Geological Society of Zimbabwe

ABSTRACTS

www.geologicalsociety.org.zw

Summer Symposium

8am to 5pm, Friday 1st December 2017
Department of Geology
University of Zimbabwe

SPONSORS:-

RIO GOLD
TANDAMANZI DRILLING
ZIMPLATS Member of the Implats Group
OPTIMUM DRILLING
GATEWAY CONSTRUCTION (PVT) LTD
Atlas Copco
African Mining & Exploration

Start	Topic	Speaker
07:45	**Registration**	
08:00	Welcome & Official Opening	Maideyi Meck - Geological Society Chair
08:40	Transparency in the Mining Sector: Addressing corruption risks and vulnerabilities in the awarding of mining claims in Zimbabwe	Farai Mutondoro
09:00	Southern Africa under cover – an integrated geophysical and geological interpretation	Branko Corner
10:00	**Tea**	
10:15	Durchbewegung textures, subterranean sedimentation and the link to mineralisation in the Lufilian Copperbelt	Tony Martin
11:00	Transtensional tectonics for the 2575Ma Great Dyke and diachronous Chilimanzi suite plutonism: the end of Macgregor's vertical tectonics	Mark Tsomondo
11:45	The Xade Complex and its place in the Umkondo igneous event	Peter Hildebrand
12:10	From Archosaurs to Dinosaurs - the 2017 Expeditions	Tim Broderick
12:35	Arcadia Lithium Project	Roger Tyler
13:00	**Lunch**	
14:00	Mining in the Sand Dunes of Richards Bay, South Africa	Ellah Muchemwa
14:20	Gold Processing at Cam and Motor Mine	Jonathan Nyagumbo
14:40	Challenges Facing Chrome Small Scale Miners	Nevison Chikandiwa
15:00	Renewal of Conventional Hydrocarbon Exploration in the Cabora Bassa Basin in Zimbabwe	Brent Barber
15:20	**Tea**	
15:35	Airborne Full Tensor Gravity Gradiometry versus Ground Gravity in the search for mineral deposits	Tenyears Gumede
15:55	Update on Zimbabwe's new Mining Cadastre System	Bill Feast
16:15	MSU Faculty of Mining & Mineral Processing Engineering	Anthony Mamuse
16:35	Summary	Tony Martin

Transparency in the Mining Sector: Addressing corruption risks and vulnerabilities in the awarding of mining claims in Zimbabwe

Farai Mutondoro

Transparency International Zimbabwe

farai@tizim.org

That there is corruption in mining is not a subject to debate. Voluminous studies by organizations such as Global Witness, Partnership Africa Canada, Zimbabwe Environmental Law Association, Transparency International Zimbabwe, Centre for Natural Resource Governance among many others, have presented enough empirical evidence on the high levels of corruption and revenue loss within the mining sector. Equally the same media reports and reports by the Auditor Generals have also revealed the rot in the Extractive Sector. This paper will therefore not make an attempt to compete with such studies and reports but will instead compliment such studies through focusing on what need to be done to curb corruption in the Extractive Sector. The paper is informed primarily by a Mining Awards Corruption Risk Assessment (MACRA) that TI Z conducted in 2017. This paper employs the lenses of the Political Economy to unpack corruption nuances in the Extractive sector. As will be shown by the paper, it's not enough to trace how much has been lost to corruption in the Extractives and by who. Such an approach does not close the avenues for corruption in the sector. As such the paper will highlight existing embedded opportunities for corruption in the mining sector. Corruption in mining just as corruption in all other key political and economic sectors is institutional and also linked to politics and power dynamics. Thus the paper problematizes the policy, institutional and regulatory framework for mining in Zimbabwe. Corruption in mining is thus as a result of opportunities and vulnerabilities housed at the policy level and institutional processes. As the TI Z MACRA revealed corruption in mining has been made possible by such structural factors as information asymmetry, flawed legislation governing the sector, a legislation that is still trapped by colonial principles of non-transparency, discretionary power afforded to the Mining Commission, policy collusion as well as absence of mechanisms allowing whistleblowing, transparency and accountability.

Southern Africa under cover – an integrated geophysical and geological interpretation

Branko Corner

Manica Minerals Ltd

branko@iafrica.com.na

Southern Africa, here taken as the region that comprises the Kalahari and southern Congo Cratons, and the important orogenic belts that surrounded or separated them during the assembly of Gondwana, was situated in the heart of the supercontinent. A plethora of data sets, both geological and geophysical, are available in the public domain, including outcrop mapping, drilling results, aeromagnetic, gravity and magnetotelluric surveys, allowing

mapping of extensive regions under cover. Deeper penetrating seismic reflection, refraction and teleseismic data, as also the magnetotelluric data, have allowed the lithospheric interpretation to be extended to the middle and lower crust, and to the upper mantle. Interpretation has included *inter alia*, mapping, or refinement of existing mapping, of: the craton boundaries and associated terranes; major faults, structural lineaments and ring structures; specific features which have a geophysical expression such as the Witwatersrand Basin, the Xade Complex and the tectonostratigraphic zones of the Damara-Ghanzi-Chobe Orogenic Belt; the Namaqua-Natal Belt and extensions thereof as the Maud Belt in Antarctica, as well as associated features such as the Beattie Magnetic Anomaly and the Southern Cape Conductivity Belt. Interpretations of the large-scale seismic, electrical resistivity, geomagnetic induction and magnetotelluric data by many workers have yielded important insights into the deep structure and evolution of the subcontinent, showing that the Archaean Kaapvaal, and Zimbabwe Cratons have deep roots that are relatively cold. As best possible, the interpreted features honour all geological and geophysical data sets within the resolution of the data. Integration of these results in the unified interpretation map presented here brings new insights into both the disposition of selected geological features under cover, and the evolution of the Precambrian geology of southern Africa, extending into Antarctica within a Gondwana framework.

Durchbewegung textures, subterranean sedimentation and the link to mineralisation in the Lufilian Copperbelt

Tony Martin

anthony.martin2107@gmail.com

The term durchbewegung has been applied to textures formed by ductile movement of near-solid sulphides – typically chalcopyrite – which mill any incorporated, less ductile material. The shallow dipping tabular mineralisation at Selebi Phikwe provides an excellent example. It is suggested here that the term be extended to any breccia resulting from abrasion of clasts within a mobile but relatively high-viscosity medium. This could include glacial ice, salt (*sensu lato)* and even pseudotachylite and kimberlite, all of which have the ability to abrade entrained rocks or minerals during movement of the medium.

Iran, countries along the northern edge of Africa and China all have salt diapirs that extrude at surface and are preserved in the arid climates. Those in Iran are spectacularly visible on satellite imagery and show flow banding and a variety of colours suggesting contamination of the salt by entrained wall rocks, and presumably, abrasion of xenoliths to produce the equivalent of durchbewegung textures.

The copper (and many other metal) deposits of the Central African Copperbelt in the Lufilian Arc are generally hosted by the lower part of the Roan Group and have been formed by redox reactions involving hydrothermal fluids. Many of the deposits in Katanga are contained within mega fragments or écailles of Roan stratigraphy surrounded by peculiar breccias ascribed to the lowermost RAT or Roches Argilo-Talqueuses.

These breccias have a wide variety of forms and textures and historically have been attributed to tectonism during the Lufilian Orogeny. Since publication of a seminal paper by Jackson in 1984, the impact of salt tectonics, or halokinesis, has become widely accepted.
The problem is that the only "salt" to be found in Katanga are relict pseudomorphs after sparsely disseminated gypsum or halite: there are no evaporite beds. However recent drilling in Zambia has intersected thick evaporites and evidence that similar rocks once occurred in Katanga may be found in the breccias that surround the écailles.

Breccias are common in Katanga. Some are approximately tabular and conformable with the stratigraphy, whereas others are of irregular shape with sharply transgressive contacts. They are commonly matrix supported and many have well-rounded clasts, some of which come from overlying stratigraphic units. There are also local traces of poorly defined bedding.
The sequence of events interpreted from this evidence:

Evaporites within the RAT formed diapirs following faults or other lower-pressure pathways and some remained as beds.

Diapiric movement of the evaporites plucked fragments from the wall rocks and surrounded megablocks of Roan stratigraphy. This process milled the more coherent fragments to produce well-rounded clasts of every part of the stratigraphic column through which the salt passed – and produced durchbewegung textures.

Hydrothermal solutions then dissolved the evaporite and the clasts fell to the bottom of the cavity that was the diapir along with a sludge of finely milled material. This would have occurred in pulses as successive parts of the diapiric salt were dissolved, resulting in underground deposition of a variety of breccias.

Yet the story does not end there. This slush breccia, being unconsolidated, very ductile and highly mobile would have participated in the Lufilian Orogeny by providing lubrication for the thrusts and recumbent folds normally found in high-grade metamorphic rocks, but at the lower greenschist facies that pertains in the Katanga Copperbelt. This process I have termed toothpaste tectonics.

And finally there is the source of the metals: mass balance estimates suggest these are not present in sufficient quantity in the RAT or other parts of the Katanga Supergroup and recourse must be made (at least in part) to a basement source. And herein lies another problem; the basement to the Katanga Supergroup has never been seen in outcrop or drill core. But there is no shortage of cations to form soluble, metal chloride and sulphate complexes from the salt, nor of its oxide-rich RAT host – it's only the metal that is in short supply. Following solution of metals, the circulating oxygenated fluids only needed a reducing environment in the form of black shales to destabilise the metal complexes and deposit the metals.

Transtensional tectonics for the 2575Ma Great Dyke and diachronous Razi-Chilimanzi suite plutonism: the end of Macgregor's vertical tectonics

Mark Tsomondo

tsomondom@gmail.com

Is the Great Dyke fracture pattern evidence for vertical tectonics under an active mantle plume or indentation-linked global tectonics? If we accept that the 2575Ma Great 'Dyke' (lopolith) formed under an extensional tectonic regime, could the same apply to the diachronic 2634-2517Ma Chilimanzi suite plutons east of the Great Dyke? The Razi-Chilimanzi suite is synconvergent under late Archean Limpopo orogenesis that recorded peak metamorphism at 2.58Ga, an age that is indistinguishable from a 2575.4±0.7Ma Great Dyke or 2575.0±1.5Ma (ref) Umvimeela satellite dyke. What tectonic setting (coupling and decoupling between upper, lower and middle crust) permits the Great Dyke and its satellites to intrude the Limpopo belt during a period of along-strike North Limpopo thrusting and intrusion of the Razi-Chilimanzi, NE-wards, which also happens to be the younging direction of these Chilimanzi plutons? The transcratonic Great Dyke and pan-cratonic Chilimanzi suite plutons are excellent geological markers for resolving these geodynamic problems that are at the heart of poorly understood Neoarchean tectonic evolution of the Kalahari craton and its amalgamation. Is the Great Dyke and its satellite dykes the stitching plutons for the amalgamation? What evidence is there to demonstrate that the Belingwe greenstone belt occupies the frontal face of a buoyant Tokwe protocraton indenter?

Here we draw attention to a rather obvious yet neglected observation about the Great Dyke and its satellite pattern that has been previously termed simply 'subparallel' by nearly all researchers. The Great Dyke and its satellite dykes are clearly *south-fanned* or represent fanned σ_1 trajectories characteristic of indenters; its localization along the contact between a stiff Tokwe protocraton and weak (western) magmatic arc lithosphere has been successfully analogue-modeled under indentation. The horizontal separation between the East and Umvimeela dykes is about 15km in the north (Snakeshead) but about 55km in the south adjacent the Northern Marginal Zone(NMZ). The wider (4-11km) Great Dyke terminates south within the Chibi pluton in the structural footwall of the North Limpopo Thrust Zone (NLTZ), and only a width-attenuated and offset extension intrudes the NMZ. In a comparable manner, the high aspect ratio (8:1) Chibi pluton extends 150km ENE and passes into a wedge-shaped (2547Ma) Zimbabwe monzogranite. Strains within the southern Belingwe greenstone belt and its Mapiravana pluton (streaky mineral lineation) are predominantly constrictional and tentative estimates of kilometric pure shear displacement parallel to the orogen (OPE) are available. The transition from constrictional to transtensional wedge-shaped granitic plutons (fanned-NE) is termed *lateral constrictional flow* (LCF) of a hot orogen (Chardon et al., 2009)- an essential but missing concept for the entire NMZ and Limpopo belt. East of the Great Dyke there are essentially three wedge-shaped Chilimanzi plutons-*in gregarious NE-tectonic escape* (not Macgregor's vertical tectonics). We revisit the western margin of the 2601Ma Murehwa batholith to show dextral extensional shear bands in the structural footwall of host gneisses. Some 20km into the interior of the Murehwa batholith, we examine horizontal extension in exhumed lower-crustal amphibolite gneiss in the presence of a Chilimanzi-style melt. We show horizontal and vertical extensional shearing structures (3D strain), including sheath folds from the margins of Chilimanzi plutons from east of Mvuma. Finally we draw exciting inferences of extensional tectonics during oblique convergence that operated across the Limpopo orogen since 2.74Ga, our preferred start to a Himalayan-style Limpopo orogeny (s.s.). To explain diachronic age relationships in magmatism, metamorphism and tectonism in the absence of oblique convergence has been impossible, a similar drawback to explaining how space was created for the large Chilimanzi plutons found east of the Great Dyke. Small including *en cornue*-shaped Chilimazi plutons with their tails merging into Shashe-Gwanda-Antelope system of transpressive dextral shears are seen west of the Great Dyke. Thus the shape of Chilimanzi-suite plutons can be shown to reflect short- and far-field tectonic controls. The ballooning and diapirism described for the Chinamora batholith must be seen in this light in order to make sense of detailed thesis research (Bekker, 2000) implying that its late-stage laccolith was emplaced westwards under N-S far field stress regime.

The Xade Complex and its place in the Umkondo igneous event

Peter Hildebrand, Branko Corner, John Blaine

Manica Minerals Ltd

peterhild@gmail.com

The Xade Complex was identified in the first regional aeromag survey of Botswana in 1975-77. It occurs in central Botswana and does not outcrop at all, being covered by 200-1000m of Kalahari and Karoo stratigraphy, and extending even deeper beneath the Neoproterozoic Passage basin to the north. Aeromagnetic data provide the most useful mapping tool, although it also stands out on regional gravity datasets. It has been characterised as an extensive volcanic and intrusive igneous complex forming part of the ~1.1 Ga Umkondo Large Igneous Province (LIP).

Despite the challenge of thick cover, motivation to explore the Xade Complex comes from important Ni-Cu-PGE mineralisation in similar age LIPs elsewhere in the world. For example, the Duluth Complex mineralisation of the North American Mid-continent Rift Keewenawan, and the Babel-Nebo deposit in the West Central Australian Giles Complex of the Warakurna LIP. To date, 7 drill holes have intersected the complex, revealing gabbroic to dioritic intrusives and basaltic rocks of both tholeitic and calc alkaline affinities. Current understanding identifies three areas of magmatism: (1) the lopolithic, kidney shaped Southern Lobe of volcanics, (2) the volcanic-intrusive Northern Lobe which dips northwest beneath the Passage Basin, and (3) the Northern Dyke System which may represent either feeder or exit magma conduits.

Continued exploration for Ni-Cu-PGE mineralisation is hampered mainly by the high costs associated with the cover. However, the Kalahari craton margin setting, the rock types identified and the magmatic processes suggested to have taken place justify further work. In addition, understanding the scope and extent of the Xade Complex and its potential, prompts consideration for exploration of similar aged rocks elsewhere in southern Africa.

From Archosaurs to Dinosaurs – the 2017 Fossil Expeditions

Tim Broderick

makari@zol.co.zw

Two significant and productive fossil exploration expeditions took place in 2017, both in conjunction with National Museums and Monuments, headed by Deputy Executive Director, Darlington Munyikwa. In January a joint group from the Environmental Studies Institute at the University of the Witwatersrand, led by Dr Jonah Choiniere with Dr Paul Barrett of the Natural History Museum, London was hosted by locals, Dave Glynn and Steve Edwards. Taking advantage of the very low lake level, the group visited the Sibilobilo Islands, type locality for *Vulcanodon karibaensis* and assessed fossil locations established by Edwards in the vicinity of the Ume Estuary and Tashinga shoreline. On the islands only isolated bone remains were found, but their distribution, not necessarily relating to *Vulcanodon*, is widespread beyond Island 126/127, which is where detailed stratigraphic sections were recorded. This work and observations on the lateral extension of lithologies across the islands show that the fossils are not preserved between lava flows but in the uppermost horizons of the Forest Sandstone Formation, here not always typically of aeolian origin.

The other fossil sites are associated with an older red bed sequence of the Tashinga Formation, apparently Bond's Pebbly Arkose Member characterized by fossil wood and gritty sandstone of the Upper Triassic. Crocodile-like cranial and dental material found near Tashinga in association with *Ceratodus* (lungfish) tooth plates in a grey mudstone interbed suggest a feeding frenzy by an archosaur of the *phytosaur* clade. This is the first record of a phytosaur in Africa south of the Sahara. Archosaurs were root to the emergence of true crocodiles and, separately, that of dinosaurs and birds.

In August 2017 Christopher Griffin of Virginia Tech was awarded a Young Explorer's Grant from National Geographic. This enabled him to stage an expedition to re-examine the association of rhynchosaurs and the earliest of dinosaurs that had been documented by Oesterlen and others from the Pebbly Arkose of the Dande Communal Land. Targeting badland erosional topography Griffin with a team from the National Museum, Steve Tolan from the Luangwa Valley and the writer found numerous bone sites relating to rhynchosaurs. This specialized group of diapsid reptiles related to archosaurs has very distinctive dentition, and a sizeable collection of bone material was collected. Rhynchosaurs occupied a narrow time span during the Carnian of the Upper Triassic. Significantly there is an association with perhaps the earliest prosauropod dinosaur remains to have been found in Africa. The almost complete skeletal remains of one of these fossils was excavated, the study of which will provide important light into the earliest evolution of dinosaurs.

Continuing to search for new Dicynodont therapsid locations in the middle to upper Madumabisa Mudstone Formation as exposed in the Omay Communal Land, an important bone collection was made for the Museum. Numerous skulls were recovered as they are preserved in hard limy nodules. The importance of this material will emerge as study ensures that Zimbabwe remains on the 'palaeontological map'

Development of Arcadia Lithium Project

Roger Tyler

Prospect Resources

roger.tyler99@gmail.com

The Arcadia Project lies some 35 ENE of the capital, within the Harare Greenstone Belt.
It is a series of 14 flat laying stacked pegmatites of the L-C-T (lithium caesium tantalum) class. The known strike length is over 4km, but surface exposure is minimal. The pegmatites are mineralogically quartz-feldspar rich, with significant concentrations of petalite, and spodumene, with subsidiary amounts of tantalite.

Historically one of the bodies; the so – called Main Pegmatite was mined sporadically in the '60s and '70s for lithium and beryl. A limited drilling programme was apparently undertaken by Rand Mines in the early '90s', but no detailed information is available.

Prospect Resources hold around 14 sq km of claims over the project area. Chip sampling of the old pit was started in May 2016 followed by the Phase 1 DD programme in June. At various times two to five drill rigs have been utilised. Five phases of drilling have now been completed; 90 DD holes (10,000m) and 188 RC holes (15,000m). Over 5,000 assay samples, have been analysed for multi-elements, with 2,000 XRDs done to define the detailed mineralogy.

25 dedicated metallurgical test core holes have been drilled, and over 8 tonnes of bulk sample sent for test work.

The current mineral, resource estimate has defined 57 Mt @ 1.1% Li_2O, with a high grade core (0.8% cut off) of 35 Mt @ 1.4% Li_2O.

A main pit some 1.5km long, maximum depth of about 140m is planned, based on reserves of 24mt @ 1.34%

A pre-feasibility study has been released detailing the profitable extraction of 1.2 Mtpa and production of varying grades of spodumene and petalite, for a CAPEX of $55m.

Work is now concentrating on producing a feasibility study for a dedicated lithium carbonate plant production facility.

Regional exploration; mapping and soil sampling continues to identify satellite and associated bodies.

Arcadia is Africa's largest and the World's 5th largest JORC compliant hard rock resource.

Mining in the Sand Dunes of Richards Bay, South Africa

Ellah Muchemwa

ellah.muchemwa@outlook.com

The mining of mineral sands in the dunes along the eastern coast of South Africa is different from conventional underground or surface mining. The mine is not static.

Richards Bay Minerals (RBM), 74% owned by Rio Tinto is South Africa's largest mineral sands producer and beneficiation company. RBM was formed in 1976 to mine the vast mineral rich sands of the northern KwaZulu-Natal province of South Africa that extend in a two kilometer wide strip for more than 20 kilometers just north of Richards Bay, which lies about 180 kilometers north of Durban.

The presence of the heavy sands minerals on the north coast of KwaZulu-Natal was first reported in the 1920s, but it was not until 1971 that the Industrial Development Corporation began a detailed investigation of the Richards Bay area. RBM operations started in 1977.

RBM produces approximately two million tons of product annually, comprising 25% of the world's titanium dioxide slag and 100 000 tons per year of rutile and a third of the world's zircon (about 250 000 tons per year) and high purity iron. Many of the products are used in the manufacture of everyday items from toothpaste to TVs and artificial hip joints to the remarkable qualities of titanium, used extensively in the aerospace and aviation industries and zircon – used in the production of ceramic tiles and sanitary ware. The zircon when refined to zirconia, is used in a wide range of advanced ceramics, jewelry, and electronic applications, including television screens and computer monitors.

The heavy minerals mined by RBM were carried by river from inland to the sea over millions of years. Over the years, weathering of host rock has released the minerals, which, because of their durability, relatively high density, and high chemical stability, withstand the weathering process and are transported down rivers to the ocean. Once in the sea, the sand is transported up the coast by currents and wave action and deposited onto the beaches. From there, the sand is blown into dunes by onshore winds.

From a geological point of view, the ore bodies are highly complex and the behaviour of the minerals in the plant may vary considerably across the ore body. Optimal performance of the separation processes carried out in the plant is thus dependent on investigating and characterising the behaviour of the minerals as they flow through the plant.

Artificial freshwater ponds are created in the dunes several kilometres from the shoreline, RBM is currently operating four ponds. On each pond floats one or more dredgers and a concentrator plant. While the dredge removes the material from the front end of the pond, the tailings generated by the separation process is stacked at the back; as a result the pond continuously moves in a forward direction.

Burrowing into the mining face of the dune, the dredger advances at a rate of two to three metres per day, depending on the height of the dune. As the sand face is undermined it collapses into the pond forming slurry, which is sucked up and pumped to a floating concentrator. At this point, the heavy minerals (about 3% of the dunes) are separated from the sand by exploiting differences in mineral density via a multi-stage circuit of sieves and sluices. A portion of the magnetite and the chromium-containing minerals are removed magnetically, and the resulting heavy mineral concentrate (HMC) is stockpiled next to each pond for transportation by road to the mineral separation plant and further processing.

A rehabilitation program has been implemented by RBM since its inception, restoring to the mined lands a combination of native coastal dune forest (one third of the land) and cash crop trees for local communities. The dunes are reshaped to mimic their pre-mining topography and spread with the top soils saved from pre-mining activities.

Gold Processing at Cam and Motor Mine

Jonathan Nyagumbo

jonathan.nyagumbo@riozim.co.zw

Historically Cam & Motor Mine opened up operations in the early 1900s and was registered as Cam & Motor Company at the London Stock of Exchange in 1910. During its early productive phase the mine was developed down to 2063m from surface giving a total recorded 150 metric tonnes of gold. During this time the mine extracted a total of 11.76 million tonnes of ore at an average grade of 12.53g/t. A lower cut off grade of 8g/t was used. Underground operations were closed in 1968 due to low gold price of USD$35 per ounce and there was treatment of tailings dump between 1968 to early 1990s.

RioZim started deskwork study review of the exploration data in October 2008. Aggressive diamond drilling project was embarked on from August 2009 to March 2011. A significant resource was defined following the drilling. The Mine reopened in April 2015 with a designed Open pit targeting a final depth of 200m from surface. Processing of the ores was being done at Danly mine plant (50km away) and an on site plant was later commissioned in November 2016. Processing of the refractory ores have been staged in three phases, with the first being treatment of the top cap oxides (surface to 30m depth) using the straight Carbon In Leach (C.I.L), followed by the transitional ores (30m to 70m depth) using the CIL and flotation. Treatment of the deeper sulphide ores is going to be treated using the CIL, flotation and roasting/bioleach technology.

Cam and Motor mine is situated on the most productive Greenstone belt in Zimbabwe, the Midlands Greenstone belt, constituting the Dalny, Indarama, Globe & Phoenix, Golden Valley, Patchway, Gaika & Connemara gold complex; all having a production history of over 400metric tonnes of gold. Gold mineralisation within the greenstone belt is structurally and lithologically controlled.

Challenges Facing Chrome Small Scale Miners

Nevison Chikandiwa

wchikandiwa@yahoo.co.uk

Small scale chrome miners face a lot of challenges during execution of their operations. Mining is slowed down when the challenges arise, thereby affecting productivity. Solving the problems requires expert personnel and financial backing of which a lot of these miners don't have.
Geology, mine design, equipment, budget all play a part in their whole or partly to the issues affecting small scale miners. Without a proper plan to circumvent the effects of the above mentioned, mining will be severely affected eventually grounding the operation to a halt.

Renewal of Conventional Hydrocarbon Exploration in the Cabora Bassa Basin in Zimbabwe

Brent Barber

barber.brent@gmail.com

The possibility of discovering conventional oil or natural gas in Zimbabwe has frequently been raised and, due to the increasing costs of purchasing petroleum products, remains topic.
Contrary to malformed rumour Mobil Exploration Zimbabwe did not discover oil during the investigations undertaken along the Mid-Zambezi Valley in the early 1990's. Neither were the seismic tapes submitted to the Zimbabwe Geological Survey, some of which were afterwards re-interpreted by the Federal Institute For Geosciences And Natural Resources (BGR) within the framework of the technical cooperation implemented between Germany and Zimbabwe, coded or illegible but remain readable.

What the investigations completed confirmed was the presence of very thick sedimentary piles in the Zambezi Rift, assigned to the Karoo or younger strata, which in the Cabora Bassa Basin are over 10 kilometres thick. The evaluations of the source rocks sampled from surface were determined to be predominantly gas prone and, as insufficient interests in joint venture drilling a well for gas could be generated at that time, the prospect was judged to be too high risk and exploration discontinued.

Over twenty years later exploration concepts, proven by the discovery of oil in similar depositional environments as close as the Albertine Graben in Uganda and Lokichar Basin in Kenya, have evolved and the hydrocarbon prospectivity, including now possibly economic gas potential, of the Cabora Bassa Basin merits reappraisal. This will be investigated under the tenure of Special Grant 5741, with following authorisation by the President of Zimbabwe, was Gazetted on 4th August 2017.

Airborne Full Tensor Gravity Gradiometry versus Ground Gravity in the Search for Mineral Deposits

Tenyears Gumede

Knowledge Factory

tenyearsgumede@gmail.com

The history of gravity gradiometry in resource exploration starts with the invention of Eotvos torsion balance by Baron Lorand von Eotvos in the 1880s. The torsion balance was superseded in exploration by the faster gravimeter in the 1930s, but the investigation of the equivalence principle continued.

There are significant advantages of performing exploration surveys airborne: primarily these are speed of coverage, ease of access, uniformity of coverage particularly for larger areas with the initial two advantages resulting in lower costs. Additionally, in untamed territories, airborne surveys give the additional advantage of safety and security. On the other hand airborne gravimetry is limited by the equivalence principle, which says that measurements on board the aircraft cannot distinguish accelerations due to gravity from those due to the motion of the aircraft. However, this can be overcome through gravity gradiometry, which can deliver the accuracy and spatial resolution required for mineral exploration.

Therefore, since prime advantage of the gradiometer survey is its greater accuracy when used in a moving vehicle and that of gravimeter is its low capital cost and size, comparison between the two needs to consider accuracy across the entire wavenumber spectrum. In reality, reduction of gravity data relies on increased filtering and a loss of short wavelength information. Minimal filtering to preserve short wavelength results in higher error, typically 10mGal RMS at 1km wavelength down to 1mGal at 3.5km (Damfield).

Ground gravity surveys, particularly micro, can routinely achieve ties with RMS errors of 0.1mGal. It is essential to know that the airborne gravity gradiometer data are filtered at shorter wavelengths typically 300m for a Cessna Grand Caravan Air-FTG survey, 100m for Eurocopter AS350-B3 Falcon Survey and 300m for a Zeppelin Air-FTG survey. It is also important to note that at shorter wavelength, the airborne gravity gradiometer data will not reproduce the ground gravity anomalies.

Reference: Damfield, M. Airborne Gravity Gradiometer in the Search of Mineral Deposits. Advances in Airborne Geophysics.

Update on Zimbabwe's new Mining Cadastre System

Bill Feast

Spatial Dimension

bill_feast@trimble.com

In June 2014 the Zimbabwe Ministry of Mines and Mining Development (MMMD) published a tender to implement a new mining cadastre for the Ministry. In April 2016, Spatial Dimension, a Cape Town based company with a long history of implementing mining cadastre solutions across the globe, was awarded the contract.

The key deliverable for the project was the implementation of an online mining cadastre system to act as the on-stop-shop for license applications, renewals, payments, reports and all other key processes.

A determining factor for the success of any system implementation, is the availability and quality of the source data. A significant part of this project was therefore dedicated to assisting the Ministry in capturing and validating their existing data, particularly with respect the large volumes of claims data held in each Provincial Office.

This talk will provide an update as to the current status of the project and discuss its importance for the mining sector in Zimbabwe.

MSU Faculty of Mining & Mineral processing Engineering

Anthony Mamuse

Midlands State University

antony.mamuse@graduate.curtin.edu.au

The Midlands State University (MSU) Faculty of Mining & Mineral Processing Engineering (MMPE) was established in 2015 to contribute to the industrialisation of Zimbabwe by providing requisite research and training in the pivotal arena of local value addition and beneficiation of Zimbabwe's mineral resources. Presently the Faculty is offering undergraduate engineering programmes in Mining, Metallurgy and Materials and will, ultimately, house other key mining-related disciplines, starting with Geology and Geophysics in 2018. Sequentially, Mechanical Engineering, Spatial Sciences and Fuels & Energy will be introduced. MSU has clear capacity-building strategies of meeting the human and material resource requirements to sustain expansion of MMPE and other faculties. The University is assisting academic staff, including many from MMPE, to undertake PhD studies in and outside Zimbabwe, and has prioritised acquisition of state-of-the art equipment for teaching and research. To complement these strides, the Faculty is establishing partnerships with Zimbabwe's research institutions, the mining industry and the government, as well as with relevant regional and international institutions to ensure that training and research are relevant and are of the highest standard. Deliberate inculcation of entrepreneurial fortitude coupled with business incubation facilities to support student enterprises, now core to MSU training philosophy, is mainstreamed in MMPE programs.