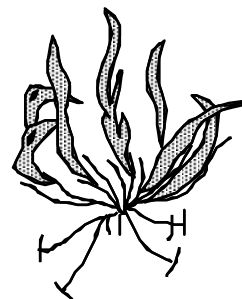

Geological Society of Zimbabwe



Newsletter

February 2010



Oldoinyo Lengai, Tanzania's 2900 metre-high active volcano noted for its eruption of soda-rich carbonate lavas, as illustrated in Martin Spence and Tim Holmes' presentation on the Chishanya Carbonatite.

THE GEOLOGICAL SOCIETY OF ZIMBABWE, P.O. BOX CY 1719, CAUSEWAY, HARARE

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Editorial

The third Newsletter under the leadership of Forbes Mugumate skids in a moment before he relinquishes the reins of our Society to Daniel Chatora following the AGM on 19th February. This event will be at 17.00 on Friday at **The Country Club (CFX) Brompton Road, Highlands, Harare**. The formalities will be followed by an entertaining talk by Tony Martin on “The Wanderings of a Consulting Geologist” and, with supper, presentation of the A.E. Phaup, Mike Vinyu and Keith Viewing awards. Come and meet up with your friends and compatriots. Please contact Gayle Hanssen on dms@zol.co.zw to let us know you will be there. Dinner costs \$15 a head and we look forward to seeing you.

The grand attendance at the Summer Symposium in November made that event a great success. In this issue we bring you most of the abstracts and Tony Martin’s summary of events, which should represent an interesting and permanent record for those who attended and for those who could not make it. The opening by Chamber of Mine’s President, Victor Gapare, the efforts by all presenters and organisers and the first class input of Sharad Master as a keynote speaker made the day the highlight of the year.

Ann Kritzinger presents her rebuttal to the criticism of Kevin Walsh and David Love in our October Newsletter, noting that geochemical analysis is incomplete and that mining archaeologist Martin Strassburgher of Germany will be examining the evidence as to the possibility that Nyanga terracing may have been a means to an end in gold concentration on mass wasting slopes.

Thanks as usual go to our regular contributors, without whose input the Newsletter would carry no news. Despite the veneer of hope and confidence that mining may represent the peg upon which our economic turnaround may hinge, one senses disturbing undercurrents that may undermine our brittle industry. The impression projected that Zimbabwe is a land with “vast” mineral resources should perhaps be tempered to a country that has a great variety of mineral potential that could be developed as small to medium-sized, rarely large mining projects following often difficult, pain staking and risk-filled exploration and verification. We have an exploration “play” that needs to be nurtured by attractive investment terms that make that “risk” worthwhile. A mine does not appear overnight. Our EPO system is constipated by over-application and under-performance due to administrative hold-up. New mines come about from a free and lively but competitive attitude to exploration that requires innovation, tenacity and accountability. Greed, ignorance and ulterior motive will not win our goal to re-invigorate our mining industry as a winner for economic recovery. Exploration and mining have been moribund for too long and it needs understanding and encouragement if its long-term benefits are to be realized by all Zimbabweans.

2010 is the year to celebrate and the Society has undertaken to stage this year’s symposium on the theme of “**A Hundred Years of Contributions to Geology**” to help the Geological Survey realize its century of existence. This will take place on 21st and 22nd October with a post-symposium field trip or trips being organized for the benefit of Members and our Guests. Watch this space for developments. We may read the Obituary to Philipp Oesterlen as being a celebration of his life in the realization that it is the achievements and contributions that people make that allows the history of an institution such as the Geological Survey to be judged in the favourable light that it is.

Tim Broderick



Chairman's Chat

Forbes Mugumbate

A happy 2010 and a prosperous New Year to you all.

The Inclusive Government is still intact albeit with sporadic hiccoughs. We hope the politico-economic situation continues to improve to create a favourable environment for investment.

The Summer Symposium, which has become the major annual event on the Geological Society calendar, was held at the University of Zimbabwe on the 27th November 2009. Many thanks to the organising team led by Andrew du Toit for making the 2009 Summer Symposium a most memorable event. The attendance was great, many more than expected, and the presentations were of top quality. We wish to extend our appreciation and thanks to all the presenters for finding time to prepare such informative papers. The author of the best paper will be presented with the Keith Viewing Award at the Annual General Meeting to be held on the 19th February 2010. Dr Tony Martin is thanked for accepting the onerous job of summarizing the proceedings and for judging the presentations for the Award.

The 2009 Summer Symposium marks the beginning of a new dimension in the activities of the Geological Society. In addition to the now traditional practice of inviting influential members of the industry to officially open the symposium, a keynote speaker of international repute was invited. Victor Gapare, the President of the Chamber of Mines opened the symposium while Dr Sharad Master of the University of the Witwatersrand delivered the keynote speech on the geology of the Magondi Belt. It was interesting to learn that some of the oldest aeolian deposits are found in the Deweras Group, and that the internationally recognised geochemical anomalies recognized as ¹³Carbon incursions in some Proterozoic basins, the so-called the Lomagundi Phenomenon, were first recognised in the Magondi Basin carbonates. The inspiring talk that covered all aspects of the geology of the Magondi basin was followed by a well-attended field excursion of the Magondi belt led by Sharad. We wish to thank all our members who continue to support Society activities through attendance at these events.

The dates set for the Centenary Celebrations of the Geological Survey are fast approaching. The dates have been set for 21-25 October 2010. The Geological Society sub-committee responsible for their contribution to the celebrations has so far met twice to deliberate on a suitable symposium and field excursion. It is however disheartening to note that the Geological Survey Department has not been doing much to prepare. The building housing the department is in a deplorable state. The preparations for printing of the 1:1 million geological map of Zimbabwe are behind schedule. The paltry budget of USD3.7 million that the Ministry of Mines got from the Treasury will not be enough for the requirements of the Geological Survey to prepare for the Centenary Celebrations. Obviously the department needs a lot of assistance. The Society will continue to persuade the department to consolidate its preparations and to possibly seek funding for the event from outside government.

We note with concern that mining activities, especially exploration, remain subdued despite government promises to expedite the granting of exploration licenses. The country remains clogged with Exclusive Exploration Order applications. The Society is also concerned by various mining fees that were gazetted following the Minister of Finance's 2010 budgetary statement. Some of the figures do not make much sense. This new policy and the continued delays in concluding the new Mines and Minerals Act will certainly affect development of the

mining industry in a very negative way. The Geological Society has written a letter advising government on the likely consequences of their new mining fee policy. We can only hope they will take heed of advice coming from various quarters in the mining industry.

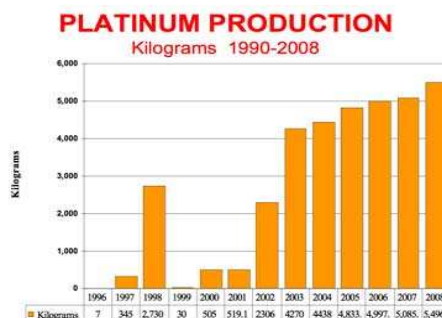
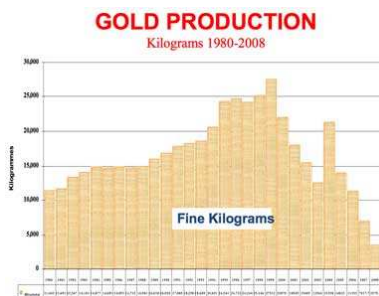
My term as Chairman of the Geological Society of Zimbabwe ends on the day of the AGM, 19th February 2010. Great thanks are due to the committee under my chairmanship for competently running the affairs of the Society under difficult circumstances. All members of the Society are acknowledged for the support they gave during my tenure of office. The support by various companies to Society activities through cash and other donations is gratefully recognized. Lastly but not least, I wish the new committee chaired by Daniel Chatora all the best. Please remember to renew your 2010 Society Membership.

Articles and Reports

Summary of Presentations made during the November 2009 Symposium of the Geological Society of Zimbabwe

Tony Martin

The first three presentations covered the state of the mining industry in Zimbabwe and the symposium opened with an overview by *Victor Gapare*, current President of the Zimbabwe Chamber of Mines, of the metals industry over the past decade and in particular the near demise of gold production in 2008/9.



This was followed by *Paul Chimboza's* talk on efforts to revise the Mines and Minerals Act and associated regulations currently being undertaken by a committee under the auspices of the Chamber. It was pointed out that the current legislation is sound but requires simplification in some areas and in particular that pertaining to the acquisition of mineral rights given the large number of claims currently being pegged and the backlog of EPO applications.

One of the initiatives to assist in this process has to involve the computerization of all blocks of claims, and an example of how this could be achieved was presented by *Kingray Gowera* using GIS software. Such a system would be welcomed by the mining industry in Zimbabwe as it would be accessible to all and therefore engender transparency.

Input into a GIS system requires reasonably accurate co-ordinates and *Neddie Mlambo* outlined conventional survey techniques and the various GPS tools available and their relative accuracies. The presentation also included future developments in satellite systems from Europe and Russia, and the need for a standardized African co-ordinate system.

Prior to getting down to geological and exploration topics, *Daniel Chatora* outlined the activities of the Society and the excellent attendance at the Symposium is a tribute to the Chairman and the committee.

The keynote address was presented by *Sharad Master* from the University of the Witwatersrand, who elucidated the stratigraphy and metamorphism of the Magondi Supergroup. This sedimentary triad lies unconformably and structurally on an Archaean granitoid-greenstone basement. The lowermost Deweras comprises a proximal volcano-sedimentary assemblage of continental beds with alluvial fans and evaporite deposits unconformably overlain by deeper water, storm-dominated deposition of the Lomagundi and the time-equivalent distal sediments of the Piriwiri containing minor volcanics. The metamorphic grade changes from both north to south and east to west with the highest grades occurring in the north-west where the Supergroup is most affected by the Magondi orogeny. The copper mineralization occurring within these metasediments is restricted to the northern parts of the belt where it is associated with carbonate rocks. These have anomalously high $\delta^{13}\text{C}$ values, which have subsequently been recognised as a world-wide event occurring around 2.2-2.06 Ga. One of the problems in assembling a history of this sedimentary basin is the paucity of suitable rocks to obtain reliable age determinations from. The basin is likely to have been controlled by strike-slip tectonics in a passive continental margin in preference to a back-arc basin as previously proposed.

Tony Martin summarized the many and varied hydrothermal mineral deposits from the well-known gold veins of Zimbabwe to the lesser-known uranium/vanadium mineralization in Karoo strata adjacent to the Zambezi Valley. Porphyries, metasomatic and massive sulphide deposits associated with plate tectonics are also hydrothermal in origin as is the Pb/Zn carbonate association.

Exploration for Karoo-hosted uranium deposits was the subject of *Julian Green's* presentation, a considerable amount of which was completed up to the mid-1980's in both Zambia and Zimbabwe using both airborne and ground radiometrics. The Zambian uranium deposits are hosted by the Upper Karoo Escarpment Grit above the Madumabisa Mudstone and are typical replacement deposits controlled by carbonaceous matter. He pointed out that while standard exploration techniques are applicable, care is required in interpreting results, as the best anomalies may not coincide with the highest grades.

Exploration of the Chishanya Carbonatite was the subject of the next presentation by *Tim Holmes* for *Martin Spence* of African Consolidated Resources. African carbonatites associated with rifting tend to be rich in CaO, whereas those within the cratons are dominated by Mg carbonates. These are derived from partial melts of the mantle and were extrusive, the well-known Ol Donyo Lengai volcano being a modern example. These volcanic plugs are important sources of apatite for fertilizer, Nb and other rare earth minerals as well as Cu. ACR are currently exploring the four complexes around Chishanya for apatite and rare earths by geological mapping and soil sampling and will be drilling the property in future. The historic resources are likely to increase with further work and now stand at around 270Mt at with around 12% P_2O_5 .

Philip le Roux outlined the effectiveness of Mobile Metal Ion (MMI) geochemistry, which makes use of weakly adsorbed metals on soil particles at surface. The technique can give better-defined anomalies by measuring only the mobile metal ions without digesting the soil itself. This requires only a small sample taken 10 – 15 cm below surface and, as identification of specific soil layers is not required, the sampling process is simplified. Sophisticated analytical techniques are required to determine the metal contents in the parts per billion range and a comparative example was presented for the Nickel Hill deposit at Mvuma and for gold deposits in Australia. The technique has been successful in locating Zn deposits under 35m of tillite in Canada. MMI can also be used for lithological mapping under thick soil cover.

Various geophysical exploration techniques were covered by *Hillary Gumbo* and in particular those which are available in Zimbabwe. These include a portable, easy-to-use magnetotelluric (MT) instrument that maps resistivity to a depth of 1km and allows the user to view the resistivity section during the survey and to incorporate drill hole data into the interpretive software. Future developments will include acquisition of magnetometers and magnetic, gravity and gravity gradient modelling software.

Andrew Pahwaringira entertained the audience with a talk on how to find water in a rain forest – admittedly ground water associated with cavities in a limestone being mined for cement. The problem was to determine whether it was economic to remove the water to allow mining to continue. The study involved understanding the geology and in particular the fracture systems followed by drilling wells and subjecting these to draw-down and packer tests complemented by geophysics and chemical analyses. By determining the permeability of the limestone it was possible to define areas that could be dewatered.

The maintenance of exploration and environmental databases was the subject of a presentation by *Chiedza Mugwagwa*. The importance of the accuracy of all inputs into a database and the ability to interrogate these were stressed along with simplicity of the system and flexibility allowing customisation to specific client needs. She also noted that the cost of maintaining a bullet-proof database is miniscule compared to the cost of sampling and analyses. A low quality database can have a serious impact on the value of a mining property.

Maideyi Meck's presentation covered the environmental issues associated with mining of the Dorowa phosphate deposit. Her study has focussed on the trace elements (Sr, Fe, Cu, Pb, Zn, Cd, As, V, Cr,) contained within apatite, which being a relatively soluble mineral, can release these potential pollutants into surface and ground water systems.

A Review of the Stratigraphy and Geological Setting of the Palaeoproterozoic Magondi Supergroup, Zimbabwe - Type Locality for the “Lomagundi” Carbon Isotope Excursion

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The Paleoproterozoic Magondi Supergroup lies unconformably on the Archaean granitoid-greenstone terrain of the Zimbabwe Craton and experienced deformation and metamorphism at 2.06-1.96 Ga, to form the Magondi mobile belt. The Magondi Supergroup comprises three lithostratigraphic units: volcano-sedimentary rift deposits (Deweras Group) that are overlain by a passive margin to foreland basin sedimentary succession, including shallow-marine sediments (Lomagundi Group) in the east, and deeper-water distal deposits in the west (Piriwiri Group). The Lomagundi Group unconformably overlies the Deweras Group, but its contact with the Piriwiri Group is either structural or not exposed in the field. Based on the upward-coarsening trend and presence of volcanic rocks at the top of the Piriwiri and Lomagundi groups, the Piriwiri Group is generally considered to be a distal, deeper-water time-equivalent of the Lomagundi Group. The Magondi Supergroup experienced very low-grade metamorphism in the southeastern zone, but the grade increases to upper greenschist and amphibolite grade facies to the north along strike and, more dramatically, across strike to the west, reaching upper amphibolite to granulite facies in the Piriwiri Group.

Carbonates form prominent horizons in the lower Lomagundi Group, occur in the Deweras Group as thick packages in the northern part of the basin, but form only thin lenses elsewhere, and are quite rare in the Piriwiri Group. Sulphate pseudomorphs and beds of anhydrite are relatively common in the Deweras Group, and also occur in the Lomagundi group. In a reconnaissance isotopic study of global Precambrian carbonates, by Schidlowski and others in 1975, the carbonate rocks of the Lomagundi Group were found to be the most isotopically anomalous regional carbonate province in the world, being very enriched in ^{13}C , with an average $\delta^{13}\text{C}$ value of +8.2‰ VPDB. Subsequent work in the Magondi Basin has shown that high $\delta^{13}\text{C}$ carbonates are also present in the continental rocks of the underlying Deweras Group. The “Lomagundi Event” has now been recognized globally in carbonate rocks deposited in the time span 2.2-2.06 Ga.

The initiation of the Deweras rift is not well constrained geochronologically. Available dating indicates an

age of 2.16 to 2.12 Ga, but it may have started as early as 2.26 Ga, if the Chimbadzi Hill mafic-ultramafic intrusion is related to early Deweras rifting. Assuming that the deepening trend in the upper Lomagundi Group and upward-coarsening trend in the Piriwiri Group reflect subsidence in the foreland basin and sediment derivation from an approaching volcanic arc, the age of the onset of Magondi deformation at c. 2.0 Ga provide an upper age limit for sedimentation. The ca. 2 00 Ma duration of sedimentation in the Magondi Basin is better explained by deposition in a passive continental margin which changed to a foreland basin, rather than in a back-arc basin as had been earlier proposed.

Some Aspects of Hydrothermal Mineralization

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Some 550 years ago Agricola recognised water as an essential ingredient along with salt and acid in the formation of mineral deposits. These ideas were supported by geologists in the 19th century, who further suggested that transport and deposition resulted from reversible chemical reactions. Today the views are accepted along with a better understanding of the tectonic processes and settings of ore deposits, although the source, transport and depositional mechanisms remain ambiguous in some instances.

Most economically extracted metals can be associated with hydrothermal activity, from those near the top of the periodic table – lithium – to those at the bottom – uranium. The only exceptions appear to be nickel and chromium. Vein deposits are amongst the most important, but hydrothermal activity can also be ascribed to many others including pegmatoids, porphyries, and stratabound base metals. Host rocks include all known types from igneous to sedimentary with distinct preferences being shown for some metals.

The advent of plate tectonics has vastly increased our understanding of ore forming processes, and although not all hydrothermal deposits are considered to be directly associated with plate movements, many are. The placement of Archaean vein systems into a plate tectonic setting is controversial.

A Brief Overview of Exploration for Karoo Sediment-hosted Uranium in Central/Southern Africa – With Specific Experiences/Examples from Zambia

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Potentially economically interesting uranium occurrences have been known to exist in the Upper Karoo stratigraphy in southern and central Africa for many years. Considerable uranium exploration and evaluation work was carried out in the Karoo of Zambia and Zimbabwe in the 1970's and early to mid 1980's by, amongst others, Saarburg-Interplan, Agip, PNC, Cogima as well as the two Geological Survey departments and various state-owned mining and exploration companies. The past five years has seen a huge resurgence (and re-learning the art) of uranium exploration in the region driven by a predicted mid to long term worldwide uranium deficit, for power generation, and a high commodity price. Using predominantly Zambia to draw examples from, this presentation aims to touch upon some of the different styles and types of uranium mineralization within the Karoo, to talk briefly about some of the exploration techniques that have been employed as well as highlighting some of the modern-day success stories. Information and data used for this presentation is either already in the public domain or is used with the kind permission of individual companies.

Summary of the Chishanya Carbonatite Presentation

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There are two suites of African carbonatite: Calcic along the East African Rift and magnesian on the cratons.

A number of carbonate sources are postulated:

1. Derived from partial melts of mantle peridotite;
2. representing fractionation residues of mantle CO₂-rich silicate magmas; and
3. being a mantle-derived silicate melt that divides into two immiscible fluids.

Chishanya Geology

The complex occurs 25 km north of Birchenough Bridge and consists of the Baradanga, Chishanya, Bepe and Sanya carbonatites, aged at about 127my.

These have intruded the southern Mutare batholith and have metasomatized the granite country rock to a quartz-free assemblage of K-feldspar, sodic and minor alkali amphibole and chloritized FeMg minerals. Carbonate minerals make up >95% of the carbonatite rock, comprising calcite, dolomite, ankerite and siderite with magnetite, chlorite, pyrite and phlogopite as accessory minerals.

Economics of the Chishanya Complex

Historically Chishanya has been explored for Cu and a number of companies have assessed the phosphate potential.

ACR have mapped and tested some of the complex; phosphate results are very encouraging, REE's are being targeted.

Mapping, surveying and sampling is ongoing.

Drilling will be undertaken in the first quarter of 2010.

Last Frontiers in Soil Geochemistry

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Mobile Metal Ions (MMI) is a term used to describe metal ions that have moved in the weathered soil profile and that are only weakly or loosely adsorbed by surface soil particles. MMI is a geochemical survey technique used to accurately locate deep ore deposits. False and displaced anomalies normally associated with conventional geochemical sampling methods are minimized. By measuring only mobile metal ions in surface soils, sharp responses or anomalies over buried ore deposits could be identified. Significant reductions in exploration costs may be realized as future exploration techniques such as geophysics and drilling can be focused into smaller, priority exploration zones, saving both time and money.

During the sampling process about 350 grams of sample need to be taken at a depth of 10 – 15 cm below surface. Sophisticated chemical processes and instrumentation are used to measure mobile metal ions that have migrated into surface soils from mineralization below. MMI geochemistry strips mobile metal ions from the exterior of soil particles using a partial dissolution method without digesting the soil itself, to measure metal ion concentrations in the parts per billion range.

The MMI sampling technique was tested and compared with conventional geochemical sampling data on Zimari Nickel's known mineralized nickel ore body at Nickel Hill, near Mvuma in Zimbabwe.

The results of this comparative exercise are the basis for this presentation.

Data Capturing Problems, Solutions and Tools

Chiedza Mugwagwa

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DataShed is a globally present industry standard for data management proven in exploration, mining and environmental applications.

Our services are delivered by geoscientists with a deep understanding of resource sector needs.

- Integrates seamlessly with mining, exploration, and GIS software.
- Improves accuracy of data for better decision-making.
- Provides full audit trails to meet industry best practice.
- Adds value to a company's most important asset, its data.

Nomad provides exploration and mining staff with easy, accurate and speedy data capture at the point of entry. Validation rules improve the quality of data collected. *Nomad* can be used offline and then later automatically synchronised to your desktop or master database to upload the data. *Nomad* users can use the pre-installed data capture templates or customise their own. These templates are rapidly deployable in an integrated data management system.

LogChief is a geological data capture application created to run on a laptop or tablet. The application is designed to simplify the collection and management of geological data associated with surface sampling and drilling. It ensures that by using defaults and company libraries, the data integrity and validation is enforced at the point of entry. The application gives users the flexibility to customise the application for their specific needs. *LogChief* can be used offline, with the collected data automatically synchronise to any database, or exported out as an *Access* table or a spreadsheet.

Spatial Knowledge Management in the Mining Industry

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Neither problem nor solution can exist independent of context. Historical context is always necessary but never sufficient. Sufficiency can only be achieved by also having a spatial context. Mining activities, as processes and a functions are context sensitive. While the mining industry has invested significantly in sub-surface characterisation of ore bodies, little attention has been paid to second generation knowledge management tools, such as GIS, which would go a long way in surface characterisation. It is increasingly becoming clear that knowledge is one of the few resources or assets that is almost infinite. Despite the significant resources that the mining industry have put in collecting this asset, its management leaves a lot to be desired. While the spirit or purpose of any system is found in its content, the design and development efforts towards well-structured repositories for spatial knowledge in this industry have been by and large piece-meal. GIS offers the mining industry an opportunity to manage its spatially intelligent knowledge assets, which are central to informing various mining activities such as mineral exploration, production and environment management.

GNSS – The Spatial Data Capturing Tool

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Introduction

GNSS, an acronym for Global Navigation Satellite Systems, play a broader role in spatial data capture. It is robust, efficient and versatile in all those applications where positioning is critical. At the moment, it is now an indispensable tool for all mapping exercises, be they in localized areas or as national mapping projects.

Traditionally, surveying was associated with optical instruments for example compasses, Wild T1s, T2s and dumpy levels, being aided by accessories such as staves, chains and tapes. In the office, a pocket calculator, scale-rule, drawing board and inking pens were, among other accessories were very important instruments needed in the final map production chain. Not only was the initial data capturing process tedious and prone to insidious errors, but also the final data processing and manual drawing of maps required nerves of steel, especially when project areas were large. The advent of Total Stations and computers loosened up the tight ends, and surveying became simplified both in the field and office. Now with GPS technology, surveying has become even simpler since all processes are automated, but obviously they come at a price.

Background and Overview

The GNSS technology, primarily developed for military venom, had ripple effects in civilian life. The principal aim was to hit targets with surgical precision during military operations. GNSS receivers for civilian use were developed to receive and process signals propagated by orbiting satellite vehicles (SVs). The receivers, using multi-bit signal processing capabilities aided by powerful and rigorous firmware and software, can compute positions on the earth's surface. The ability to compute positions (co-ordinates) on the earth's surface is the genesis of understanding the geo-spatial information power base.

This versatile technology, when fully embraced, makes development smart. Its precision, efficiency and robustness facilitate the timeous delivery of set targets and goals.

The system comprises GPS, Glonass, Galileo and Beidou. *Global Positioning System* (GPS) is an American-sponsored satellite technology and is run by the Pentagon, Department of Defence (DoD). The programme was rolled out in 1978. As of May 2009, the constellation consisted of 31 operational satellite vehicles orbiting around the earth at an average distance of twenty thousand kilometres above the earth's surface. At any point on earth, a minimum number of four satellites occur above the horizon. The system has four ground-based monitor stations, one master control station and three upload stations.

The satellites broadcast data packets via the L1 and L2 radio signals. All satellites are continuously monitored by the ground stations, which transmit the information to the master control station. The master station calculates all the relevant parameters, for example, atomic clock corrections and orbit realignments, among other corrections. These corrections are transmitted to the upload stations, which forthwith upload the data to respective satellites at least once a day.

Glonass is a Russian-sponsored satellite-based technology and was unleashed in 1982. The system is undergoing a modernization phase. There are twenty operational satellite vehicles, with the latest three satellites being blasted into respective orbits in December 2008. *Galileo* is a European Union satellite system, which is still undergoing its developmental stage. Only two experimental satellites are in orbit. When fully operational, the satellite navigation system's constellation will consist of thirty (SVs). By 2013, the system will reach its full development.

Beidou is a Chinese satellite navigation technology. It is still in the embryonic phase. Initially, the system will provide regional capability. When fully rolled out, the constellation will consist of thirty SVs in orbit as well as five geo-stationary satellites. The fructification of the programme is expected to rapidly expand between 2015 and 2020.

The combination of all the above when fully operational can benefit all nations immensely. Even at this stage, the capability of GNSS can be rated as being ninety percent effective.

How it works?

- Satellite trilateration – the basis of the system;
- Satellite ranging – measuring distances from a satellite;
- Accurate timing - why consistent clocks and a 4th SV are needed;
- Satellite positioning – knowing where a satellite is in space; and
- Correcting errors – correcting for ionospheric and tropospheric delays.

The ellipsoid on which GPS operates is called WGS84 and consequently all measurements are made on a common platform and co-ordinate system.

For accurate surveying, differential GPS is the cornerstone. The method requires one receiver (base station) to be set up at a known survey control station, for example on a trigonometrical beacon, and the other receiver (rover station) to be carried around to occupy points during measurement. The base station and the roving receiver(s) must measure simultaneously. The approach can either be in post-processing or real time kinematic (RTK) modes. This allows corrections to be applied on the data captured by the rover, hence to correct vectors relative to the base station.

Applications

The system is versatile, and a wide range of applications is covered. Applications covered in this discussion are biased towards the mining industry. Lidar mapping is a vital and thrifty mapping technology which is guided by GNSS technology. Large-scale mapping projects require this technology. Maps produced can be used in various fields ranging from geology to infrastructural development. Mineral prospecting is carried out on a platform of accurately mapped areas. For the geologist, points of interest can have their co-ordinates extracted from the resultant maps in office and uploaded into the (GNSS)/GPS receivers. These waypoints can be navigated to in the field. A closer and more analytic look on the ground is carried out (ground truthing).

Borehole positions can be staked out with little or no difficulty at all. When the differential GPS (DGPS) surveying technique is used, sub-centimetre accuracy is achievable. Proper feasibility studies based on accurate positions are undertaken and correct decisions are taken. For meaningful investment in the mining sector, mining rights by way of mine leases need not to be overemphasized at this juncture. Mine leases provide collateral security and can only be registered when accompanied by survey diagrams. Cadastral survey is expeditiously executed if DGPS is employed. Apart from meeting the Surveyor-General's specifications, DGPS surveying ensures short turnover periods. For example, it can take four months to survey 15,000 hectares of mine lease area by total station, but a record three weeks is achievable when DGPS techniques are employed.

Mine control survey requires use of DGPS for reliable co-ordinates. Setting out of portals and mine infrastructure becomes easy and errors are minimized, provided good setting out procedures are adhered to. In opencast mining ventures, machine control makes the whole procedure smart. GPS receivers mounted on excavators and draglines are synergized with the geologist's design maps. This allows economical cuts of grades and adherence to appropriate depths so that the required sections are only worked on. Unwanted waste material will be excavated with full knowledge, unlike if the miners are using conventional surveying procedures. Surface stockpiles are measured in record time by DGPS operating in RTK-mode for determination of volumes. Mine planning becomes very informed with no lost time as with the tedious conventional methods.

Mine safety is also kept under check. Subsidence of the ground can be monitored. By using continuous operating reference stations (CORS), small movements can be detected, thus monitoring any subsidence. Mine reclamation requires a good GIS application, which is easily supported if GPS-based measurements are used.

Conclusion

Spatial information in the mining sector forms the basis of informed mineral resource development. GNSS mapping technology, provided all factors are equal, results in accurate maps being produced in the shortest time possible. For Zimbabwe's reconstruction, mining plays a significant role as the industry contributes a substantial amount to the GDP. The Africa Reference Framework (AFREF), which seeks to unify the whole of Africa to operate on the same co-ordinate system for co-ordinated development also touches the mining industry. Continuously operating GPS base stations have been proposed throughout the African continent at distance intervals of 500km. Users may have to buy roving stations only, and costs will be reduced significantly.

Being an attractive technology, there is need to outlay substantial amounts to procure the equipment. Accrued benefits will eventually outweigh the procurement costs, and accelerated development will be experienced.

Hydrogeological Studies at a Limestone Quarry

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Recharge, discharge and water quality studies were conducted in order to understand the hydrogeological regime affecting a limestone deposit.

The geology was established by core drilling. Production and observation wells were sunk by destructive drilling techniques.

Constant and/or stepped drawdown tests were conducted. Recovery data was also collected from the production well and all observation wells. A weir tank was used to check the flow-meter readings and also provide a convenient location to determine the pH, TDS and temperature variations of the discharge.

The production well and the inner nest of observation wells were dug some 2 km from the quarry and in the H/W of the deposit. The inner observation wells were sunk inside the quarry perimeter.

Piezometers were installed in the main lithological units to monitor the water levels during production or during the lack of it.

For shorter constant observation, data-loggers were planted in the wells as far as possible. The use of data loggers complimented the effort of taking readings at specified intervals.

Permeability was determined by using falling head and the packer tests. The falling head tests were conducted at the observation wells using data-loggers or dip-meters.

The integrity of the observation wells was established by geophysical methods (caliper, β and resistivity) in the initial stages of the study.

To supplement the study, historical data from wells dug in the environs was collected. Local authorities and all stake holders were told about the exercise.

Ideally, data should be collected from the observation wells for a whole year before any hydrological model is finalized. However, pertinent questions surrounding undesirable water levels had to be answered fast.

After processing the data, it was evident that the pumping capacity of the quarry could be altered to deal with worst water recharge rates.

The deposit could not be pursued too far into the H/W because of ensuing high pore pressures.

The future of mining lay in following the deposit west along strike.

The pumped water could be directed into a channel with minimum recycle chances.

Minerals that have a potential to host metals in their crystal structure at Dorowa rock phosphate mine, Zimbabwe: Implication for environmental Management

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There are a substantial number of minerals in the Dorowa alkaline ring complex. Chemical analysis (atomic absorption spectrometry and XRF) established that the phosphates at Dorowa are associated with metals and sub-metallic elements that include copper, zirconium, strontium, rubidium, lead, zinc, cobalt, iron, and manganese.

The major minerals found in the ring complex are feldspars, pyroxenes, apatite, magnetite and calcite. Recent work (Meck *et al.* in press) has established the potential metal host among the many minerals present and concludes that the minerals that have a potential to host toxic elements in their crystal structure are apatite and calcite, which belong to the carbonate and phosphate families respectively. Apatite is the only mineral that can host pollutant trace elements (Sr, Fe, Cu, Pb, Zn, Cd, As, V, Cr,) in a more stable manner. Calcite can also host metals in its structures but the substitution is limited. Metal substitution capacity by the other observed minerals is not possible from a crystal-chemical perspective.

The fact that only a few minerals can host the pollutants means if they are identified and isolated then it is easy to manage them. The fact that the accessibility of elements trapped in the calcite and apatite structures to the environment is very high due to the fact that both apatite and calcite dissolve in weak acids thus dissolvable in natural environmental conditions also calls for serious monitoring in environmental management

3D Earth Exploration

Hillary Gumbo

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3D Earth Exploration is a recently registered geophysical contracting and consulting company. Our focus is on 3D data integration, modelling and visualisation. We recently acquired a magnetotelluric (MT) unit that maps rock resistivity down to a depth of 1km from which geological and structural interpretation can be done. Unlike most other systems available on the market our unit, called the *Stratagem*, is very portable, easy to use and one can view the resistivity section during survey. We also plot up and view data every evening during survey. At present we can also plot the data in 3D (together with say drillhole data) at our office immediately after receipt of field data. In the near future we aim to provide our technician with the software to do that on site. We also have license for *VPmg 3D magnetic modelling* software and are currently running some trials on the Selby Test Range, the Zimbabwe Geological Survey Geophysics Test site on the outskirts of Harare. We will upgrade our license to include gravity and gravity gradient modelling sometime soon. We are in the process of acquiring more equipment and software to broaden our data acquisition and modelling range. We expect to have a set of magnetometers before the end of 2009.

Proposed Amendments to the Mines and Minerals Act

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The Chamber of Mines and the Ministry of Mines and Mining Development have over the last 5 years or so been working on proposed amendments to the current Mines and Minerals Act Chapter: 21.05 and a draft Bill has been crafted and is awaiting finalization before being brought before the Parliament of Zimbabwe for ratification and enactment into law.

The main objective to the proposed Amendments is to have a Mines and Minerals Act that aims to produce policies that stimulate current and future investments and support existing investors and producers.

The scope of this presentation is to share some of the highlights and pertinent issues that the Amendment Bill seeks to address.

The proposed amendments will touch on issues related to the following amongst others:

- The Indigenisation and Empowerment of the Mining Sector;
- Royalties payable by mining companies;
- The Mining Affairs Board's role and constitution;
- A New Mining Title system;
- Mining Leases versus Mining Claims;
- Extra Lateral Rights;
- Special Grants;
- Landowner's fees; and
- Environmental protection.

The Chamber of Mines has noted that the current Act is generally accepted as an excellent piece of legislation and the current amendment efforts are to buttress this fact and tie up some loose ends for the benefit of the mining industry and make it globally competitive.

Nyanga Archaeology: rebuttal of a "Re-examination of field evidence and interpretations"

Ann Kritzinger

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Walsh's two-day visit to Nyanga on which his and Love's piece in GSZ Newsletter Oct 2009 is based was not a serious "Re-examination of field evidence". There was no field walking of the terraces at Gungutsva Mine and not a single sample was taken for assay. Due to Walsh family difficulties with the terrain a planned detour to see past work in progress in a 1-sq km area of quartz heaps and associated hydraulic tank systems on the same hill as the mine was abandoned. The latter features have two of the highest precolonial gold-processing results to date – 1.49g/t tunnel infill; 2.04g/t quartz rubble surrounding grindstone at tunnel uphill entrance.

The extent of Walsh's field walking on Bende Gap was less than 1 km along a level track. Sitting in the shade he compared the flights of narrow terraces to seats in a Roman amphitheatre (a good analogy) and noted present-day farming 400m below. We discussed the archaeologist's preoccupation with terracing on (fertile) dolerite, also their failure to test infill of tunnels, frequently visible to the naked eye as crushed quartz. Walsh declined to visit high-level sites (waste mineralization 0.18-0.22g/t Au), although Gungutsva had walked a 3-hr return journey to carry samples. Panning is not possible in steep headwaters like those at Bende Gap in Nyangui Forest Reserve – where small scale mining is prohibited (but gold is present in the lower reaches of the Ngoni, the main Bende stream).

Walsh usefully points out that the Gungutsva Mine “quartz veins are hosted in mafic rocks” – a classic Zimbabwean greenstone occurrence that I should have noted from my Matabeleland experience of goldmining and prospecting. Members of the Society also failed to make the connection on a field trip in 2007, maintaining that the “[Gungutsva] quartz reef ... [is] located along a dolerite/granite contact” (Newsletter, Oct 2007:15).

Stockworks of narrow quartz veins present in a variety of bedrock lithologies is the most obvious genesis of Nyanga alluvial gold exploited by the *makorokoza*. Quartzite, arkose and laterite also exhibit have a gold content. Dolerite cannot host gold but its contact with altered granite appears to be significant. Comparing *Google Earth* 3D imagery with Stockmayer’s 1978 and 1980 geological maps shows that most terracing is concentrated, not *in* dolerite but in granitoids *below* dolerite contacts, negating Summers’ (1958:316-17) “rule that dolerite hills only were terraced” and Soper’s conclusion that “The preference for dolerites is clear” (2002:35). The CAMEC Muda River information is relevant in that it upholds an association with dolerite, as do early 1970’s EPO reports 218, 221 and 325 to the near west and north of the Gungutsva claims in respect of mineralization, e.g., “In all cases, high values for copper and nickel were related to dolerite sills and dykes” (EPO 221, SA Manganese Ltd).

I do not plan to publish a full report on my assay data until I have 300 samples tested. To date a quarter of this goal has been completed across a 65-km radius, with definitive results. Professional surveys would be more valuable in the national interest than questionable “interpretations” from non-existent field examination, and time-wasting fabrication having no basis in fact. In the latter regard my crop-trial methodology was not raised with Walsh, but he was given the bones of a riddle from an indigenous farmer regarding fencing. The majority of terraces is only 1-2m wide. Only the very few over 10m wide could have been protected from large herbivores such as kudu, and then only with fences 2m high. Fencing postholes are archaeologically traceable. Where are they?

Note from mining archaeologist Martin Strassburger (MA Freiburg)*

When Ann Kritzinger approached me in June 2009, when we were addressing the 30th anniversary conference of the National Association of Mining History Organisations in Derbyshire UK, I could only guess the extent and importance of her subject. Over several months we exchanged and discussed information via e-mail – now may be the time to give the opinion of a mining archaeologist.

It was decided to write a framework for further research to collect more information for the interpretation and (re)evaluation of the archaeology. There are several features of unknown or unclear function (tanks and terraces) in context with gold contents and iron working. Here the existing evidence has to be carefully evaluated.

On top of the geological list are gold (primary, alluvial) and iron deposits. Then there is the agricultural legacy of the region – inappropriately the extent of terracing would indicate modern industrial farming. Given the evidence presented so far, gold mining should not be ruled out (agriculture does not exclude mining and vice versa). The whole subject leads to several questions concerning settlement archaeology and economy, including mining and agriculture. These questions can only be answered by detailed research, which together with multidisciplinary discussion, has just begun.

* Currently studying ‘placer mining in Bavaria where the features have been interpreted as traces of ancient agriculture activities’.



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 and Bond Award certificates for 2008 -- 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

News



Geology Department, University of Zimbabwe

Maideyi Meck

The situation at the Geology Department has finally improved. The number of teaching staff has increased to 6 as Mr Dzimba has rejoined the Department and members of staff are now reporting to work regularly. The third-year students were taught and examined whilst the Department is currently enrolling first-year students as well as teaching service courses to the Mining Engineers. We hope to take in at least forty new students. One PhD thesis was handed in late last year.

The Chair Person still receives enquiries from former students who have been either retrenched or sent on forced leave by their employees who are facing the stress of the current world recession. If any company has any vacancies for geologists, please contact the Department.

Plans to re-start the MSc in Exploration Geology programme are now at an advanced stage. We are also looking at introducing a second masters' degree programme. Prof Manuel is currently working on the idea and anyone with input or has a wish to contribute towards its structure are welcome. A short resume for Prof. Isidro Manuel follows:

Name: Isidro Victor Manuel

Born: 18th May 1960

Nationality: Mozambican

Education: BSc 1980 - Eduardo Mondlane University, Maputo
MSc 1983 - Mining Academy of Freiberg, Germany
PhD 1992 - Aachen Technical University, Germany
MBA 2008 – ESAM

Interests: Environmental geology/environmental management/environmental education/disaster risk reduction and capacity building; Exploration of ore deposits and the geology of mineral deposits; Leadership and management.

Experience: More than 10 years experience in environmental geology, environmental management, environmental education, environmental impact assessment, ground water and superficial water quality, land degradation and disaster risk reduction and general disaster management.

Contact details:

Name	Position	Other	Email	Cell
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Mrs G. Chipari	Secretary, DG		gchipari@science.uz.ac.zw	0912 950681
Ms N. Musundire	Secretary, MRC		nmusundire@science.uz.ac.zw	011 436649
Mr. F. Mugumbate	Chairman, GSZ	Geo Survey	fmugumbate@gmail.com	011 431109
Mr. H. Gumbo	GLF subcommittee		hgumbo@mweb.co.zw	0912 566912
Mr. K. Musiwa	GLF subcommittee	Mining, UZ	kudzic@eng.uz.ac.zw	0912 948915
DG Direct line/Fax:	263-4-303557			

Note: DG – Department of Geology; MRC – Mineral Resources Centre; GLF – Geology Lecture Fund

Geological Survey Department



ZIMBABWE

Forbes Mugumbate

The Geological Survey continued to work within the framework of the Short Term Emergency Recovery Programme (STERP), an economic stabilization strategy put in place by the Government of National Unity to lay a foundation for comprehensive economic recovery. In attempting to achieve the broad aims of STERP, the Department has encountered several challenges relating to the shortage of experienced and adequately trained professional staff, low staff morale, inadequate funding, and aging equipment. However, despite the general economic challenges and the resultant demoralizing working conditions, members of the Department are commended for diligently and professionally carrying out duties throughout 2009.

Staffing

The professional staffing situation remained stable at about 34% of complement. The year 2009 was not affected by the usual resignations as all the five junior geologists were in fact recruited during the year. The Department, however, suffered from the effects of mass resignation during the previous year. The staffing situation remained skewed with the few experienced geoscientists occupying management positions and several raw geoscientists, but a dearth of experienced geoscientists in place. The professional staffing situation as at 31st December was as follows:

Post	Incumbent	No. Posts	Filled Posts	Vacant
Director	Hawadi, M.T.	1	1	0
Deputy Director	Mugumbate, F.	1	1	0
Regional Geologist	Mupaya, F.B.	3	1	2
Chief IT Geologist/Geophysicist - Data Management	Mukandi, M.A.	1	1	0
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. Sibanda, R. Kashiri, T. Mangezi, M. Hahlani, W. Maisera, M.	26	9	17
Geological Cadets	-	4	0	4
Geophysicist /Senior/ Principal	Shawarira, L. Ndoro, M.M.	5	2	3
Total		44	15	29

Robert Sibanda resigned to join the private sector with effect from 8 January 2010 while William Hahlani is on three months internship at Renco Mine. We wish to extend our gratitude to Renco for this important gesture, and encourage other companies to follow the example. Our geologists, all of them with general degrees, need experience. They face the danger of spending years without learning much as we are not active in the field owing to financial constraints. They need to be attached to active projects for them to learn and gain that experience. We take this opportunity to request for assistance from industry in this endeavour.

Bornwell Mupaya attended several meetings in his capacity as a board member to the Pan African Minerals Development Company, a new mining company jointly owned by the governments of South Africa, Zambia and Zimbabwe. A Zambian geologist has been appointed as the CEO. Four candidates from Zimbabwe will be interviewed in February for the post of Chief Geologist.

Forbes Mugumbate attended “The Global Partnerships Summit 2010” held in Chennai, India from 21st to 23rd January 2010. Professor Welshman Ncube, Minister of Industry and Commerce, led a 20-strong delegation from Zimbabwe comprising representatives from government and industry. The Partnerships Conference is meant to facilitate networking and interaction between investors and potential beneficiaries of investment. Many companies expressed interest in investing in Zimbabwe’s mining, energy and agricultural sectors.

100 Years Celebrations

The Geological Survey marks 100 years of its establishment this year - 2010. The Department was started in 1910 primarily to assist in the development and exploitation of the British South Africa Company (BSAC)’s mineral resources. It became a Government Department in 1924 when responsible Government was introduced. The BSAC continued to fund the Department until government purchased the mineral rights in 1933. A strong leaning towards economic and mining geology has been a feature of the Geological Survey activities since its inception. As a result, the Geological Survey has over the years produced various documents with a strong bias towards promotion of the mineral potential of the country. The Department has therefore played a critical role in the development of the mining industry in this country. It is therefore befitting that the attainment of 100 years of existence be celebrated. The dates for the official celebrations have been set for 21st and 22nd October 2010.

Unfortunately this important year has come at a time when the country is experiencing severe economic challenges. The Geological Survey got an initial budget of only USD 373 000 for all activities for 2010. Whether some more money will be forthcoming depends on how much the government makes from receipts. This, compounded with the low morale of government employees owing to their poor working conditions, makes preparation for the Centenary Celebrations a difficult task. Resources are needed for general preparations, including the spruicing up of Maufe Building which houses the Geological Survey. The building is now almost 65 years old and needs to be repaired thoroughly. Electric wiring requires to be revamped; some corridors are so dark that they resemble a poorly lit adit; the roofs leak, so threatening a veritable mine of documentation; toilets are malfunctioning; water taps leak; and the walls are dirty. The Geological Survey is hoping to publish a new version of the 1:1 Million Geological Map of Zimbabwe in time for the celebrations. The version in use is a 1977 compilation. Assistance is required to make the celebrations a success.

As its contribution to the celebrations, the Geological Society of Zimbabwe is organising and sponsoring an international symposium, “A 100 years of contributions to Geology”, and field trip. The Geological Survey wishes to thank the Society for this brotherly gesture.

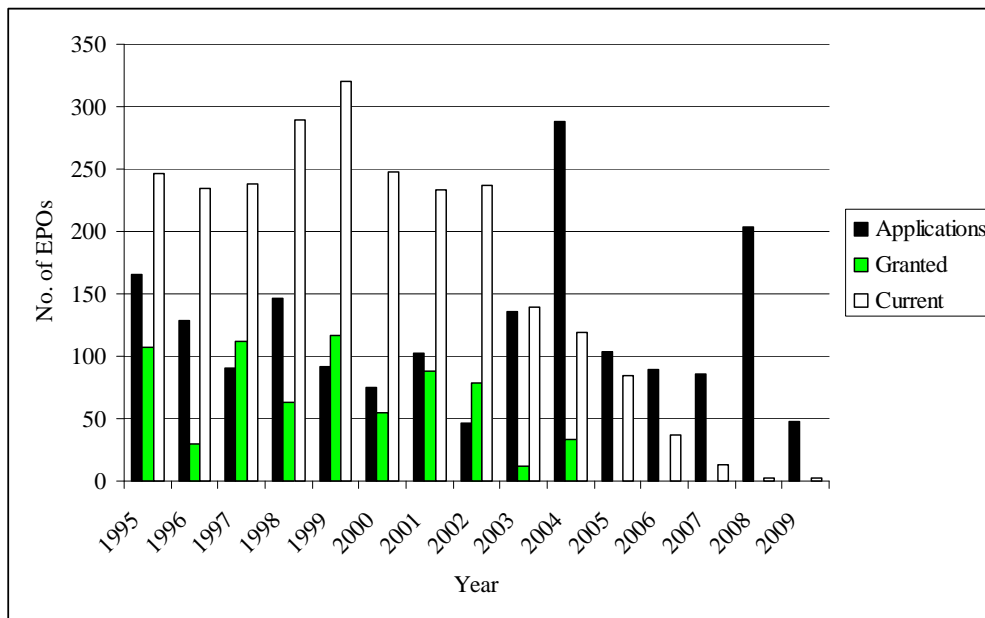
Geological Mapping

Except for one project in the south-east part of the country, being implemented under a co-operative agreement with the China Geological Survey, regional geological work remains suspended as a result resource constraints. The China Geological Survey project has progressed well. A total of 30,334 samples was collected over an area of 9000 km² (3.3 samples per km²) and analysed for 39 elements in China. Several strong anomalies for different elements were detected and have been followed up during a Phase-3 exploration programme. Results of this work are pending. The China Geological Survey has expressed interest in replicating this project in other areas, until the whole country has been covered by systematic geochemical sampling. They are waiting on the signing of a Memorandum of Understanding with the Zimbabwe Geological Survey for more projects to be implemented.

Mineral Exploration

The Department and the Ministry of Mines in general continue to be inundated by foreign companies intending to invest in the country’s mining industry. Most visitors are frustrated by the continued freeze of ground by EPO applications dating to as far back as 2003 (see figure below). The delay in concluding the new amendments to the Mines and Minerals Act has also been cited as an impediment to the development of the industry. The Ministry is frantically processing the EPO applications to facilitate possible granting. The Ministry is also consulting with important stakeholders on amendments to the Mines and Minerals Act.

Chiadzwa maintains its popular interest. Several companies from all over the world have made applications to form joint ventures with the ZMDC to explore for and exploit diamonds in the Marange area.



Graph showing the EPO situation over the years. Applications are new requests made during a particular year. The total number of applications pending are over 400.

Mining Industry News

M. Maisera

General mining policy issues

The Ministry of Mines plans to expedite the granting of Exclusive Prospecting Orders to facilitate resumption of mineral exploration, which ceased six years ago. To this end it is revising license fees and others issues. In his 2010 budgetary statement, the Minister of Finance made several announcements that affect the Mining Industry. Fees for various licenses were raised drastically and the maximum size for an EPO was reviewed to 20 000 ha. In the same presentation, the Minister took a swipe at the mining industry for not doing much to improve the economy by raising royalties from precious metals from 3.0 to 3.5%.

Government is set to decide on the winning bid for the 70% controlling stake in troubled Zimbabwe Iron and Steel Company after it short-listed Archelor Mittal and the Gateway Consortium. Arcelor is a reputable and vastly experienced South African steel maker whilst Gateway is a consortium comprising top Indian steel manufacturer Jindal and the local firm, Steelmakers Zimbabwe.

Developments on individual minerals

The engagement of two companies, Mbada and Canadile, has been announced to partner the ZMDC in the exploitation of the *Marange diamonds*. The two companies commenced mining after installing state-of-the-art processing equipment. The ZMDC, whose mining activities in the area had been previously described as mechanized panning, has moved out of the area to make way for the investors. Judging from recent announcement by one of the companies to sell 300,000 carats per week, it would seem that production has increased tremendously. However, the intended diamond auction was halted, after it was observed that proper procedures had not been followed.

Hwange Colliery Limited managed to repair its dragline using a loan from ZIMASCO, who will be repaid through coal and coke supplies. This move is strategic for the industry in order to maintain a constant supply of commodities.

Most Special Grants for *coal* have been recommended by the Mining Affairs Board and are awaiting approval.

Chrome mining firm AFREZ is at an advanced stage in the of construction of their processing plant at Ngezi. The company hopes to complete the project in about 2 years. Several other companies interested in chrome are negotiating with local firms for shares. This points to a possible boom in chrome operations in the near future.

There has been a steady increase in *gold* production from and exploration on existing mines. Production at New Dawn Mining's Turk Mine has continued to increase since operations resumed early in 2009. Mwana Africa has started exploration to revamp its Freda-Rebecca gold mine, recently the largest producer in the country. The company expects to increase its phase 1 production to about 30,000 ounces by year-end. African Consolidated Resources (ACR) has completed feasibility studies on the Pickstone-Peerless project, which will see the development another gold mine. Good drill intersections are reported from several other projects, such as the Giant and Blue Rock at Gadzema.

Obituary

Dr Philipp Mathis Oesterlen, 1941-2009

Philipp Oesterlen was born at the height of the Second World War at Chalottenburg in the District of Berlin on 31st July 1941. He succumbed to cancer back in his native Germany on 25th May 2009 in his 68th year.

We do not have a record of his boyhood and how he survived the rigors of war, but in 1963 he entered the famous Freiburg School of Mines, obtaining his *Diplom-Geologen*, equivalent to MSc, in 1969 from *Die Technische Hochschule Munchen*. He had specialized in sedimentary geology and found himself launched into an assessment of Karoo rocks in Angola for his doctorate (*Dr. Rer Nat.*) through the same institution. His thesis, *Beitrage zur stratigraphie, petrographie und sedimentologie des Karroo-Systems und seiner Prakambrischen unterlage in gebeit ostlich von Malange (Nord Angola)*, was accepted in Munich on 21st May 1974. Just prior to that he married Ute Klever of Hamburg on 19th March 1974. With his knowledge of Portuguese, it seems that the couple migrated to Brazil for a time. They had a daughter, Eve-Marie, and a son, Rui-Philipp. Philipp's second son, Philipp Mathew, was born in 1993.



It is only in 1987 that we find them in Zimbabwe for the first time. Philipp was working for Saarburch-Interplan on that company's detailed assessment of the Kanyemba uranium deposit located in Upper Karoo sediments close to the point where the Angwa River passes from Zimbabwe into Mozambique. Concurrently the Federal Geological Survey of Germany (BGR) was assessing Saarburch's aeromagnetic survey of the Zambezi Rift and they were performing deep magnetotelluric soundings in the Valley east of the Angwa River. There was active interest in the hydrocarbon potential of the Luangwa Valley in Zambia and Zimbabwe needed to encourage an investigation of their section of this 'play' in the Zambezi Valley. Philipp Oesterlen was the right person to consolidate our fragmentary knowledge of the geology. Sponsored by CIM (*Centrum fur Internationale Migration und Entwicklung*) of Frankfurt, he started his career with the Geological Survey of Zimbabwe in March 1988 and was immediately given a Landrover and caravan and sent to map the key Karoo and post-Karoo stratigraphy east of the Chewore gneiss inliers and north from the Zambezi Escarpment to the Zambezi River at Kanyemba. This task he carried out stoically and with precision and enthusiasm over the next few field seasons to 1991, covering some 2400 km² of remote and wild country that resulted in the 1998 publication of Bulletin 98 describing the geology of the Dande West area. My first visit to Philipp in the field found him and his two field assistants locked inside the caravan somewhere near the Sarawanda Hills. Ashen, they emerged to relate how a pride of lion had aggressively

kept them imprisoned for more than two days. I had previously said to Philipp, “Find me some bones – there is a story out there”. It was not long before that same team came up with a collection of assorted bone material and some strange dentition. We photostated the remains and sent these images to Mike Raath who showed them to James Kitching at the Bernard Price Institute in Johannesburg. James’ immediate response was that these are from a rhyncosaur, a mammal-like reptile restricted to a narrow time frame in the Triassic. Their work managed to constrain the age of the Pebbly Arkose unit through a link to the species *Hyperodapedon*, known from Scotland of all places.

Promoted to the post of Principal Economic Geologist, Philipp extended his contract with the Geological Survey from 1992 to the end of February 1994 during which time he consolidated his work on West Dande and the Zambezi Valley as a whole. This coincided with the assessment by BGR personnel of the results of Mobil Oil’s exploration report over 30,120 km² of the Zambezi Valley. Philipp became closely involved in this task and took a direct interest in the tectonic framework of the rifting. With Tom Blenkinsop and others he played a prominent role in the compilation and publication of the 1:1 Million Tectonic Map of Zimbabwe, and he and Tom published their ideas on the perceived failed triple junction of the Luangwa and Zambezi rift zones. Concurrently Phillip liaised with Brian Millsted of the Council for Geosciences in South African and they expressed the ideas on the lithology, palaeontology and sedimentary environment of the western Cabora Bassa Basin that had developed. However, perhaps his main task at this time was to summarize EPO final reports numbered 501 to 650, eventually consolidated as Bulletin 102, again in 1998.

Philipp, with his family, now returned to Germany and from his home in Hanover, attached himself to the Institute of Geology and Lithosphere Dynamics at the University of Gottingen under Professor H. Porada to develop his thoughts on the structural development of the Zambezi Valley as a whole. In 1996 the post of Chief Field Geologist at the Geological Survey fell vacant and Philipp was invited to take it up. Again through CIM sponsorship, and once formalities were complete, Philipp returned to occupy his station in September 1997. He immediately set to work to help establish the bilateral project between the Geological Survey and BGR on the ‘Industrial Minerals and Rocks (IMR) of Zimbabwe’; to train and supervise local counterparts; to visit the current regional mapping projects in Gokwe North and Mwenezi West; and to further his own interests through reconnaissance mapping around Chiswiti in the eastern Cabora Bassa Basin and across the Mana Pools Basin of the Zambezi Valley. As time progressed he assisted in the editing and printing, through CIM, of some eight Geological Survey publications; he initiated the compilation of the updated 1:1 Million Geological Map of Zimbabwe; he furthered the IMR project to a successful conclusion; drafted a project proposal to introduce digital methods of cartography to the Drawing Office; helped to computerize the library holdings and represented Zimbabwe on the SADC Working Group to study Karoo basins.

Tragedy struck on 6th June 2000 when Philipp’s second wife died and he returned to Hanover to be with his son, Philipp Mathew. This event put in jeopardy his intent to extend his CIM-sponsored contract for a further three years, but his application proceeded and he returned to continue in the post of Chief Field Geologist from 1st February 2001. However, this reinstatement was to be short-lived as CIM found that they could not continue sponsorship after the end of January 2002, and Philipp found himself having to resign. No less than 41 members of staff, from the highest to the lowest at the Geological Survey, contributed towards his farewell, no mean measure of their esteem for him and his achievements.

Tim Broderick

News about Zim Geoscientists

Prof. Paul Dirks has left The University of the Witwatersrand to head the departments of Earth Sciences at James Cooke University in Cairns, Queensland where he joins *Prof. Tom Blenkinsop*.

Armand Chivers, formerly Mine Manager at Madziwa and Jumbo mines, died following a stroke on Thursday 28th January 2010.

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

Research Funding Opportunities



GSZ Research and Development Fund

The objective of the Research and Development Fund is to give financial assistance for the development of earth science research and training in Zimbabwe. This financial assistance shall be in the form of annual Grants. Grants shall be made for activities over the course of up to one year. Those wishing to continue beyond one year must make subsequent and separate applications. The purpose of the Fund is to support:-

- Research projects on earth science topics of interest (Note that grants from the Fund will not be made to support projects which result in results that are not available to all members of the geological community in Zimbabwe);
- Scholarships for postgraduate study in earth sciences;
- Field trips and short courses for the training of Zimbabweans in earth sciences; and
- Travel to conferences to present earth science results.

In recommending the award of Grants, the following shall be considered:-

- The objective and purpose of the Fund;
- Potential benefits of the proposed activity to the geological and mining communities in Zimbabwe, in terms of development and/or the generation of new knowledge;
- The availability of matching funds, source or provided by the applicants; and
- The aim of awarding more than one Grant in a given year.

Grants made from the Fund shall be on condition that:-

- Results from the supported activity will be presented to the Society via a talk and an item or items in the Newsletter;
- Submission to the Fund Subcommittee of an annual report by 31 December of the year in which funding is granted; and
- Submission of a financial report to the Fund Subcommittee, with copies of receipts, by 31 December of the year in which funding is granted

All applicants for the award of Grants from the Fund shall be Members in good standing for the current membership year. Normally, the principal applicant should have been a member in good standing for at least twelve months.

Applicants for Grants should submit to the Research and Development Fund Subcommittee an application containing details of the applicants, summary of the activity, justification of the activity, proposed methodology, timeframe, budget for application and details of matching funds, if any. If you would like to apply for support, please contact the Research and Development Fund Subcommittee Secretary. Applications for this year should be made to the Chairman, Mr Forbes Mugumbate.



SEG Timothy Nutt Memorial Fund

Any enquiries relating to this fund can be directed through the Geological Society Committee to Judith Kinnaird, Professor of Economic Geology at the University of the Witwatersrand, who is the regional SEG representative.

Conferences

Mining Indaba, Cape Town, South Africa – 1st – 4th February, 2010.

The 11th International Platinum Symposium, Sudbury, Canada – 21st – 24th June, 2010.

SEG Conference, Keystone, Colorado, USA – 2nd – 5th October, 2010.

Zimbabwe Geological Survey 100th Anniversary Symposium, Harare – 21st – 22nd October, 2010. Field trip – 23rd – 25th October.

CAG 23 - “Together in Africa for a Leading Role in Geoscience” - 23rd Colloquium of African Geology, 8-14 January, 2011, University of Johannesburg, South Africa under the auspices of the Geological Society of Africa. Scientific Sessions, Workshops, Short Courses and Field Excursions. For further details see <http://www.cag23.co.za> or e-mail cag23@uj.ac.za or hmouri@uj.ac.za

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

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