Geological Society of Zimbabwe

Newsletter

February 2012

The Tundavala Gorge is a vertical incision into quartzites capping the Humpata Plateau, falling over 1000 metres to the gneissic terrain below carrying the railway between the Atlantic port of Namib and the town of Lubango in southern Angola. PHOTO: Tim Broderick

The Geological Society of Zimbabwe, P.O. Box CY 1719, Causeway, Harare

Contents

The Committee, on behalf of the Geological Society of Zimbabwe, would like to offer a sincere vote of thanks to Marion de Beer of *Cadline* for preparing and printing our Phaup Award certificates for 2009 -- free of charge. This is, as previously, a wonderful gesture of Marion's time and skills and we can only encourage all you geologists and mining houses to steer your Autocad mapping work in her direction and to take advantage of at least 30 years of hard-won cartographic experience. *Cadline* also offers monochrome printing and scanning services in formats up to A0. Their telephone contact is 04-2917261/60 Tel/Fax is 04-301855 and the address is 94B Pendennis Road, Mount Pleasant in Harare. marion.debeer@cadline.co.zw

Editorial

Welcome to the third and final Newsletter from the 2011 Committee under Houda Bouammar. It comes to you on the eve of the AGM as Houda hands over the reins of leadership to Bornwell Mupaya. Within these pages you will see that the Geological Survey has lost a key personality in Bornwell, who has decided to follow his own desire. We wish him well for his future, and sincerely hope that the Survey can bridge the gap he has left in their thin ranks.

The Chairperson shares with us a letter she has sent to the Secretary for Mines and Mining Development on the Society's behalf. This is a response to the considerable debate and concern that erupted following the proposal and gazetting of the new fee structures for mining. To large extent we feel that these inappropriate responses are born of a lack of appreciation and understanding of the progressive nature of serious exploration and mining, the high risk that these activities attract and the extended time frame in which they take to mature if we as a nation are to realize the best advantage from the desired products. A favourable investment environment is what is required, which encourages serious exploration activity and mining feasibility to identify new mineral deposits that can be working into the future for our long-term benefit. Look what happened to Tanzania when in 1982 it realized that its gold production had dwindled to zero. An enlightened decision to liberalize the mining law brought in a landslide of exploration and mines development. We as a professional Society believe in offering ourselves in dialogue rather than in confrontation. We sincerely hope that Houda's letter is read and comprehended in the spirit with which it was written.

As always we must thank our contributors for their valuable inputs, which keep us in touch with institutions and events within our industry. The emphasis of this issue is to share with those who could not be with us in November, the highlights of this year's Summer Symposium, to which we invited two keynote speakers – a respected mentor to many of us, Ben Mapani from Namibia, and an old friend and supporter in Zimbabwe geology, Andy Moore from Botswana. The meeting is considered to have been a great success as it brought together many of us in stimulation and camaraderie. We thank the organizers, notably Andrew du Toit and Kudzie Musiwa for their usual efforts on our behalf, and appreciate those efforts that were made from all around the country and region to attend. Next year's event promises to be bigger and better – watch this space.

My apologies for the slightly late appearance of this Newsletter, reason for which explains the picture on the front cover. The Hon. Editor was hived off on a visit to Angola, which was rewarded by some stunning scenery and many positive impressions.

Tim Broderick

Chairperson's Chat

Houda Bouammar

As we enter a new year and the term of a new committee under Bornwell Mupaya, I wish them well in the pursuits of our Society, some of which hold exciting prospects and certainly hard work. I thank my Committee for the support they have given me over the past year and recognize their role in its successful outcome. We look forward to seeing as many of you as possible at the AGM on the 24th February.

Implementation of new mining fees as applied to the Mines and Minerals Act have been reason for immediate and serious concern and debate, and I share the text of a letter written on behalf of the Geological Society, expressing these concerns and offering constructive criticism in a non-confrontational manner. The new committee should keep this dialogue open.

Dear Mr Mupazviriho **(**Permanent Secretary, Ministry of Mines & Mining Development)

RE: New Fees SI 11/2012

Introduction

The Geological Society of Zimbabwe is very concerned about the serious consequences the Zimbabwe mining sector will suffer following the new "Application and Registration Fees and Surface Rentals for Mining Licences for Diamonds, Coal, PGMs and Chrome" fees that have recently been gazetted. We, as an association of professionals for the sector, believe that the new fees will, with no doubt, represent a major disincentive to any credible investment.

We understand that the aims of the new fees are:

- For the country to benefit from investments in the mining sector;
- To implement a sustainable fee structure in proportion to the goods and services rendered by the Ministry of Mines;
- To discourage holding of mining claims for speculative purposes, and to
- Attract credible investors.

However, the new fees are largely unrealistic in this context and will not only fail to achieve these objectives but will certainly discourage credible investors who will have to spend the funds in rentals rather than in discovering economic mineral deposits and developing them into successful mining operations.

We understand that the new fees aim to discourage speculative actions in this critical economic sector of the country and attract serious investors. This is consistent and in line with the 'Use It' or 'Lose It' concept.

However, these two objectives of encouraging 'Users' and discouraging 'Non-Users' must be approached in two different ways:

- The fees for the 'Users' should not exceed the levels to allow successful legal administration of the Act (structured in proportion to the goods and services) - otherwise they would constitute a major disincentive.
- The fees for the 'Non-Users' must be structured so that holding ground becomes worthwhile only if there are credible plans for the resources to be explored or mined.

The regulations are mutually contradictory, repetitive and difficult to link with earlier regulations and the empowering Act. This confusion in the regulations constitutes a significant and highly undesirable source of uncertainty for the industry.

Due to this uncertainty we will not go clause by clause through the regulations but rather the Geological Society of Zimbabwe comments on these regulations are the following:

‘Use It’

Exploration
These regulations seem to reflect a general and fundamental misunderstanding of the mining and exploration industry.

Exploration is guided by geological models and is driven by the need to understand the nature of any one deposit. Evaluation of such deposit involves applying and developing these models to quantify the resource and leads to the integration of the technology and business models that eventually make the deposit a physically and economically viable mining operation.

The following must be considered when allocating exploration and mining titles a financial component:

- The high degree of risk especially at the outset.
- The largely intellectual nature, in the form of models, relevant technologies and business vision, of the mineral exploration and evaluation.

In allocating titles and exploration titles in particular, it is not a case of simply dividing up a known and defined resources to the highest bidder as one might do in the case of other real estate businesses. Neither the government nor the investors know what is being allocated at the outset and there are significant risks that the investment will not succeed due to a wide range of technical and commercial reasons. The progression of expenditure and risk in the mining cycle is illustrated in Figure 1.

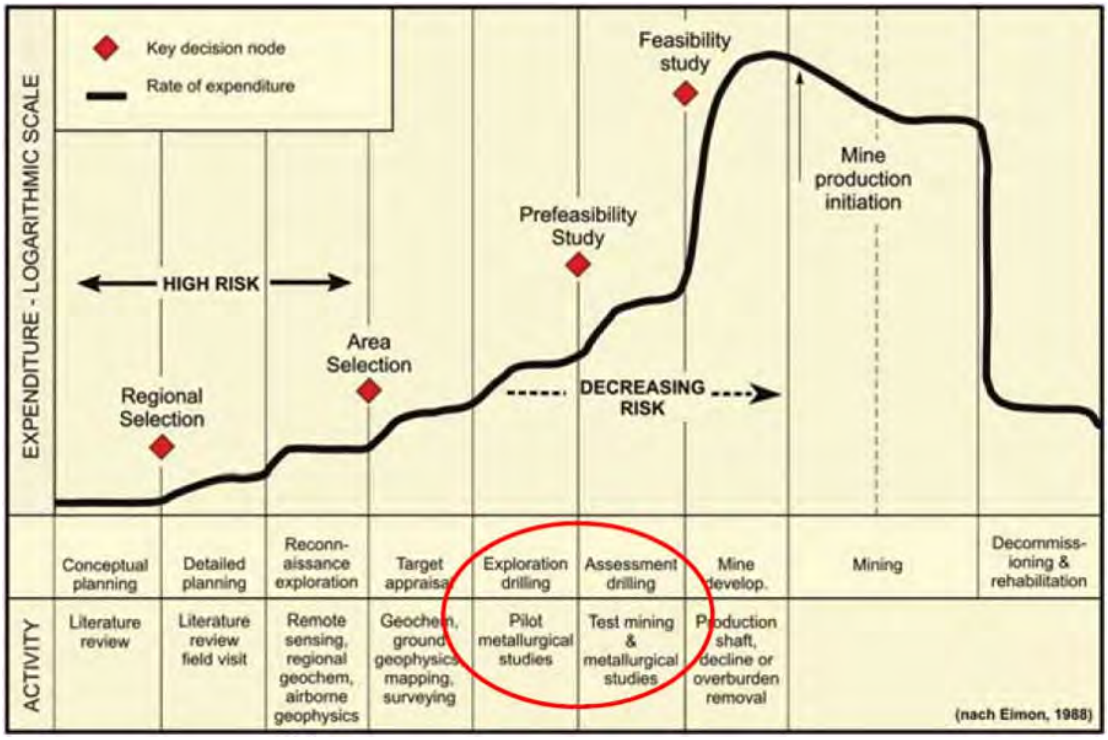


Figure 1: The Mining Development Cycle

For this reason, if a vibrant industry is to be encouraged, the barriers to entry should be as low as possible and competitive on a regional and international level. Rather than high fees to distinguish between players, the use of a system of work plans and capacity demonstration like those applicable to EPOs should be encouraged.

The scale of the new prospecting and registration fees, represent an insurmountable barrier to entry for all scales of operators. They should be affordable by both small-scale miners as well as multinationals.

The variation in fees for different minerals indicates a misguided view that the risks are different for different minerals.

The fees for export of samples for test work are particularly misguided. How is the industry to develop if the sending of samples for the testing of new technology or for international assay (to facilitate international funding) is discouraged?

Mining

Inspection fees have been increased to the point where even in areas with reasonably well-defined resources, the full value of the resource in the ground will be spent on these fees in only a few years. This is a serious threat even to the most energetic of mining companies.

Not only will this stall growth by compromising the viability of new investments, it will also contribute to the closure of existing operations. It is assumed that ground rental is another term for inspection fees and their mineral-specific nature makes ground rental an increased disincentive for what have been up to now the most vibrant sectors of the industry. If the aim is for these sectors to contribute more to the fiscus, it would be better for government to stick to the conventional and well established methods of taxation.

The fees for export documents apply to 'Users' are orders of magnitude more than the cost of processing the applications, thus constituting a disincentive to operation. The fees for the support of applications for National Project Status, duty exemption, work permits etc all apply to active mining companies, and these should be encouraged not penalized. The National Project Status system is a worthwhile incentive in the Tax Act for mining growth, and the new fees undermine this incentive.

'Lose It'

The fees for inspection and protection by payment have been increased drastically to encourage holders of large tracts of ground to release what appears to lie idle. This needs to be carefully managed so that where large investments in process facilities, infrastructure etc are required, the mining company can maintain ownership of sufficiently large resources to justify and underpin the investment.

Today, large international exploration and mining players are not structured to identify, explore and evaluate small deposits. This is left to the junior and mid-tier sized companies. In the last 20 years or so, small players have proved to be the discoverers of major mineral resources and the builders of quick mining operations. The exploration and junior mining industry around the world is fuelled by small players being able to add intellectual value to a resource and then sell it on to a larger company. For our industry to grow, it is important that this key sector is not stalled by inadequate and unrealistic 'Lose It' legislation.

Conclusion

The new fees are seen by us in the Geological Society as a serious threat to the mining industry of the country. The unrealistic barriers these fees create discourages entry to all scales of energetic, credible and serious investors. By charging such high rates, even the most serious of investors will 'Use It' AND 'Lose It'!

Rather than attempting to manage the chaotic state of the current mineral rights system through fees, it would be more effective and beneficial to both government and the industry to urgently modernise the cadastral system in line with the international best practices so that that investor's confidence is regained and maintained for successful mineral resources development in the country.

To constructively achieve this goal, all professional parties of the mining industry in the country should be consulted and are ready to contribute in this process of adjusting efficiently the title rights fees.

The Geological Society is available for consultation and assistance in reaching a positive outcome to this crisis.

Yours sincerely

Dr Houda Bouammar

Articles and Reports

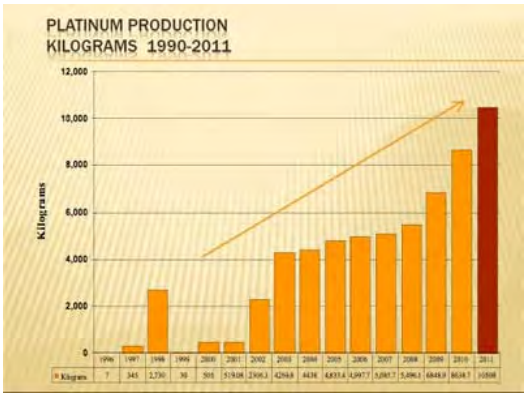
Report on the Geological Society of Zimbabwe's Annual Summer Symposium, November 2011

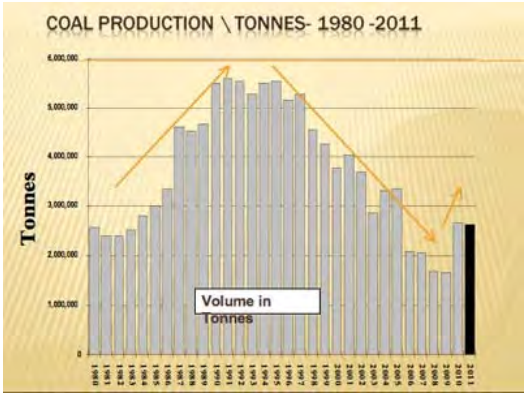
Benjamin Mapani

The 2011 Geological Society of Zimbabwe (GSZ) Annual Summer Symposium took place at the University of Zimbabwe Geology Department's Jan Kramers Museum, on Friday 25th November. As an invited guest, it falls upon me to summarize the deliberations of this symposium, attended by professional geologists, academics, students, and visitors from South Africa, Botswana, Namibia and Zambia. The total number of delegates was about 60 people. The Chairperson of the GSZ, Houda Bouamar, with an organizing committee led by Andrew du Toit and Kudzai Musiwa (Hon. Secretary), managed the event and the field trip to Domboshawa north of Harare on 26th November. Led by Andy Moore, this excursion was into an area with superlative granite scenery. He laid emphasis on the macro and micro geomorphological features and apparent magmatic layering displayed by the 100% rock exposure. Mechanisms for the sheet-like emplacement of Zimbabwe's later (Archaean) granites were discussed.

Houda Bouamar welcomed the delegates. The Symposium was then opened by **Allan Mashingaidze,** who is both a geologist and Second Vice President to the Zimbabwe Chamber of Mines. **Bornwell Mupaya** (Chairman-elect) then gave a brief synopsis of the current activities being undertaken by the Geological Society of Zimbabwe.

The second talk was by **David Matyanga** of the Chamber of Mines who discussed the strategic considerations for growth in the mineral sector of Zimbabwe. He illustrated how constraints in Zimbabwe had actually slowed down growth in a sector whose planning terms are usually 10-15 years, as opposed to a government's life span of a parliamentary term. The major bottleneck restricting investment in Zimbabwe's minerals sector is the lack of a finalized and clear legal framework. He emphasized that no long-term strategic decisions had been taken, and even the investment in human resources has been adversely affected by the labour flight from Zimbabwe. The paper presented graphs that showed that gold production is slowly increasing, as is that for platinum and chrome, whilst coal is set for recovery.





The first keynote talk was by **Ben Mapani**, who illustrated how current research in the generation of continental crust can be used to infer fertility of that crust for mineral exploration. This can be done by interpreting the Hf-Lu, U-Pb and stable oxygen isotope concentrations within crustal rocks. Crustal growth episodes can be fingered with accuracy, and show where areas with high mineral prospectivity may be found.

The second keynote speaker was **Andy Moore** who showed how the current Zimbabwe watershed has evolved since pre-Karoo times. Using kimberlite finder minerals such as ilmenite, Moore, *et.al*., show that the regional watershed has migrated southwards, thus shifting from an initial Ovambo-Kalahari-Zimbabwe axis to behead the flow of some rivers from their north-westerly direction to their current south-easterly direction. The talk also touched on how fauna over the same period had specialized in their environments, adapting to changes in geomorphology.

The next talk was by **Hillary Gumbo and Peter Bourhill**. Hillary Gumbo, who gave the talk, showed how they managed to map sub-cropping coal horizons and cross-cutting mafic dykes in southern Zimbabwe using aeromagnetic and CSAMT (Controlled Source Audio Frequency Magnetotellurics) geophysical methods. The combined data gave results that made it a lot easier to target coal seams for drilling.

Nic Money from Zambia discussed the challenges associated with oil and gas hydrocarbon exploration in that country. He illustrated the positive evidence that exists for the possibility that oil and gas could be present, but suggested that "the final test is a drill hole". He revealed that Zambia has set up an entity, the "National Petroleum Company of Zambia ", to spearhead the search for these hydrocarbons.

Paul Chimbodza discussed current exploration targets for heavy mineral sands and their potential in Zimbabwe. Concentrations of heavy minerals range from 4% and sometimes to as high as 55% in river alluviums of the Zambezi Valley and point to the potential of a commodity that has not yet been explored fully in Zimbabwe.

Fred Hlasi presented on the PGE Resource of the Great Dyke, specifically from the Selukwe sub-chamber. The juxtaposition of the older Shurugwi Greenstone Belt imposed disturbances on the Great Dyke in that area. The Main Sulphide Zone is the most economical and persistent horizon at the top of the first cyclic unit in the Ultramafic Sequence with variable grades of 0.1-8% in sulphide mineralization, whilst in the Lower Sulphide Zone the content can reach 1.5%.

Copper deposit types, which range in age from the Archaean to Karoo times in Zimbabwe, were discussed by **Bornwell Mupaya**. Volcanic Massive Sulphides Cu-deposit types are represented in the Archaean Shamva and Midlands greenstone belts. Cu-ores are also associated magmatically with the Great Dyke and with a sedimentary affiliation as the Mhangura-type. The Mutandahwe Igneous Complex hosting Cu-Mo-W mineralization represents the post-Karoo porphyry Cu-deposit type. The full

potential of these deposit types have yet to be well explored in Zimbabwe.

The talk by **Marcia van Aswegan** shifted emphasis from classic geology to data management. Marcia illustrated how credible resource reporting must be based on auditability and accountability within estimation procedures. This, she added can only be possible if relevant primary data sets can be identified and reduced to distinct geoscientific parameters. Descriptors and conventions need to be published as "data standards". Marcia then, as emissary for the Geological Society of South Africa, emphasized the need for increased communication and co-operation between geologists within the southern African region.

Arimon Ngilazi talked on "perspectives on geology practice in Zimbabwe". The recent surge in the minerals industry has seen an increase in demand for geological services. Due to the emigration of qualified Zimbabweans, there is a gap in the human resources category to fully service industry requirements. This has created a lack of continuous professional development as mentorship and/or professional training on the job has declined due to the stretched demand on the few who have to comply with company production schedules.

These highlights of the Symposium show that the Geological Society is making strides in the right direction, even under challenging circumstances.

Some Abstracts from the Symposium

Strategic considerations for Growth of the Minerals Sector – Vision 2020

David Matyanga

The operating environment for the mining industry in Zimbabwe has generally been adverse leading to short term approach in resolving the challenges facing the industry. Since 1980 little has been done to focus and deal decisively with strategic issues that affect the long-term development of the industry. The decision to invest in human resources development initiatives is the only strategic initiative during this period. However, this drive has been greatly compromised resulting in the need to re-evaluate the sustainability of current efforts to supply labour. Assuming that the political issues affecting all development efforts are resolved, and the country is once again fully participating in international issues without the current constraints, is the mining industry capable of taking advantage of prevailing conditions and attract capital at the same levels at the best jurisdictions in the world. If not, what are the areas that would require the attention of policy makers to place Zimbabwe as a competitive destination for investment? If this environment is availed where will Zimbabwe be as a mining country in 2020? The paper provides an analysis of how each individual major mineral is expected to grow during the period 2013 to 2020 and the investments required to see these projects through. It will explore the likely constraints to production and the strategies that can be adopted to deal with the constraints.

The evolution of continental crust of the Nuna-Rodinia component: an example from the Hoewarte Complex, central Namibia

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University of Namibia, Faculty of Science, Geology Department

The Hohewarte Complex is a Paleoproterozoic to Neoproterozoic province in Namibia, that records mantle evolutionary trends that may be common to Kalahari Craton characteristics. The evolution of a variety of mafic to ultramafic gneisses, pelitic gneisses and schists, granitic and felsic gneisses and granites suggests a much more juvenile crust with implications for the crustal evolution of southern Africa. To map the crustal growth processes in light of the geological evolution of southern Africa we have used both Hf-Lu and U-Pb isotopic systems. Mafic gneisses record ages of 1754±15 Ma, probably showing some oceanic rifting during Nuna times, whereas granitic gneisses record crust forming events at 1826±20; 1286±170; and 1218±120 Ma, which could imply initial amalgamation of Rodinia. Granites record ages of 1058±51 Ma. These correlate with final sutures of the Rodinian accretion as a super continent. The samples we have suggest that the Hohewarte has preserved a juvenile signature from the time of its formation around 1820 through to 1754 Ma. We observe a lot of mafic to ultramafic components in the banded gneisses, suggesting a more complex tectonic origin. The study has implications for mineral exploration in primitive versus evolved or recycled parts of the crust.

On A Roll. Dynamic Evolution of the Central Zimbabwe Watershed

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The major watershed between the Zambezi and Limpopo rivers, which traverses central Zimbabwe in a broadly southwest-northeast orientation, has been interpreted to reflect a line of epeirogenic flexure (Maufe, 1927; du Toit, 1933; Moore, 1999), inferred to be of late Palaeogene age (Moore, *et al*., 2009a).

The line of uplift was termed the Kalahari Zimbabwe Axis by du Toit (1933). Moore (1999) subsequently inferred that uplift had occurred on an arcuate line, broadly parallel to the southern African coastline, which he designated the Ovambo-Kalahari-Zimbabwe (OKZ) Axis. Uplift along this Axis disrupted an earlier north-west flowing drainage system, extant since pre-Karoo times, with headwaters located 200-300km to the south-east of the modern watershed (Lister, 1987; Moore *et al*., 2009b).

During the mid 1990's, Somabula Explorations (Sex) carried out drainage sampling as part of a kimberlite exploration programme in Exclusive Prospecting Orders (EPOs) located to the east of Bulawayo. This work resulted in the recovery of a diffuse spread of kimberlitic picroilmenites in headwaters of south-flowing Limpopo tributaries rising off the central watershed. However, follow-up sampling failed to locate any local kimberlite source rocks, and it was concluded that this unexplained kimberlite pathfinder anomaly is secondary, formed by the remobilization of a diffuse heavy mineral lag associated with the senile surface of the central watershed. The latter has been variously interpreted as a relict of the African Surface (Lister, 1987), or an exhumed pre-Karoo surface (Moore *et al*., 2009b).

Remarkably, the compositional field (or chemical fingerprint) of the ilmenite population recovered to the south of the watershed in the Bulawayo EPOs, shows a very strong overlap of the corresponding ilmenite field for the ~500 Ma Colossus-Wessels-Moffat group of kimberlites, located to the north of the central drainage divide. Further, they differ from the compositional fingerprint of known kimberlites to the south of the watershed. This argues strongly that the ilmenites recovered in the Bulawayo EPOs were ultimately derived from the Colossus kimberlites to the north. However, given the long-lived north-west drainage system, prevailing from pre-Karoo times until initiation of

the watershed (Lister, 1987), this raises the question as to how and when the ilmenites might have been dispersed to the south of these kimberlites.

It is proposed that the answer to this conundrum is that the locus of the late Palaeogene uplift that initiated the central watershed was originally located to the north of the Colossus-Moffat kimberlites. This would have reversed the original north-west flowing drainage system that had prevailed since Karoo times, permitting southwards dispersion of ilmenites derived from the Colossus-Moffat kimberlites. We suggest further, that the locus of maximum uplift migrated progressively southwards to its present-day position during the ongoing evolution of the central watershed. This resulted in a progressive southwards remobilization of the ilmenites and associated heavy mineral lag that developed on the watershed.

Such a dynamic "rolling" linear uplift model for the origin of the watershed is difficult to explain in terms of plume-initiated uplift. However, it is consistent with the model of lithospheric buckling linked to stresses caused by reorganizations of the spreading regime at the mid-ocean ridges surrounding southern Africa, as envisaged by Moore *et al*., 2009b.

On a regional scale, uplift along the OKZ Axis resulted in the formation of the inland Kalahari Basin. Rivers such as the Zambezi and its headwaters were impounded by this basin, resulting in the development of a major wetland system of meandering rivers and ephemeral lakes in which the Kalahari sediments were deposited.

Following, and possibly even initiated by the OKZ uplift, ancient rifts such as the Luangwa-Gwembe were reactivated, leading to south-westward propagation of the East African Rift System into south-central Africa. This rifting disrupted the regional drainage net, resulting in the development of a changing archipelago of wetlands in time and space. Important examples are the Bangweulu Swamps, the Kafue Flats, Palaeo-lake Barotse on the upper Zambezi, a massive inland lake centred on the Makgadikgadi basin in Botswana and the major extant wetland of the Okavango Delta.

Drainage disruption and the dynamic evolution of the wetland archipelago were superimposed on the major climatic swings between aridity and high rainfall pluvial conditions that characterized the Plio-Pleistocene. The interplay between the climatic vicissitudes and the dynamic wetland system provided a potent evolutionary driving force. Thus, for example, severance of the former links between the Upper Chambeshi River and the Kafue, and the latter river and the Zambezi, resulted in the isolation of populations of highly water-dependant Lechwe antelope in the Bangweulu wetlands, the Kafue flats and the linked Upper Zambezi – Okavango river system. Isolation of these different populations by tectonically-driven drainage changes resulted in independent speciation in these three isolated wetlands systems. This accounts for the distinctive Black Lechwe (*Kobus smithmani*) of the Bangweulu wetland, the Kafue Lechwe (*Kobus kafuensis*) on the Kafue Flats, and the Red Lechwe (*Kobus leche*) on the Zambezi-Okavango wetland system (Cotterill, 2005).

The dynamically changing archipelago of wetlands provided important refugia for faunal and floral populations during arid Plio-Pleistocene glacials. The result was the evolution of divergent faunal lineages adapted to wetland and arid savanna environments respectively.

Recent genetic evidence shows that lions (*Panthera leo*) in the Okavango wetland do not inter-breed with those in the surrounding more arid savanna habitat. This is interpreted to reflect habitat specialization of these two lion populations, and possibly barriers to interbreeding. Fossil and genetic evidence suggest that the ancestral lions were wetland specialists, and that the savanna lions developed from a population that became isolated during an arid Plio-Pleistocene glacial, thus favouring adaptations to exploit the arid savanna environment (Moore, *et al*., 2011).

REFERENCES

Cotterill, F.P.D. (2005). The Upemba Lechwe *Kobus anselli*: an antelope new to science emphasizes the importance of Katanga, Democratic Republic of Congo. *Journal of the Zoological Society of London*, **265**: 113-132.

Du Toit, A.L. (1933). Crustal movements as a factor in the geographical evolution of South Africa. *The South African Geographical Journal*, **16**, 1-33.

Lister, L.A. (1987). The erosion surfaces of Zimbabwe. *Zimbabwe Geology Survey Bulletin*, **90**, 163pp.

Maufe, H.B. (1927). Some problems in Rhodesian physical geology. *South African Journal of Science*, **XXIV**, 30-36.

Moore, A.E. (1999). A re-appraisal of epeirogenic flexure axes in southern Africa.*South African Journal of Geology*, **102**, 363-376.

Moore, A.E., Cotterill, F.P.D., Winterbach, C.W., Winterbach, H.E.K., Antunes, A. and O'Brein, S.J. (2011). Genomic, climatic and geomorphic evidence for ancestral wetland lions: insights into colonization of Africa by *Panthera leo*. Submitted to PLoS ONE.

Moore, A.E., Blenkinsop, T.G. and Cotterill, F.P.D. (2009a). South African topography and erosion history: plumes or plate tectonics? *Terra Nova*, **21**, 310-315

Moore, A.E., Cotterill, F.P.D., Broderick, T. and Plowes, D. (2009b). Landscape evolution in Zimbabwe from the Permian to the present, with implications for kimberlite prospecting. *South Africa Journal of Geology*, **112**, 65-88.

Integrated Exploration on Coal Project in southern Zimbabwe

Peter Bourhill and Hillary Gumbo

This is a presentation of results and interpretation of both geological and geophysical surveys carried out on a Coal Project in southern Zimbabwe situated on dolerite dyke swarms. The aeromagnetic data maps out surface geology whilst the CSAMT method maps out geology at depth down to 1km. The results of the two techniques as well as surface geology mapping are assembled into a 3D interpretation of the area delineating basin geometry, low conductivity layers (coal and carbonaceous shales), dolerite dykes swarms, sills, faults etc. This makes the siting of drill holes a lot easier and targets them to intersect all likely coal horizons in less structurally deformed areas. The dykes raise the rank of the coking coal causing it to lose its ability to coke; as a rule of thumb probably within a distance of around two times the intrusive thickness; the geophysics allows the geologist to site holes into coal that has not been affected by dyke intrusion.

Prospecting for Oil and Gas in Zambia and Surrounds

Nic J. Money

Zambia with an area of some 750,000 square kilometres and surrounded by eight countries is situated in the heart of the central southern African plateau that is floored essentially by crystalline basement rocks over 400 million years in age. The surrounds of Zambia that share the plateau include the borders with Zimbabwe, Botswana, Namibia, Angola, the Democratic Republic of Congo, Tanzania, Malawi and Mozambique.

The crystalline basement core rocks of the plateau are transected by major rift-like grabens, tectonic dislocation zones and sags, which extend into some of the surrounding lands and they constitute the sedimentary basins of the region. The rift zones and sags carry younger sediments that range in age from the Ordovician to Recent. The rocks belong to Palaeozoic and Permo-Triassic times, but in western Zambia and parts of the surrounds, Cretaceous rocks occur, in some of which hydrocarbon possibilities have been recorded. It is noteworthy that the bottom sediments of some lakes in the border areas of Zambia have provided oil seeps and gas shows. The substantial sedimentary pile centred on the Okavango-Makarikari-Ethosa basins sitting within the larger framework of the Kalahari basin is extensive and has a long geological history that deserves a detailed study.

Zambia, as with its neighbours, is minerals-rich, but no oil has been found to date despite a sustained prospecting programme with varying intensity since the 1970s. The fundamental pre-requisites for hydrocarbon origin, occurrence, migration and entrapment are found in a number of sedimentary basins in the country and surrounds. Zambia has been flown geophysically and substantial records are kept with the

Geological Survey Department. Although exploration work by oil companies in the 1980s yielded few positive results despite two wild-cat wells, subsequent evaluation has generated renewed interest. In recent years samples for microprobe analysis undertaken by German laboratories have given positive results for gas occurrence. Data packages have been prepared and sold to interested companies by the Geological Survey Department.

The Ministry of Mines and Mineral Resources has demarcated some 41 blocks for issuance under a selective bid, some of which have been granted to a number of Zambian and international bidders. The basic laws for oil search and production have been re-drafted and a new Petroleum Act (2008) issued. A government company, the National Petroleum Company of Zambia has been set-up to spear-head the government's interest and stake.

The finding of hydrocarbons in the rift zones of Uganda and also Sudan has given impetus for the continued work in Zambia for oil exploration as indeed the issuance of an oil exploration licence recently to a company in the south Rukwa BasinofTanzania, which lies close to the north-eastern border of Zambia. Finding oil close to the border of Zambia or within Zambia would trigger a major search in all these areas. The future for oil exploration in the region bodes well.

The Business of Geoscientific Data

Marcia van Aswegen

During the last twelve years, requirements for transparency and materiality within geological data sets have been introduced. Credible mineral resource and reserve reporting is based on auditability and accountability within estimation procedures. This cannot be achieved unless relevant primary data sets can be identified and reduced to distinct geoscientific parameters. The descriptors, conventions and constraints governing them must be defined systematically and published as a "data standard". Professional work practice and quality assurance methodologies which promote proper geological thinking and understanding can be combined into a practical work procedure for each exploration programme and mine site. These procedures will promote the transfer of skills and identify required competencies. They will support the data standard required for data collection and provide the frame-work for a quality management protocol within the data management environment for each data set. Geoscience incorporates many specializations. Data sharing across related sub-disciplines will be possible when common parameters share the data standard. This will improve geological decision making as well as mine planning.

Perspectives on geology practice in Zimbabwe

Arimon Ngilazi

The recent resurgence of interest in the Zimbabwean minerals industry has seen a surge in the demand for geological services both within existing mining companies and new entrants. Irrespective of company size, the requirement for services

encompasses a wider range of disciplines including exploration, geological modelling, resource evaluation and mining services. Generally, the bigger mining companies require independent and extra resources to achieve their objectives while small and medium companies require to fill the technical void in their operations. This trend seems likely to continue into the near future – at least within the next couple of years. Zimbabwe has qualified college and university graduates in all the disciplines to be able to meet this need. However, these skills are now globally dispersed due to emigration and Zimbabweans fill expatriate positions in their search for greener pastures. This means that in almost every discipline there is a shortage of skills to service the demand. Geologists working in the production environment whether in the long term (tenement exploration) or short term (mining services) have had to learn quickly on the job to carry out a wider range of services or else outsource them to consultants. Either way some opportunities for continuous professional development have been lost as practitioners spread themselves too thinly or have in some cases abdicated responsibility to third parties.

This is not to suggest every geologist should be able to do everything but there is need to consciously keep up with best practices in a structured manner. It is very important to do so, given that the days are gone when internal company practices can remain below internationally accepted standards. As existing companies seek funding from sources other than shareholders and new entrants seek mining assets to invest in, the demand for professional and quality work compliant with prevailing standards both on the ground and in written presentations has become of paramount importance. This is nothing new but is perhaps a wake-up call to remind geologists that being a member of institutions like the SAIMM and AusIMM is not a sufficient claim to competency. This as true for professionals employed by exploration or mining companies as it is for consultants.

News

Geology Department, University of Zimbabwe

Maideyi Meck

The Department of Geology is still struggling. It did not take students in August 2011 and was expecting to take in 2012. However, the advert by the University for the September 2012 intake did not include Geology. This is mainly based on the new requirement at the university that every lecturer should have a minimum qualification of a PhD. The current stream of students is finishing in July, meaning the Department will have completely stopped training geologists. The Department will only be teaching Geology for Engineers unless lecturers are found before July this year. (Masters holders may be exempted for Geology).

The good news from the Department is that the mining industry has pledged to help by funding a professorial chair and the University will do what it can to provide resources for those who want to pursue PhD studies and be bonded to the university for an equivalent period. Mr Pardon Kanyezi and Mr Victor Owen who finalised their

proposal for MPhil studies last year have shown no progress due to other commitments.

The part-three field trip will take place in May to the Belingwe Greenstone Belt. Assistance in the form of supervision, transport, fuel or cash is being sought from well wishers.

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Note: DG – Department of Geology; MRC – Mineral Resources Centre; GSZ – Geological Society of Zimbabwe

ZIMBABWE GEOLOGICAL SURVEY Z G S

ZIMBABWE

Geological Survey Department

The professional staffing situation remained critical. It is regrettable to announce the resignation of **Fadzanayi Bornwell Mupaya**, a Chief Geologist, who worked for the Geological Survey for more than 19 years. Bornwell acted professionally by serving his three month's notice up to the end of January 2012 after having resigned with effect from 30 October 2011. **Mukai Mangezi**, Geologist, also left the department for greener pastures. He literally absconded. We wish them all the best in their endeavours. **Mitshell Maisera**, Geologist, extended her maternity leave. The professional staffing situation as of now is as follows:

Post	Incumbent	No. Post	Filled Posts	Vac.
Director	Hawadi M.T.	1	1	0
Deputy Director	Mugumbate F.	1	1	0
Regional Geologist		3	0	3
Chief IT Geologist / Geophysicist Data Management		1	0	1
Chief Economic Geologist		1	0	1
Chief Field Geologist		1	0	1
Chief Geophysicist		1	0	1
Geologist/ Senior / Principal	Lunga S. Mugandani E.T. Mpindiwa S. Muzanenhamo F Kashiri T. Maisera M.	26	6	20
Geological Cadets		4	0	4
Geophysicist /Senior/ Principal	Shawarira L. Ndoro M.M.	5	2	3
Total		44	10	34

Given the staffing and financial constraints, the department's activities were rather subdued, being confined to the routine work of providing extension technical services to small-scale miners and monitoring exploration in Coal Special Grants. By the way the EPO situation has not changed. There are still no current EPOs in place.

The production of the 1:1 million map remains a headache for the department. This will, however, be a top priority project for 2012. Relevant GIS software has been acquired, and training arrangements are being made.

The department benefits from the 'Look East Policy' as shown in the table below. The following are some of the activities undertaken by members of staff since our last report in the October 2011 issue of the GSZ Newsletter:

Name	Activity
Temba Hawadi	Attended the Mining Indaba, February 2012. Was part of a delegation that accompanied the Minister to the Kimberley Process plenary meeting held in Kinshasa, November 2011. He attended the China Mining Expo, November 2011.
Forbes Mugumbate	Attended a month-long training workshop on Geochemical Survey Technologies for African Countries in China, November 2011. While in China, he attended the China Mining Expo in Tianjin, and negotiated new co-operation with the Geological Survey of China.
Fadzanayi Mupaya	As a Board Member of the Pan African Mining Development Company, he attended meetings in Zambia and South Africa.

Sokesimbone Lunga	Attended a month-long course in Mineral Exploration in Korea, October 2011.
Ernest Mugandani	Attended a month-long seminar on Mineral Evaluation and Management in China, November 2011. While in China he attended the China Mining Expo in Tianjin.
Sibongubuhle Mpindiwa	Attended a course on Uranium from Phosphates held in Morocco, November 2011. He is attending a three-month course on Basic Techniques in Remote Sensing for mineral exploration.
Tendai Kashiri	Attended a month-long training workshop on Geochemical Survey Technologies for African Countries in China, November 2011. While in China he attended the China Mining Expo in Tianjin. He is attending a three-month course on Remote Sensing and GIS in Korea, January-March 2012.
L. Shawarira	Is attending a three-month course on Basic Techniques in Remote Sensing for mineral exploration.

MINING INDUSTRY NEWS

Forbes Mugumbate

New mining rentals

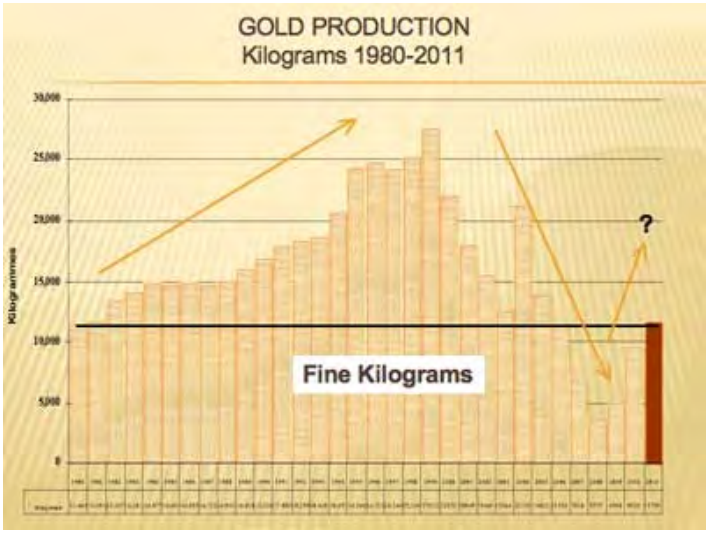
A major news item captured world-wide by newspapers was the gazetting by Government of new mining rentals, fees, and other charges. The new charges with increments that range up to 5000% have caused panic in both the large- and small-scale mining sectors.

Small-scale miners argue that the new fees jeopardize the indigenization of the mining industry. The sector normally uses ground as part of equity in joint ventures with foreign capital. This is no longer going to be possible for many small-scale miners as ground rentals are beyond their reach. On the other hand large-scale miners feel the rentals are too high and will render some projects unviable. Already some mining houses have posted cautionary statements in newspapers regarding the possible effects of the new fees.

The gazetting of the new fees came a few months after the Minister of Finance announced in his budget statement for 2012, an increase of royalties for gold from 4.5% to 7% and for platinum from 5% to 10%.

We can only hope that these developments do not negatively affect the positive impetus that has been clearly discernible in the industry. For instance, production of gold by small-scale gold miners was on an upward trend. According to Fidelity Printers and Refiners, the sector produced 260.6kg in September 2011, 388.1kg in October, 348kg in November, and 489.5kg in December. The sector is poised for further growth given the equipment comprising compressors, jackhammers, water

pumps, etc. that was recently acquired from China by the Mining Industry Loan Fund for small-scale miners. Currently engineers and geologists in the Ministry of Mines are assessing selected small mines for possible assistance with equipment.



Indigenization

The indigenization of the mining industry has gained momentum with the creation of community share ownership trust schemes in some parts of the country affected by major mining activities. President Mugabe officially launched the Zimplats share ownership trust encompassing the Chegutu-Mhondoro-Ngezi-Zvimba Communities. The platinum firm ceded a 10 percent stake to the communities and handed over US$10 million to the trust for community development programmes.

Unki and Mimosa, the other platinum firms, also launched similar schemes in communities surrounding their mines, and each pledged US$10 million for community development projects. Government is mobilising communities in other areas of the country to prepare for the possible launching of community share schemes.

Marange Diamonds

The USA Government's Office of Foreign Assets Control has put Mbada Diamonds and Marange Resources on its sanctions list. This came despite the decision by the Kimberley Process Certification Scheme (KPCS) to allow both companies to export their diamonds into world markets. The Government of Zimbabwe has some interests in the companies through the Zimbabwe Mining Development Corporation (ZMDC) that has entered into partnership with some foreign companies. The ZMDC itself is already under sanctions.

Anjin, a joint venture company between China's Anhui Foreign Economic Construction Company Limited and the Zimbabwe Mining Development Corporation, is the latest diamond mining company in the Marange area to get the KPCS certificate to market its diamonds. Anjin had stockpiled over 2 million carats of diamonds prior to the certification, and is now reputed to be one of the largest diamond producers in the world. The company is recovering an average of 234,750 carats per month according to the Deputy Minister of Mines and Mining Development.

Meanwhile, Marange diamonds are reported to have caused a stir in the diamond market. The KPCS certification of Marange diamonds and subsequent marketing have seen prices of rough diamonds falling on the international market, which has negatively affected traditional diamond suppliers such as De Beers and Alrosa.

ZMDC

Jerry Ndlovu is now the CEO at the government-owned Zimbabwe Mining Development Corporation (ZMDC). The post had remained vacant since the then-CEO and general manager, Dominic Mubayiwa, was removed. Sam Siziba, a geologist, has been the acting CEO. Mr Ndlovu was head of Airports and Business Development at the Civil Aviation Authority of Zimbabwe. He is an engineer by profession.

Meanwhile the ZMDC has shown willingness to re-open the SSM asbestos mines of Shabanie and Mashava. This follows the disbursement of salaries to over 3000 workers who had gone for over 3 years without a salary. The Chairman of the ZMDC board of directors, Goodwills Masimirembwa, indicated that the company was carrying out feasibility studies prior to re-opening the mines.

RioZim

In a bid to deal with a crippling debt of several millions of dollars owed to local banking institutions, RioZim has sought shareholder approval to issue new ordinary shares to raise money to retire the debt and finance working capital. The company was also considering securing a local partner with foreign links as part of the rescue plan. We wish them success in their plans to reinvigorate the company.

Kwekwe gold rush

Zimbabwe's latest gold rush began with stories that huge gold nuggets had been found in the Sherwood Farming Block, about 20 kilometres outside of Kwekwe. This triggered a stampede as thousands of people descended into the area to try their luck.

The recent upsurge in the use of gold detectors is to be blamed for these intermittent gold rushes. Many people have acquired these gadgets that are going for about US$5000 each, and they are scanning many parts of the country for nuggets.

As nuggets are likely to be sporadically found in gold areas by these nugget hunters, gold rushes are going to be an intrinsic part of the mining arena for the foreseeable future. Unfortunately the process of nugget hunting causes a great deal of environmental damage, as the hunters hire bull dozers to turn the earth upside down to expose new surfaces for scanning with their machines.

The recent rise in mining fees is likely going to significantly increase the nugget-hunting process as many who have been working in the registered claims will not be able to maintain the claims.

News about Zim Geoscientists

Please provide us with news about yourself or other geologists. We need to keep in touch with all of you out there. E-mail fbmpaya@yahoo.co.uk or makari@zol.co.zw

GSZ Research and Development Fund

Enquiries relating to the distribution of funds through this facility should be made through the standing Chairperson.

SEG Timothy Nutt Scholarship Memorial Fund

This fund will be available to provide financial support for geology students and young economic geologists located in Zimbabwe or in Southern Africa with ties to Zimbabwe. The fund may be used to support SEG student chapter activities, travel to meetings, field trips, for research or study grants, technical lectures or any other activities approved by the SEG Regional Vice President for Africa.

Applicants must describe what the project is, why the research is important and how it is to be done.

An estimate of expenses for the project must be included with the application.

Grants are expected to be fully utilized by year-end.

Grant recipients are required to provide a year-end accounting of how the money was spent together with a suitable progress report or final abstract.

The next call for applications will be in January 2012. See the Society of Economic Geologists website for further details.

Conferences

Rhodes University, Department of Geology Kimberlite Course, Grahamstown, 16th – 20th April, 2012.

This course is primarily designed for practicing earth scientists. Delegates should regard it as either an introductory or refresher workshop in this topic designed to bring industry geologists up-to-date with recent advances in economic geology relating to kimberlites. Delegates are accepted on a first-come-first-served basis. The course is co-ordinated by Mike Skinner (general kimberlite petrography and kimberlite distribution), Geoff Howarth (eruption processes) and Steve Prevec (kimberlite dating techniques) from Rhodes plus guest lecturers, including Jock Robey (kimberlite prospecting & upper mantle geology), Mike deWit (kimberlite prospecting) and Dave Apter (indicator mineral chemistry). The course will cover the essentials necessary to understand/run basic kimberlite exploration programmes appreciate and comprehend topics including; mantle models, kimberlite petrography, mantle indicator mineral recovery and mineral compositional analysis, diamond studies and kimberlite dating. The courses are all held in the Geology Department, Rhodes University with morning sessions from 0830 to 1300hrs and afternoon sessions from 1400 to 1700hrs. Transport and accommodation in Grahamstown are the responsibility of the delegates. The department can provide information in this regard. Daily programmes will include morning lectures and afternoon practical sessions involving mainly kimberlite macroscopic and microscopic observations. The cost of the five-day course is R7500 (exempt from VAT). *Contact:* The Secretary, Exploration Geology (Mrs Ashley Goddard), Geology Department, Rhodes University, P.O. Box 94, GRAHAMSTOWN 6140, South Africa. expsec@ru.ac.za http://www.ru.ac.za/academic/departments/geology/

Craton Formation and Destruction with special emphasis on BRICS cratons, University of Johannesburg, South Africa. 21 – 22 July 2012, with post-Workshop Excursion to Barberton, the Witwatersrand, the Bushveld and Vredefort, 23 – 28 July 2012.

The two-day Workshop on Craton Formation and Destruction follows on from the International Conference on Craton Formation and Destruction held in Beijing in April 2011. The North China Craton has become the type locality for the study of processes related to craton destruction. The Kaapvaal Craton is renowned for its long term stability and rich record of diamondiferous kimberlites and associated xenoliths. With these two cratons as end members in the creation-destruction spectrum, comparative views of cratons will elucidate the roles of surface geology and deep mantle dynamics in cration formation and destruction. In light of their pivotal roles in Palaeoproterozoic plate reconstructions and craton assembly, additional views from the Brazilian, Russian and Indian cratons are especially encouraged. Contact: craton2012@uj.ac.za

Copper in Namibia, Copper Exploration, Mining & Processing, Ministry of Mines & Energy Auditorium, Windhoek, 13 – 14 September 2012. mail@geolsocnamibia.org

The 23rd International Geological Congress, Cape Town, South Africa – 2016.

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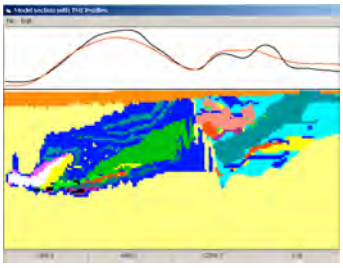
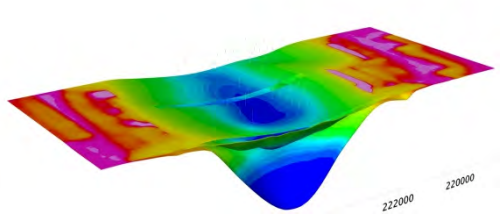
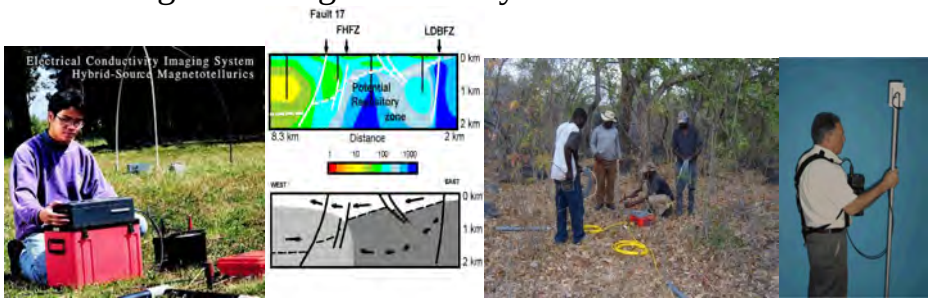
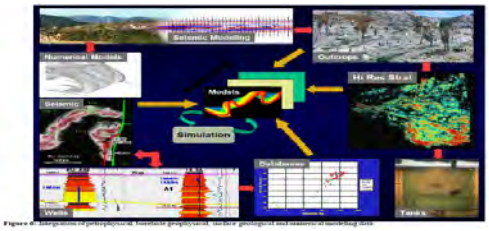



- CSAMT and ground magnetic surveys



- 3D Data integration and visualisation



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Institutional Membership, 2011

African Consolidated Resources

Beemarch Properties Limited

Anglo American

Canister Resources

Geology Department, UZ

Goldsearch Technical Services

Samrec Vermiculite Zimbabwe (Pvt) Limited

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