Lengai is one of a number of extinct carbonatite volcanoes in the area. Ash from the carbonatites, including that from Lengai, carpets the eastern parts of the Serengeti plains. Dawson (1989) was the first to recognize that "calcretes"

Map

The spectacular cone of Oldoinyo Lengai rises 2000 m above the floor of the rift valley (foreground scale provided by Morris Viljoen).

were in fact carbonatite ashes. Moreover, he observed that ash from the 1966 eruption reached as far as Serena Lodge, 150 km to the west. This was a violent eruption that covered many of the earlier lava flows in the crater. Part of Olduvai Gorge where Louis and Mary Leakey made some of the most famous hominid finds is composed of ash from Lengai.

There are numerous explosion craters and tuff cones in the floor of the rift valley. The most recent of the major tectonic events is dated at approximately 1.2 My BP and this resulted in the north-south faulting which produced the western boundary fault of the Gregory Rift (Dawson, 1989). The

The western escarpment of the Gregory Rift valley near Lake Natron.

road descent from the small town of Mosonik into the valley is spectacular. There is no significant faulting along the eastern boundary. This tectonism also resulted in formation of inland drainage basins, including those occupied by the alkaline lakes of Eyasi, Natron, and Manyara.

Recent eruptions at Lengai occur every 15 to 25 years according to Church and Jones (1995). The first documented event was in 1904. Ash eruptions in 1966-7 excavated a crater with a depth of 150 m and a diameter of 400 m. Eruptions in 1983 and 1988 included both pahoehoe and aa flows (Dawson, et al., 1990). This was reported to be dependent on effusion rates and active flows were observed to have thermally eroded underlying lava. In 1993, a blocky flow erupted that included silicate inclusions. Church and Jones reported evidence of immiscibility between co-existing silicate-carbonatite melts. The latter are unusual as they are characterized by high contents of Na2O (over 30% according to Dawson et al., 1990), and, concomitantly are relatively poor in K2O and CaO. They may be referred to as natrocarbonatite. It is the anomalously high sodium content that causes the lavas to react so rapidly with meteoric water to produce a complex range of light-coloured secondary minerals.

The bulk of Lengai consists of phonolitic and nephelinitic tuffs and agglomerates, although, as noted by Dawson et al. (1995) the core of the mountain is not exposed (due to its youth). A number of pyroclastic units can be identified on the slopes of the cone, some of which reveal dark nephelinite and phonolite lavas. Plutonic blocks (jacupirangite-ijolite to nepheline syenite) are also recognized.

By 1992 the wall of the northern crater was reduced to a height of 15 m, making it far more accessible. Numerous small ash and spatter cones, as well as mounds built up around fumaroles were prominent during a visit in May 1995. In 1962, Guest noted that spatter cones were

Part of the floor of the northern crater, including an active vent.

ejecting ash and lava blocks. In 1995, some of the ash cones included vents with evidence of near-surface magmatic activity. The shiny white, smooth-topped pahoehoe flows (from the 1992 eruption) had barely weathered by 1995. Older flows have in part been reduced to crumbly, pale grey debris. The close spatial relationship of aa and pahoehoe flows is well preserved. The latter are typically only a few cms thick and include flow channels (Fig. 6)

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Natrocarbonatite flows from the 1993 eruption in the northern crater. An aa flow is overlying several pahoehoe flows.

that in 1995 remained hot. Fumaroles may be demarcated by small deposits of sulphur. One of the hazards of the crater, in addition to subsidence and overhangs adjacent to vents is the presence of H2S gas. An observation made by some recent visitors, including Anton Esterhuizen (pers.

Channels in a pahoehoe flow.

Commun., 1995) is the ejection of near-vertical columns of intensely hot, brownish gases (and ashes?) which jet into the stratosphere.

During December 1995, a team from Geneva filmed strombolian eruptions and building of a small cinder cone that was periodically halted by phases of collapse with eruption of small flows. The flows were reported to be very thin (5 cm) and with a viscosity ten times less than typical basalt (possibly the lowest ever reported for terrestrial lavas). In 2006, an unusually large eruption of natrocarbonatite occurred (Mattsson and Vuorinen, 2009). The lavas included both blocky and pahoehoe flows, some of which overflowed the summit crater. Kervyn et al. (2008) estimated a lava volume of almost a million cubic meters was erupted during a period of several weeks. A major flow also occurred relatively low down on the northwestern flanks of the cone. On the basis of a detailed remote sensing study, the latter authors also described the occurrence of volcano collapse and debris avalanche deposits (or DADs) at Lengai. The volcano volume was reassessed as 41+-5 km3. The DADs extend up to 24 km from the cone and are estimated as relatively young. The occurrence of remarkably extensive debris deposits at Meru were described in the March edition of Geotraveller and similar features have been observed to be prominent features of many of the volcanoes in the rift valley of this area.

Additional features of interest in the area include a visit to some of the craters in the valley floor as well as the so-called "Shifting Sands" near Olduvai Gorge. These latter are isolated dunes composed of black ash derived from Lengai. The largest of the dunes reveals a classic crescent-shaped (9 m high and 100 m in length) and is migrating west at the remarkable rate of approximately 17 m/year. The track left by the dune is clearly visible and includes a trail of different species of fossilized dune beetles that have been widely studied. Movement of sand particles by wind and bouncing of grains off the ground (saltation) is possibly thought to create a negative charge, thus creating an electrical field which suppresses dispersion (Kok and Renno, 2008).

The ecology of the area around Lengai is largely controlled by the geology, as may be expected in an area where the rocks are relatively young. Lake Natron, located to the north of Lengai is the principle breeding ground of flamingo in East Africa. The birds are attracted to the water by the remarkably high algae content, which in turn is due to the high proportion of dissolved sodium carbonate, reputedly much greater than at other alkaline lakes. This is presumably due to weathering of the natrocarbonatite at Lengai. The brines are so poisonous that it has been reported that even the flamingo could not survive if their filtration systems were not so efficient.

Ash clouds from Lengai which are dispersed by prevailing easterly winds have influenced development of the grasslands that characterize the eastern part of the Serengeti plains, a distinct ecological area from the bush country farther to the west. The migration patterns in the Serengeti NP, despite being controlled by regional rainfall patterns have also been influenced by the recent eruptions of Lengai.

Oldoinyo Lengai is an active volcano that poses a potential hazard to air travel. The mountain is located close to the transcontinental flight paths between southern Africa and Europe and jets of hot gas/ash may be hazardous at heights of 30,000 feet or greater.

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(Submitted by R N Scoon in part based on a visit with the MINSA group in 1995. Photographs from 1995 and 2005.)

Contributed by Roger Scoon

Isolated dune composed of ash from Lengai, near Olduvai Gorge.

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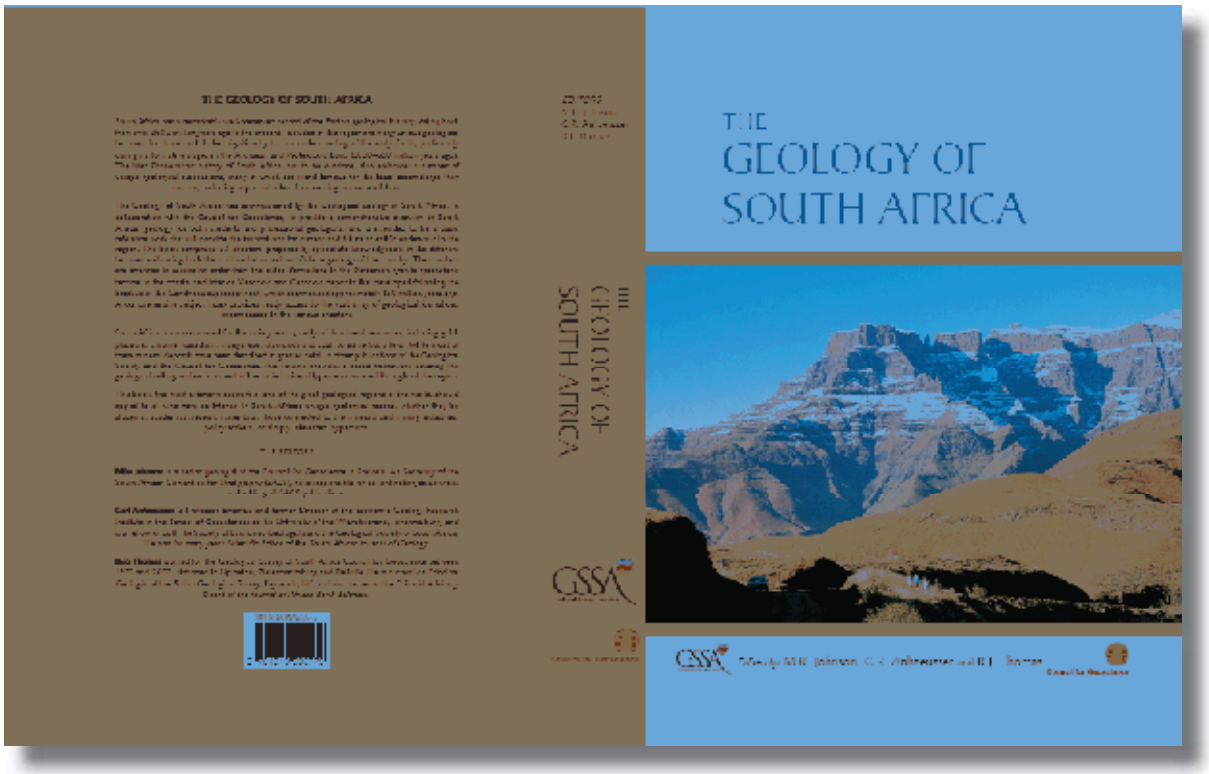

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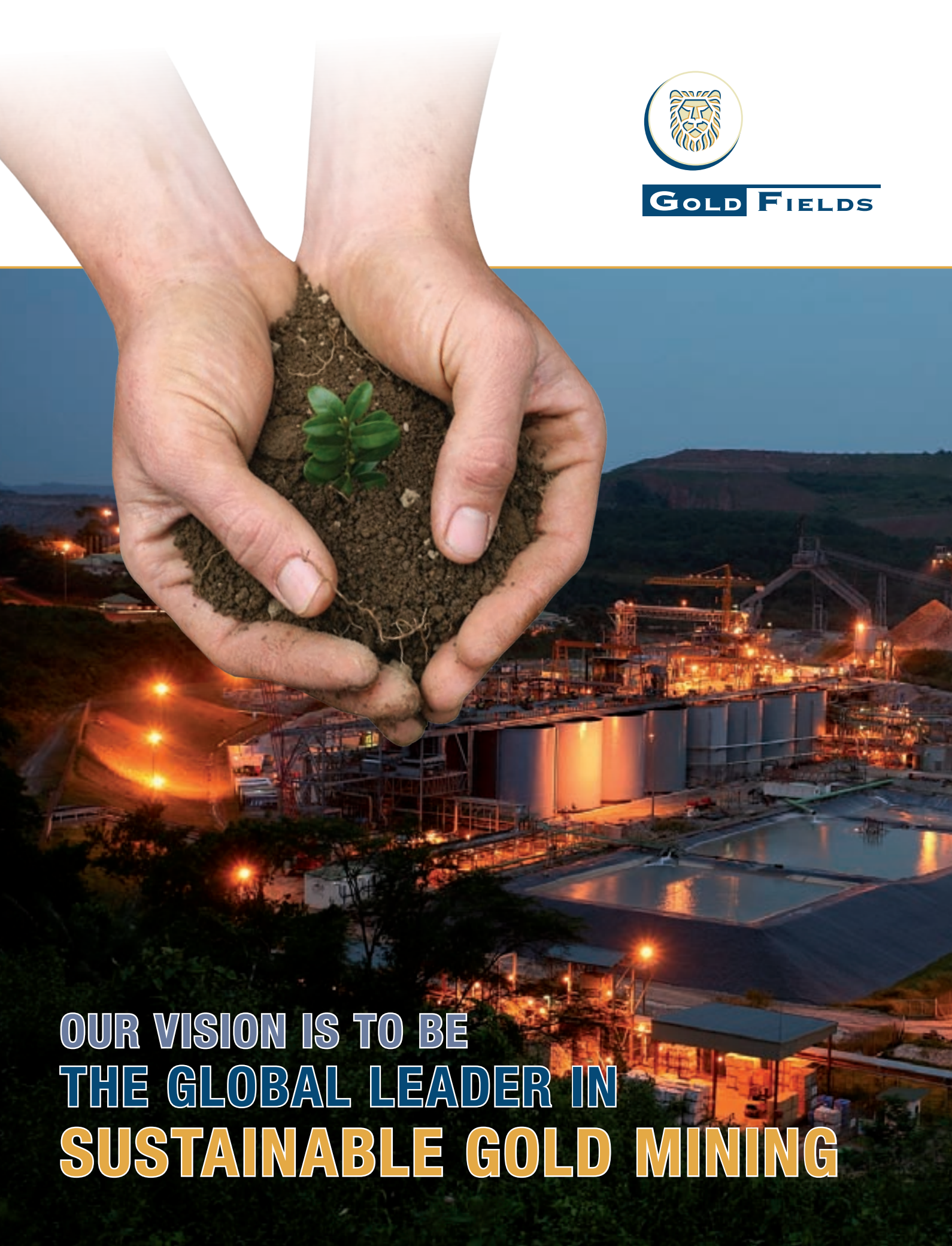

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