Geological Society of Zimbabwe

Newsletter

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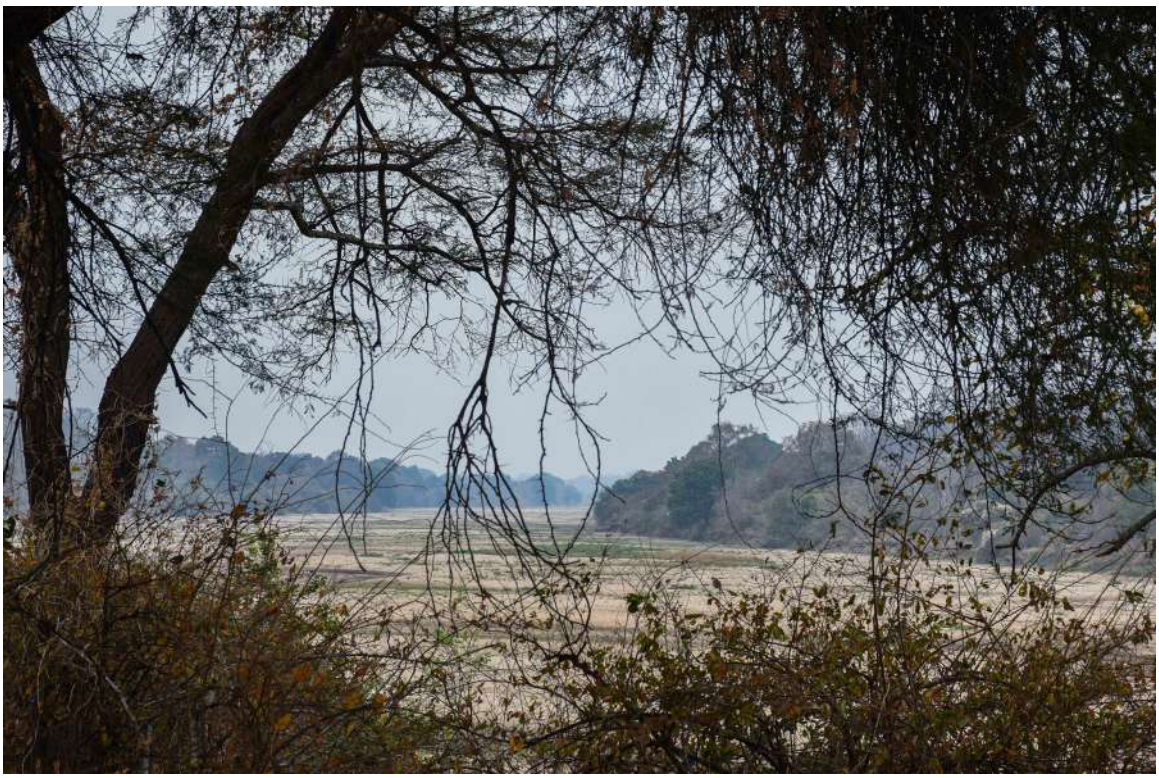

The Angwa River downstream of Mana Angwa, Dande Communal Land
Photo: Tony Martin

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

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Editorial

Undoubtedly the highlight of the year was staging of the 2018 Summer Symposium, this time in early September to allow for a, hopefully cooler, 4-day field trip to the Chewore Inliers and to the dinosaur tracksite. The greater part of the arrangements for both these events were co-odinated by Andrew du Toit, who must be congratuated for his energy and attention to detail in these ambitious undertakings. A landslide attendance was recorded at the Symposium on Thursday 6th September to which were attracted many from beyond our borders, who are mentioned by the Chairman. This included an offer through Gordon Chunnett for the A.L. du Toit Memorial Lecture to be presented by Lew Ashwal, whose delivery was greatly appreciated and is outlined in this Newsletter as are other selected abstracts and Tony Martin's summary of the proceedings. Our sponsors are duly acknowledged.

Early the following morning 38 of us assembled at the Mazowe Dam wall to proceed via Guruve, Mahuwe, Mashumbi Pools, the Chapoto fossil forest, Angwa Bridge and the Manyima *dicroidium* peat exposure to our basic camp at Usanga Usanga spring in Doma Safari Area. The Maunde Valley had attracted us as this provided one of the original inroads to the Chewore Inliers, the mapping of which was initiated by Fritz Both and continued by Ben Goscombe, with Peter Fey working to the west, under a 1990's Australian Aid initiative with the Zimbabwe Geological Survey. Erudite papers were published defining metamorphic terranes within the Chewore, giving anomalous ages when compared to the Zambezi Belt in the Escarpment to the south, providing a lack of correlation and presenting a wealth of structural detail. The presence of amphibolite and a strange date of 1.4 Ga attracted the attention of Simon Johnson from St Andrew's in Scotland who concluded after a number of visits involving the mapping of field relationships and collection for detailed geochemical samples that the mafic assemblage was chemically and morphologically a metamorphosed and deformed ophiolite complex. Such a remnant of oceanic crust in a continental setting was the focus of the field trip as it opened the field for serious debate.

Are these sheeted dykes or not? Maunde River bed, Chewore. *Photo Tim Broderick*

Despite the heat and up-river trudge the chatter was indeed lively given that we had the 'big-guns' at hand including Lew Ashwal, Sharad Master, Tom Blenkinsop, Tony Martin and Peter Fey. Whether consensus or not was reached that deformed amphibolites are sheeted dykes, oblate shapes are pillows, strange magnetitic breccias were originally chromite seams or if gneiss with a large-bladed kyanite association represents ultra-high pressure whiteschist, may remain moot points. After checking in with National Parks at Mkanga Bridge the following morning, and taking on our armed rangers, we set off for the footprints. With Ali in tow the original exposure of the tridactyl trackway was described before we set off over the ridge to the sauropodomorph and other track exposures in the tributaries. Then it was back to the small prints in the bed of the Ntumbe River, but by that time the heat was telling and we decided not to trapse further upstream. The camp at Mana Angwa was calling which, although abandoned, was made open to us by the hunting concessionaires. This allowed us access to the gorge, the semi-articulated *Massospondylus* remains in Forest Sandstone at the Maura confluence, a breathtaking view downstream along the Angwa River (cover photo), stars, interaction and a final meal prepared by the UZ staff.

The Chewore field trip gang – a fun time was had by all. A list of participants follows.
Photo: Tony Martin

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Again, the Newsletter would not be news if our regular contributors did not compile and present it. As always a vote of thanks is extended to Maideyi Meck, Antony Mamuse, Ernest Mugandani, Mabasa Hawadi, Forbes Mugumbate and Tony Martin for their efforts in this regard.

From the Editor's desk, I wish all readers well for the Season and strength and happiness in the New Year.

Tim Broderick

Chairperson's Chat

Stephen Duma

Welcome to yet another exciting edition of the GSZ Newsletter, for which production I am extremely indebted to our dedicated editorial and contributory team who diligently work to provide the geological fraternity with up-to-date and relevant content.

This year has seen an upsurge in interest in local mining-related projects ranging from the usual hype around our gold-bearing greenstones, to the search for and investigation of various pegmatite-hosted lithium deposits, new entrants into the PGM sphere of the Great Dyke and of course that relating to the much-talked-about Zambezi gas and oil prospects. Consequently we look forward to the development of many new geologically-orientated projects in the near future.

Your Committee has maintained momentum by arranging field trips and talks that are both relevant to the current environment and which stimulate meaningful debate. Such was the atmosphere as we hosted Jeff Chaumba to talk in June and we managed to attract an illustrious line-up of talented professionals to bolster our September 2018 Summer Symposium, including Lew Ashwal, Tom Blenkinsop, Mark Tsomondo, Peter Fey, Andy Moore and Sharad Master among others. The abstracts for the symposium talks and snippets from the well-attended 4-day, very stimulating field trip to Chewore are all available to readers on the GSZ website. Updated membership details have also been posted to the website to allow all members to verify their paid-up status and to allow ammendment that will ensure that the committee has accurate details for all our valued members and associates. The website offers a unique platform to individuals and organisations to advertise their products and services directly to an expanding list of players within the mining industry. The site www.geologicalsociety.org.zw is also a means for us to show-case upcoming events that will be of direct interest to our membership and followers, notably the Zimbabwe Mineral Resource Conference, which is now slated for 2020 in Harare. Browsers can keep abreast with our events and the publications section includes an archive of past Newsletters as well as a wealth of other detail. Contact details are available for current Committee Members and for our Secetariat, and the site includes the new membership application form.

Your Committee is already planning exciting engagements for the New Year including a talk on the Cabora Bassa Basin in January and more field trips that will expose our membership to the local geology and also provide opportunities for networking.

I take this opportunity to wish you all a very Merry Christmas as we look forward to a positive 2019.

Articles and Reports

2018 A.L. du Toit Memorial Lecture - Wandering continents of the Indian Ocean

Prof. Lewis Ashwal, Wits University
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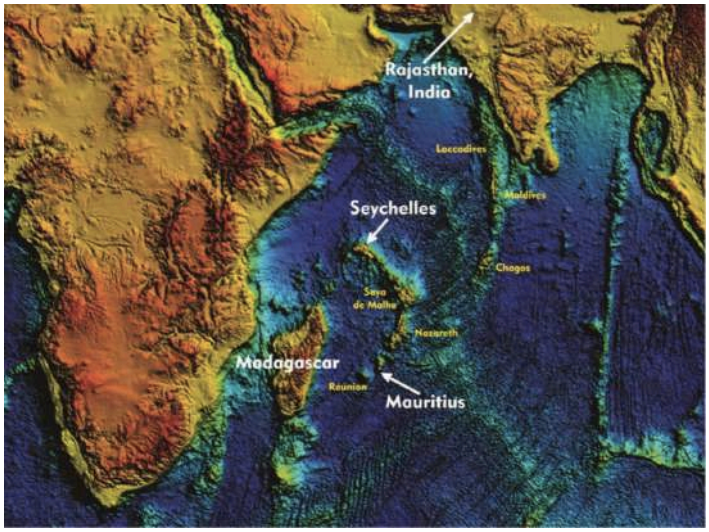
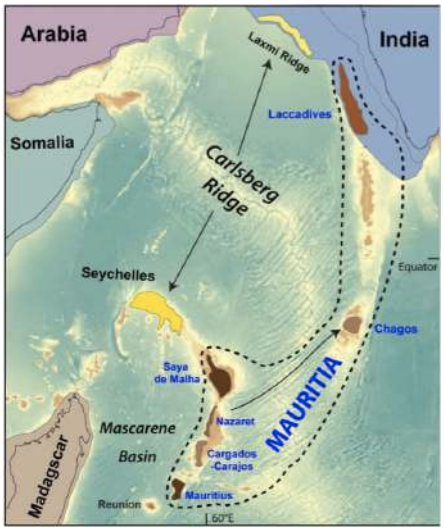
Photo: Tony Martin

On the last page of his 1937 book "*Our Wandering Continents*" Alex du Toit advised the geological community to develop the field of "comparative geology", which he defined as "the study of continental fragments". This is precisely the theme of this lecture, which outlines my research activities for the past 15 years, on the continental fragments of the Indian Ocean.





In the early 1990s, my colleagues and I were working in Madagascar, and we recognized the need to appreciate the excellent geological mapping (pioneered in the 1950s by Henri Besairie) in a more modern geodynamic context, by applying new ideas and analytical techniques, to a large and understudied piece of continental crust. One result of this work was the identification of a 700-800 Ma belt of plutons and volcanic equivalents, about 450 km long, which we suggested might represent an Andean-type arc, produced by Neoproterozoic subduction. We wondered if similar examples of this magmatic belt might be present elsewhere, and we began working in the Seychelles, where late Precambrian granites are exposed on about 40 of the >100 islands in the archipelago.

Based on our new petrological, geochemical, geochronological measurements, we built a case that these ~750 Ma rocks also represent an Andean-type arc, coeval with and equivalent to the one present in Madagascar. By using similar types of approach, we tracked this arc even further, into the Malani Igneous Province of Rajasthan, in northwest India. Our paleomagnetic data place these three entities adjacent to each other at ~750 Ma, and were positioned at the margins, rather than in the central parts of the Rodinia supercontinent, further supporting their formation in a subduction-related continental arc.

A widespread view is that in the Neoproterozoic, Rodinia began to break apart, and the more familiar Gondwana supercontinent was assembled by Pan-African (~500-600 Ma) continental collisions, marked by the highly deformed and metamorphosed rocks of the East African Orogen. It was our mentor, Kevin Burke, who suggested that the present-day locations of alkaline rocks and carbonatites (called "ARCs") and their deformed equivalents (called "DARCs"), might mark the outlines of two well-defined parts of the Wilson cycle. We can be confident that ARC rocks formed originally in intracontinental rift settings, and we postulated that DARCs represent suture zones, where vanished oceans have closed. We also found that the isotopic record of these events can be preserved in DARC minerals. In a nepheline syenite gneiss from Malawi, the U-Pb age of zircons is 730 Ma (marking the rifting of Rodinia) and that of monazites is 522 Ma (marking the collisional construction of Gondwana).

A general outline of how and when Gondwana broke apart into the current configuration of continental entities, starting at about 180 Ma, has been known for some time, because this record is preserved in the magnetic properties of ocean-floor basalts, which can be precisely dated. A current topic of active research is the role that deep mantle plumes may have played in initiating, or assisting, continental fragmentation. I am part of a group of colleagues and students who are applying complementary datasets to understand how the Karoo (182 Ma), Etendeka (132 Ma), Marion (90 Ma) and Réunion (65 Ma) plumes influenced the break-up of Gondwana and the development of the Indian Ocean. Shortly after the impingement of the Karoo plume at 182 Ma, Gondwana fragmentation began as Madagascar + India + Antarctica separated from Africa, and drifted southward. Only after 90 Ma, when Madagascar was blanketed by lavas of the Marion plume, did India begin to rift, and rapidly drifted northward, assisted by the 65 Ma Deccan plume, eventually colliding with Asia to produce the Himalayas. It is interesting that a record of these plate kinematics is preserved in the large Permian – Eocene sedimentary basins of western Madagascar: transtensional pull-apart structures are dextral in Jurassic rocks (recording initial southward drift with respect to Africa), but change to sinistral in the Eocene, recording India's northward drift.

Our latest work has begun to reveal that small continental fragments are present in unexpected places. In the young (max. 9 Ma) plume-related, volcanic island of Mauritius, we found Precambrian zircons with ages between 660 and 3000 Ma, in beach sands and trachytic lavas. This can only mean that a fragment of ancient continent must exist beneath the young volcanoes there, and that the old zircons were picked up by ascending magmas on their way to surface eruption sites. We speculate, based on gravity inversion modelling, that continental fragments may also be present beneath the Nazareth, Saya de Malha and Chagos banks, as well as the Maldives and Laccadives. These were once joined together in a microcontinent we called "Mauritia", and became scattered across the Indian Ocean during Gondwana break-up, probably by mid-ocean ridge "jumps". This work, widely reported in international news media, allows a more

refined reconstruction of Gondwana, suggests that continental break-up is far more complex than previously perceived, and has important implications for regional geological correlations and exploration models. Our results, as interesting as they may be, are merely follow-ups that build upon the prescient and pioneering ideas of Alex du Toit, whose legacy we appreciatively acknowledge.

How the Magondi Belt lost its length: Chemostratigraphic test for correlation in Central African Precambrian metamorphic belts

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The Palaeoproterozoic Magondi Supergroup, consisting of the Deweras, Lomagundi and Piriwiri groups, occurs in the Magondi Belt flanking the western border of the Archaean Zimbabwe Craton. Master reviewed the geology of the regions to the north of the Magondi Belt, in eastern Zambia, NW Mozambique and western Malawi. He noted that the protoliths of the lithologies present in the highly metamorphosed Sinda and Lusandwa groups of the "Mozambique Belt" of eastern Zambia, namely quartzo-feldspathic meta-arkose with interbedded metapelite, marble, and amphibolite sills, correlate well with the lithologies of the Deweras Group. He also noted that protoliths of the Mvuvye Group of marble, quartzite and graphitic schist, together with base metal sulphide mineralization, corresponded very closely to the lithological sequence in the Lomagundi and Piriwiri groups, with which they were correlated. These lithological correlations implied that the region of eastern Zambia could have been a northern continuation of the Magondi Belt, but which was at a higher metamorphic grade (granulite facies) than most of the Magondi Belt of NW Zimbabwe. The Magondi Belt was thus thought to continue northwards across the Zambezi Valley into the Eastern Province of Zambia, across the Zambezia Province of Mozambique into the Chipata District of Malawi.

The suggested correlations were tested by using carbon isotope values from marbles in the Mvuvye and Sinda groups in the Chindeni Belt of eastern Zambia, sampled during the IGCP 363 field excursion in 1996. The isotopic analyses were done, using the protocol of Master *et al*. (2013), at the University of Manitoba. These marbles, however, show only near-to-zero $\delta^{13}C$ values of 0.47 to -1.3 ‰ V-PDB, n = 6 differing from ^{13}C enrichments ($\delta^{13}C$ > 8 ‰ V-PDB) characteristic of the Lomagundi and Deweras group carbonates, and thus they are not correlative on chemostratigraphic grounds with high $\delta^{13}C$ carbonate rocks of the Magondi Supergroup. Schidlowski *et al*. (1976) first utilized the Lomagundi C-isotope excursion to show that the Tengwe River Group carbonate rocks in the Urungwe Klippe did *not* correlate with the Lomagundi Group, since their C-isotope compositions were very different. It has subsequently been established with radiometric dating that the rocks of eastern Zambia are part of a Mesoproterozoic arc terrain, the Southern Irumide Belt, which has ages of around 1.4-1.0 Ga. The Southern Irumide Belt was accreted to the Congo-Tanzania-Bangweulu craton, and is separated from the Kalahari Craton (of which the Zimbabwe Craton is a constituent part) by an eclogite-bearing suture zone formed during the Pan-African Damaran-Lufilian-Zambezi Orogeny. Thus we agree that the Magondi Belt does not correlate with any terrains that are currently to the north of it. The logical continuation for the Magondi Belt is to the SW, where it disappears under younger cover, and seems to link with the Limpopo Belt,

marking the southern boundary of the Zimbabwe craton before its ~2.0 Ga collision with the Kaapvaal Craton.

Our study illustrates that structural, lithological and metamorphic trends are insufficient for robust geological correlation in Precambrian orogenic and metamorphic belts, and they need to be backed up with good geochronology and chemostratigraphy. In the past, the structural trends of lithologies from eastern Zambia were correlated with regions of the Southern Province (Choma-Kalomo Block), and the Great Dyke and Atchiza complexes as well as the Magondi and Chindeni belts were all correlated on the basis of lithological and structural trends. None of these correlations now hold, and the terrains in Zimbabwe and Zambia south of the Zambezi-Makuti-Rushinga belts can no longer be correlated with regions to the north - they are separated by a major suture where the Congo and Kalahari cratons collided in the Neoproterozoic-Palaeozoic Pan-African Damara-Lufilian-Zambezi Orogeny. The Magondi Belt consequently has lost its former supposed length, and is truncated to the north by the Makuti Group and the Escarpment Fault, and does not continue across the Zambezi Valley to eastern Zambia, Mozambique, or Malawi.

Arcadia Lithium Project

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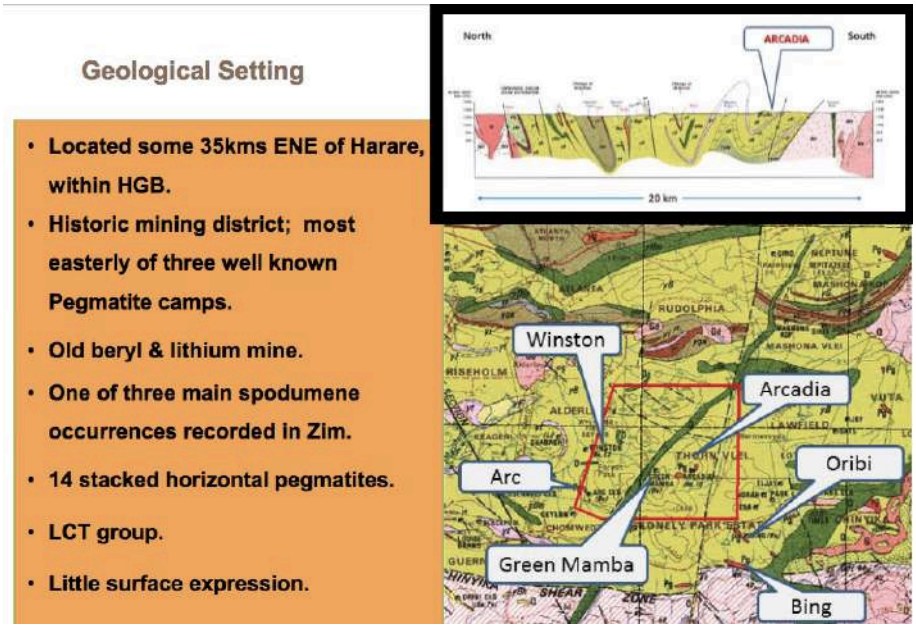
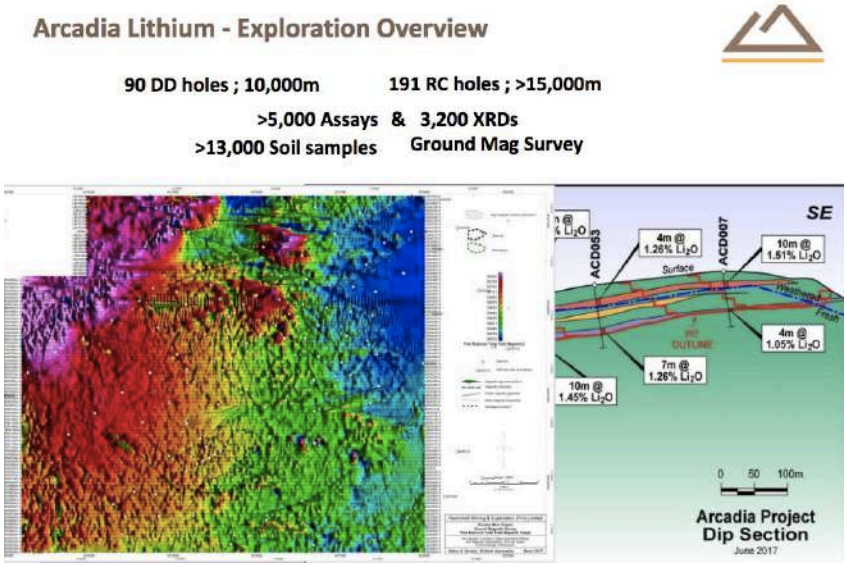
The Arcadia Project is located some 35km ENE of the capital, within the Harare Greenstone Belt.

The ore bodies comprise a series of 14 flat-lying, 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 and 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 1960s and 1970s for lithium and beryl. Limited drilling programmes were carried out by Central African Minerals (CAM) in the early 1980s, and by the Geological Survey of Zimbabwe, before independence.

Prospect Resources hold around 14 km^2 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 drilling rigs have been in place consecutively. Six phases of drilling have now been completed comprising 90 DD holes (>10 000m) and 192 RC holes (>15 000m). Over 5000 assay samples have been analysed for multi-elements, with 2000 XRD determinations being done to define the detailed mineralogy.



A total of 25 dedicated metallurgical test core holes were drilled, and over 8 tonnes of bulk sample material was sent for test work.

To date the 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, with a maximum depth of about 140m is planned, which is based on reserves of 24mt @ 1.34% Li_2O.

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 involving geological mapping and soil sampling continues to identify satellite and associated ore bodies.

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

Pre-stripping and mine construction are scheduled to begin during the fourth quarter of 2018.

GSZ Summer Symposium – 6th September, 2018
Summary

Tony Martin

Prof. M. Thaddeus Ityokumbul, the Zimplats Professor and Acting Director of the School of Earth and Mineral Sciences at UZ, opened the 2018 Symposium by outlining the composition and functions of the new School, which now includes the Geology Department along with the departments of Mining and Metallurgy, and the Institute of Mining Research. He emphasised that economic growth is very much dependent on quality education and quoted John F. Kennedy, "Our progress as a nation can be no swifter than our progress in education. The human mind is our fundamental resource."

2018 A.L. du Toit Memorial Lecture - Wandering continents of the Indian Ocean

Professor Lewis Ashwal in delivering the Alex Du Toit Memorial Lecture per kind support from the Geological Society of South Africa, reported on over 15 years of research into fragments of continental crust scattered around the Indian Ocean. With high-quality mapping of Madagascar and field observation he has recognised 700-800 Ma, Andean-type igneous rocks. Similar aged rocks in the Seychelles and India are considered to be the dispersed remnants of the same arc and palaeomagnetic data link these three localities to subduction along the edge of Rodinia during the amalgamation of Gondwana.

To confirm this, a search was made for alkaline/carbonatite intrusions (ARCs) formed at the onset of continental rifting and their deformed equivalents (DARCs) indicating subsequent collision. An ARC from Malawi gave an age of 730 Ma (Rodinia rifting) with a 522 Ma DARC marking the Pan-African amalgamation of Gondwana.

Moving on to the breakup of Gondwana starting around 180 Ma, Prof. Ashwal referred to the role of mantle plumes associated with the Karoo (182 Ma) and Etendeka (132 Ma) Igneous Provinces, and post-breakup volcanism on the Marion (90 Ma) and Reunion (65 Ma) islands. Soon after Karoo volcanism, Madagascar, India and Antarctica split off from eastern Africa, but only after 90 Ma did India drift north from Madagascar. Supporting evidence for this comes from the change from dextral displacement relative to Africa in the Phanerozoic of western Madagascar, followed by sinistral as India moved northwards in the Jurassic.

A spin off of all this research has been the recognition of a continental fragment beneath Mauritius (9 Ma) where zircons ranging from 3030 to 2522 Ma have been found, and it is speculated that further fragments may accompany other Indian Ocean islands – and perhaps those elsewhere.

How the Magondi Belt lost its length: Chemostratigraphic test for correlation in Central African Precambrian metamorphic belts

Dr Sharad Master shortened the Magondi Belt as a follow-up to his last Summer Symposium talk where he eliminated a complete orogeny – all in the cause of trying to elucidate the complexities of the multiple collisional zones that form the western and northern margins of the Zimbabwe Craton. In the early 90's Sharad noted various

metasedimentary/volcanic sequences (including marble) in Zambia extending towards Malawi that were similar to the Magondi Supergroup lithologies, and on this basis proposed an extension of the Magondi Belt to the northeast.

Recent $\delta^{13}C$ analyses of the Zambian carbonates have shown values close to zero, which are very different to the characteristic Lomagundi C-isotope Excursion, and recent 1.4 to 1.0 Ga dates of the Zambian rocks indicate that these are part of the Mesoproterozoic Southern Irumide Belt.

This confirms a previous proposal by Peter Treloar causing Sharad to note that lithological, structural and metamorphic similarities are insufficient to make robust correlations, which also require geochemistry and geochronology.

Mantle Plumes: Fable, Fiction or Fact

In 1963 Tuzo Wilson proposed the concept of mantle plumes and used the Hawaiian island chain as evidence of volcanicity from a stationary plume beneath moving oceanic crust. Plumes have since been invoked to explain volcanicity and plate motions in Africa and also the unusual elevation of the southern African Plateau. But as **Andy Moore** pointed out, there are some problems with this model.

Firstly the alkaline volcanic lineaments show age progressions and some post-Gondwana volcanism that cannot be correlated with plate movements. Secondly, Gondwana breakup occurred along earlier suture zones and it is unlikely that mantle plumes would have targeted these. Finally, the doming of Southern Africa, if formed by a circular plume, should result in a radial drainage pattern, which it does not; indeed the Kalahari basin occupies much of this high land and seismic tomography does not indicate a plume beneath it.

To explain these conflicts Andy referred to the 1974 paper by Turcotte and Oxburgh, which proposed that the ellipticity of the Earth would produce tensional forces within a plate as it moves to lower latitudes – a concept they termed membrane tectonics.

Tectonic Controls on the intrusion of the Great Dyke and the Bushveld Complex

Tom Blenkinsop spoke on the secular evolution of the Earth and the role of the local tectonic history in the formation of the Great Dyke and Bushveld Complex. Jim Wilson associated the emplacement of the 2575 Ma Great Dyke with a conjugate fault system generated by the collision of the Kaapvaal and Zimbabwe cratons. This explanation is relatively simple.

The emplacement of the Bushveld at 2055 Ma is more difficult to interpret because the Transvaal Supergroup and the Bushveld Complex cover the Basement. Nevertheless, it probably formed from feeder dykes similar to those under the Great Dyke, and Tom presented the following supporting evidence for this.

The assembly of the Kaapvaal Craton from smaller Archaean blocks is marked today by the east-trending Thabazimbi-Murchison Lineament (TML) that passes beneath the

Bushveld and westwards to the Malopo Farms Complex. Following on from this was the collision of the Kalahari Craton with an Archaean block along the Magondi-Kheis Belt and with it the reactivation of the Limpopo Triangle Shear Zone and the TML – all at around 2.0 Ga. An important point here is that a relatively wide range of principal stress directions can generate dilation in pre-existing fractures and this appears to have happened along the TML despite an oblique impact of the Magondi.

The importance of this structure is shown by its position relative to the thickness variation from north to south of the Bushveld and its facies variations. The proximal facies is thicker where closer to the TML suggesting that this fracture was the conduit for the magmas that spread to the thinner, distal facies to the south. Flow direction data also support this conclusion.

The location of both the Dyke and Bushveld away from craton margins and the difficulty of magma penetrating thick continental crust also point to a fundamental tectonic control on both. Tom concluded that tensional reactivation of pre-existing fractures due to collisions between continental blocks triggered the extrusion of vast volumes of magma and that mantle convection was probably insignificant.

Geology of the Chewore Inliers and Environs

Peter Fey on a return visit to Zimbabwe outlined the history of geological mapping in the Zambezi Valley where the Chewore inliers are exposed, which started in 1937 to end with his own work between 1992 and 1995 and that of Oesterlen, Goscombe and Both, and Johnson between 1994 and 2000.

The Chewore Inliers comprise a number of Mesoproterozoic horsts that protrude through Karoo cover where four terranes have been recognised:

- The Gneiss Terrane of quartzofeldspathic gneisses, partly of sedimentary origin;
- The Quartzite Terrane, predominantly of paragneisses;
- The Granulite Terrane of gneisses, mafic granulites, quartzites and enderbites;
- Concordant orthogneisses which predate all other events and were emplaced around 1080 Ma.

Re-mapping has identified various lithologies which were interpreted as ophiolite and island arc sequences dated at 1393 ± 22 Ma, the oldest such remnants in Africa. This work also identified three periods of folding and all of the terranes were reworked by the Pan-African around 524 ± 16 Ma.

The Chewore Layered Igneous Complex was emplaced across the contact between the Granulite and Quartzite Terranes towards the end of the Pan-African and subsequently dismembered into four fragments by block faulting.

Rifting and Karoo sedimentation followed a prolonged period of uplift and with continued deformation, some Basement-Karoo contacts are faulted. The Dande Sandstone Formation and reworked Kalahari sediments overlie the Karoo sequence.

The economic prospects in the area are restricted to the hydrocarbon potential of area, which is currently under investigation. Chromite and the PGM potential of the Chewore Complex are not considered to be economically viable.

Of syntaxes, oroclines and secondary continental ribbons: accretionary orogenesis overlapping Limpopo continent-continent collision in c. 600Myr Kalahari Supercontinent cycle (3.1-2.5 Ga)

Mark Tsomondo gave us another episode on his favourite theme on the assembly of the Kalahari Craton. As is apparent from this and previous talks, the complexity of the Limpopo event is enormous and involves not only the Belt itself, but also the pre-collisional construction of the continental nuclei of both adjacent cratons and the far-field post-collisional effects. What is clear is that this is work-in-progress and much remains to be done given the vast geological-geophysical-geochronological datasets that are now available for large parts of this region.

Firstly, Mark pointed out the factors that would influence the collisional process including the shape, size, thickness and rheological characteristics of the two impacting bodies and in particular the presence (or not) of a promontory or indenter.

As a starting point Mark believes that initial impact occurred around 2.75 Ga based on the age of the Mashava Igneous Complex – the shape of which suggests fracturing due to indenter impact – rather than the previously-accepted 2.70-2.60 Ga dates.

Next, Mark addressed the issue of what comprised the indenters and he presented evidence of lithospheric thickness and rheology heterogeneities within the Kaapvaal Craton. The Colesburg and Thabazimbi-Murchison Lineaments have been interpreted as sutures marking the assembly of the Kaapvaal implying thickness/rheology variations – and these are also seen in recent seismic data. Along the eastern edge of the Craton is the Ancient Gneiss Complex of thicker and older crust and its equivalent in Zimbabwe, the Tokwe Fragment. These are considered by Mark to be the prime candidates for the indenters.

Turning to the collisional events, Mark believes that the sinistral thrust-wrench lineation trajectories along the Hout River Shear Zone, which forms the southern margin of the Limpopo Belt, provides evidence for both oblique convergence and transpressional-extrusional, orogen-parallel movement – but only in a south-westerly asymmetrical direction of tectonic escape from the indenters.

He also showed that the oroclinal shape of the belt as indicated by geophysics, is similar to examples from eastern Australia and northern Italy that are curved in a similar manner to the Northern Marginal Zone – all being interpreted as reflecting indenter collision followed by rotation.

In conclusion, Mark proposed that the oblique impact of the thick, old and cold lithosphere represented by the Ancient Gneiss and Tokwe ribbons caused pinned deformation (collision followed by rotation) and that these two terranes are probably key to unravelling the convergent-collisional-extensional domains that characterise the

Limpopo Belt. Supporting evidence for this is found in computerised simulations that model such collisions.

The ruby fields of Montepuez Complex, Mozambique – detailed magnetic and radio-element interpretation for target generation

Tenyears Gumede reported on the geophysical surveys he conducted over some ruby deposits of northeastern Mozambique. These occur within amphibolites associated with quartzite, marble and granitic gneisses that are part of the Pan African Mozambique Belt. Weathering largely obscures the complexity of the deformation and hence the need for ground magnetic and radiometric surveys. These confirmed the multiple ductile deformations of the area and that the rubies and rhodolite garnets seem to be coincident with converging NE-trending lineaments and that the amphibolite host is characterised by an elevated magnetic intensity and is depleted in radiometric elements, thus providing targets for future exploration.

Arcadia Lithium Project

Adam Moodley gave an update of the Arcadia Lithium Project covering 14 stacked, flat-lying pegmatites that contain petalite and spodumene with subsidiary tantalite.

Prospect Resources, the current holding company, has now drilled ~ 25,000m of cored and RC holes with over 5000 analyses, 2000 XRD determinations and 8 tonnes of bulk sample being subjected to metallurgical tests. The current Resource is 57 Mt @ 1.1% Li_2O, or 35 Mt @ 1.4% Li_2O (0.8% cut-off).

The pre-feasibility study based on a 1.5 km-long pit to 140m, a Reserve of 24 Mt @ 1.34% Li_2O and a 1.2 Mt/a production rate is complete with a feasibility study in progress, which includes construction of a lithium carbonate plant. Arcadia is now Africa‘s largest and the World‘s 5th largest JORC-compliant hard-rock lithium resource and mine construction will start towards the end of 2018.

Grade improvement through multi-disciplinary team synergies – a case study of Unki Mine, Great Dyke of Zimbabwe

Melusi Hlambelo reported on the measures taken to control the grade at the Unki Platinum Mine, which dropped alarmingly following an increase in the production rate and the deployment of a new suite of mining equipment. The measures taken to achieve the planned grade included a decrease in panel widths, better quality face marking, a decrease of blast-hole burdens and the use or air holes along the periphery of the panels, and most important – ensuring accurate drilling.

All of these resulted in a grade improvement from 3.11 g/t in Q1 of 2015 to 3.41 g/t in Q4 of 2015.

Principles of hyperspectral imaging and its applicability to geological samples

Mike Donze of TerraCore talked about the use of spectral emissions in the identification of silicate and other minerals. Spectral emissions have been widely applied to satellite and airborne images, but its use on rocks is relatively new.

The technique selects narrow bands of the infrared spectrum within and beyond the visible, and that is where the hyperspectral comes in: essentially the accurate identification of minerals depends on choosing emission wavelengths within very narrow bands.

The process involves the measurement of energy reflected from a rock sample and research has shown which wavelengths are most suited to which minerals.

Having measured the spectrum the challenge is to process and interpret the data, and to convert these into images useful to geologists. Imaging can be done at sub-millimetre scales and Mike showed a number of examples illustrating this non-destructive method of mineral identification.

Surpac Structural Suite - Using orientated data in your geological modelling workflow

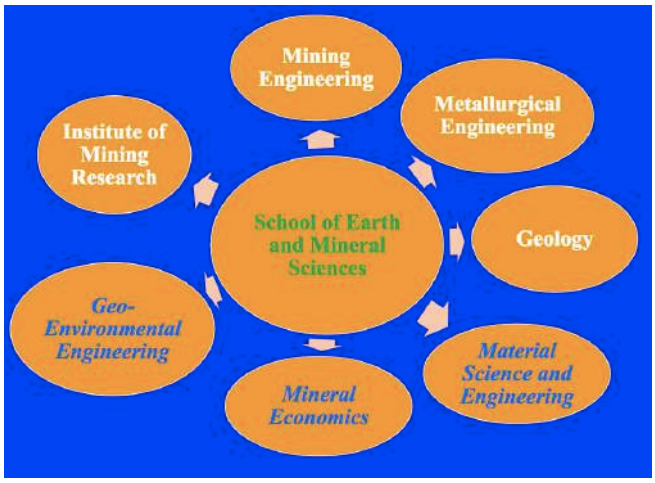
Nicky Vlok gave an overview of the Structural Suite for Geovia Surpac for the visualization and analysis of any orientated data from lithological contacts to structural data such as foliations and joints from surface maps or core logs. The software allows easy visualisation of these and any other structural features to assist in the identification of risk and decision making related to stability and support on mines.

News

Geology Department, University of Zimbabwe

Maideyi Meck

The Department of Geology is now fully functional under the School of Earth and Mineral Sciences.



Dr M.T. Ityokumbul, Zimplats Professor, School of Earth nd Mineral Sciences, UZ

The Department has two new members of staff, Mr Peter Maketa and Mr Shepherd Mabhanga, who are recent Masters' graduates from Algeria. Mr Charles Mhindu and Mr Daniel Chatora also helped the Department on a part time basis during the course of the semester. Teaching progressed well and we managed to attach all of our students except for one. Many thanks to the mining houses that have facilitated the industrial attachments. We at the Department hope that the mining industry will once again absorb our students for the crucial experience that they need next year.

The Geology Department received a donation worth approximately US$400,000 from Unki Mine, which comprises a research microscope, a teaching microscope, two stereo microscopes and 32 student microscopes all from Zeiss in Germany. The handing over ceremony was presided over by the Minister of Higher Education, Science and Technology and attended by representatives from the Ministry of Mines and Mining Development and the Chamber of Mines as well as delegates from academia and some mining houses. We are indebted for this wonderful gesture that will greatly benefit our students, teachers, researchers and supporting staff. The university has responded by meticulously and timeously doing its bit by preparing appropriate facilities to ensure that the microscopes will be well kept. It is our hope that Unki and many mining houses will also benefit from the use of this equipment, which gives us the opportunity to meet, collaborate and work with other researchers those from the mining industry. Representatives from the mining industry are free to visit the new UNKI LABORATORY at any time.

Following a well attended workshop on 1st August, the Department continues to review its curriculum but as yet has received only limited opinion from geologists working within the Mining Industry of Zimbabwe. Thus we are appealing to geologists out there to forward their opinion and suggestions for consideration to ensure that future graduates meet the requirements and expectations of industry in terms of quality and training.

The 2nd Semester, which commenced in August, has gone smoothly and students are now writing their exams. Despite having students due for field work, we will not be running these courses this semester due to it falling within the rainy season.

Contact details as of February 2018:

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Mr S. Mabhanga	Lecturer				
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The Mennell Geological Society

Audious Kashesha (Chairperson) audieekm@gmail.com
Bernatrix Makenah (Secretary) panashebpm@gmail.com

The Professor Tom Blenkinsop UZ Geology Field Trip Fund

Following the successful presentation of the 2013 A.M. Macregor Memorial Lecture in Harare and Bulawayo, and his lead of the field trip in the Renco Mine area, Professor Tom Blenkinsop made a generous donation of $200 to the Geological Society of Zimbabwe (GSZ). This was in support of University of Zimbabwe (UZ) geology student field trips. Over the years the UZ Geology Department has been under funded, resulting in their failure to raise sufficient money to conduct the mandatory field trips for its students. The GSZ responded by donating funds and materials from its own resources as well as from members. This assistance went towards the welfare of the geology students, especially in meeting costs for field trips.

Using the donation from Prof. Blenkinsop as seed money, the GSZ has now established the *"Professor Tom Blenkinsop UZ Geology Field Trip Fund"* to be administered by its Executive Committee. Tom has indicated an interest in supporting the Geology Department on a long term basis, not only to help in mobilizing funds for various activities, but by also providing moral and material support. Annually the students go on their main field trip, which lasts around 2 weeks with direct costs being in the range of $6000 per class. Therefore we are appealing to all our members to donate generously to this worthy cause both in cash or in kind. Materials such as fuel and food are most welcome.

The direct benefits that accrue to the geological profession are that it ensures a properly trained graduate. Referring to the adage that he best geologist is the one who has seen the most rocks, our students need quality field trips. From these field excursions we also want to develop the Zimbabwe Geology Atlas.

Your donations, either in cash or in kind, should be forwarded to our Treasurer, Collins Mwatahwa – E-mail: cmwatahwa@Angloplat.com or to our Administrator, Julie Kuhn - E-mail: geol.soc.zimbabwe@gmail.com

THANK YOU FOR YOUR GENEROSITY

H. N. Gumbo

MIDLANDS STATE UNIVERSITY

FACULTY OF MINING AND MINERAL PROCESSING ENGINEERING
ZVISHAVANE CAMPUS

Introduction

The current August-December 2018 semester has progressed remarkably well. During this period the Honours Degree in Applied Geology commenced, the Faculty was awarded the Royal Academy of Engineering Higher Education Partnership in Sub-Saharan Africa grant and the Department of Mining Engineering held a very successful, well-attended short course in Mining Law. The Faculty's Mining Industry Advisory Committee held a strategic planning meeting in Harare in August 2018. However, the Faculty has not been spared of challenges emanating from the general economic impasse facing the country. Due to the shortage of foreign currency, planned importation of high-tech teaching and laboratory equipment has not materialised. This newsletter instalment also touches on student activities and industrial placements.

Commencement of Bachelor of Science Honours in Applied Geology

The long-awaited BSc Honours (Applied Geology) course, offered to both conventional and visiting students by our new Department of Geosciences, commenced this semester with 25 pioneer visiting students. The other programme offered by the department is the BSc Honours (Exploration Geophysics) degree, which commences in February 2019.

Mining Industry Advisory Committee (MIAC) Strategic Planning Meeting

Captains of industry and Faculty staff who constitute MIAC held a planning workshop in Harare in August 2018 to map out a five-year strategy for the Faculty. The meeting was very successful and strategic planning documents are currently under review.

Mining Law Short Course

The Department of Mining Engineering ran its second edition of the Mining Law short course from 5-9 November 2018. The very successful course, attended by 22 mining industry personnel and 21 Faculty students, was concluded during a certificate award ceremony. Faculty students will further take examinations based on the course as it constitutes one of their modules.

Royal Academy of Engineering Award

The Faculty was successfully awarded the competitive Royal Academy of Engineering-Higher Education Partnership in sub-Saharan Africa (HEP-SSA) grant worth £140,000 to advance engineering education through the project, "Assessment of Zimbabwe's industrial minerals and coloured gemstones", which is in collaboration with 2 local

universities, one local research institution, one industry partner, one South African university and two UK universities. The Faculty will seek to work with other interested local partners in specific aspects of the project.

Student Activities

The Student's Mining & Metallurgy Association is organising an interactive dinner with the members of the mining industry and other stakeholders at our Zvishavane Campus. The tentative date is 7th December 2018, subject to confirmation by VIPs, including ministers. All Geological Society members and friends are invited to attend and formal communication will be availed once dates have been finalised.

Student Industrial Placement

I would like to thank industry and other stakeholders for timeously providing industrial placements, ending December 2018, to our 9 pioneering 4th year students. The students generally had wonderful experiences and we hope that they are good candidates for future employment opportunities.

The Faculty is now seeking industrial placements for its second group of 4th year students for January - December 2019. The group comprises 31 students (mining engineering – 22; metallurgy – 9). We ask industry players and stakeholders who can assist to come forward – please use my email below, or contact the Faculty using details on the MSU website.

Conclusions

The Faculty values partnerships in research and development with local and international entities and government to advance the sustainable exploitation and utilisation of Zimbabwe's resources for the country's maximum equitable socio-economic benefit.

Submitted by Dr Antony Mamuse, Executive Dean
antony.mamuse@graduate.curtin.edu.au

Geological Survey Department

Ernest T. Mugandani
etmugandani@gmail.com

STAFFING

The Public Service Commission (PSC) through the Ministry of Mines and Mining Development has made new appointments in the Provincial Offices and other ministry departments effective from the end of June 2018. Congratulations to those appointed to the posts.

Sokesimbone Lunga is now the substantive Deputy Director of the Zimbabwe Geological Survey (ZGS) while **Dr. Mabasa Temba Hawadi** continues as the Director for ZGS.

The writer (**Ernest Mugandani**) has been appointed Acting Deputy Provincial Mining Director for Midlands Province following the appointment of **Nelson Munyanduri** as the substantive Provincial Mining Director for Midlands Province.

Forbes Mugumbate continued as the Provincial Mining Director for Mashonaland East Province following his redeployment from Mashonaland Central Province in May 2018. **Tendai Kashiri** joined the same province as substantive Deputy Provincial Mining Director.

Sibongubuhle Mpindiwa (Ms), now a substantive Deputy Provincial Mining Director, has been redeployed to Mashonaland West Province as Acting Provincial Mining Director while **Mitchell Maisera (Ms)** continues as Acting Deputy Provincial Mining Director in this province.

Frank Muzanenhamo has been redeployed to Manicaland Province as Acting Deputy Provincial Mining Director while **Omen Dube**, a Mining Engineer by profession, is now the substantive Provincial Mining Director for the province.

The department also welcomes **Rumbidzai Hilda Shereni (Ms)** who transferred from Matabeleland North Province. She transferred to the Zimbabwe Geological Survey, Harare with effect from June 2018.

SPONSORED SKILLS DEVELOPMENT TRAINING

Organization of African Geological Survey (OAGS)
The Department is participating in various training programmes offered under the Pan African Geoscience Project (PanAfGeo). The programmes aim at restoring the skills gaps that exist in African Geological Surveys.

The Director, Dr. M. T. Hawadi, attended the 11th OAGS Annual General meeting held in Dakar, Senegal from 8th to 10th November, 2018.

Japan International Co-operation Agency (JICA)
Admire Charumbira is the latest beneficiary of the JICA training courses. He attended a training course on Remote Sensing and Exploration from 28 September – 4 November 2018 in Tokyo.

Japan Oil and Gas National Co-operation (JOGMEC)
The Ministry of Mines and Mining Development has a Memorandum of Understanding (MOU) with JOGMEC. The Zimbabwe Geological Survey is the executing agency. It is under this framework that the department is receiving support for Remote Sensing Techniques through training and workshop attendance.

Mathias Ndoro, Vimbai Gengezha (Ms) and **Abenezel Makuvaza** attended Remote Sensing Competition held in Lobatse, Botswana from 28th October – 3th November 2018. This is an annual event by JOGMEC whose scope is to strengthen remote sensing skills for geoscientists in the Southern African Development Community (SADC) region.

Vimbai Takawira (Miss) and **Sokesimbone Lunga** attended the Remote Sensing and GIS Seminar and Workshop from 1-10 November 2018 in Gaborone, Botswana.

Governance Institutional Strengthening Project (GISP)
The project has resulted in 12 new publications, some with maps, being printed and 20 being reprinted courtesy of the support given by the African Development Bank (AfDB) under this project. The publications are listed below and are available for sale in the Geological Survey Drawing Office in Harare.

NEW PUBLICATIONS AT THE ZIMBABWE GEOLOGICAL SURVEY

Dr. Mabasa Temba Hawadi, Director,

Zimbabwe Geological Survey (ZGS)

Under the Governance Institutional Strengthening Project (GISP), ZGS managed to have 12 new publications printed with 18 being reprinted. Four new maps were printed and 14 were reprinted as listed below. All were delivered in early October, 2018 and are now on sale. The support came through the African Development Bank (AfDB) who facilitated the editing of the new publications under the auspices of Tailjet Consultancy. The printing was done by Kadimah Print Global in the Republic of South Africa. In the table B = Bulletin, SR = Short Report and MRS = Mineral Resource Series.

No.	Status	Title	Author(s)	*Editor*
B 95 text	New	The Geology of the Country around Dorowa-Shawa	J. N. LAUDERDALE	*Mr. D. E. H. Murangari*
B 99 + map	New	The Geology of the Western Portion of the Chewore Inliers, Zambezi Valley	P. FEY	*Prof. Tom Blenkinsop*
B 103	New	The National Gravity Dataset of Zimbabwe	K. P. FISK; M. T. HAWADI	
B 104 text	New	The Geology of the country South of Mataga, Mberengwa, Mwenezi, Gwanda and Beitbridge Districts	N. E. H. BOUAMMAR	*Mr Tim J. Broderick*
B 105 + map	New	The Geology of the Country between Chireya and Goredema, Gokwe North and Gokwe South Districts	A. AIT- KACI AHMED	*Dr Dennis S. M. Shoko*
B 107 text	New	Review of the Geology and Summary of the Known Fossil Fuel Potential of the Karoo and Younger rocks in Zimbabwe	B. BARBER; P. M. OESTERLEN; A. AIT-KACI AHMED; M. A. MUKANDI.	*Dr Dennis S. M. Shoko*
Map	New	Gravity Map of Zimbabwe	K. P. FISK; M. T. HAWADI	
MRS 26	New	An Assesment of the Lesser Known Coal Localities IN North Western Zimbabwe	B. BARBER	*Dr Dennis S. M. Shoko*
MRS 28	New	Tantalum and Niobium in Zimbabwe	G. NASCHEL-WESCHKE	*Mr Peter Fey*
MRS 29	New	Copper Deposits in Zimbabwe	F. B. MUPAYA	*Dr Kosmas Chenjerai*
MRS 30	New	Gemstone Deposits of Zimbabwe	M.T. HAWADI; L. S. MAFARA	*Dr Maideyi Mabvira-Meck*

SR 51 text	New	The Geology of the country around Belingwe Peak.	J. L. ORPEN ; A. MARTIN; F. MUGUMBATE.	*Dr Kosmas Chenjerai*
SR 55 + map	New	Geology of the Country Southwest of the Chewore Inliers, Hurungwe District	P.T. ZIZHOU; S. LUNGA	*Mr Peter Fey*
B 32	Reprint	The Geology of the Mutare Gold belt	A. E. PHAUP	
B 40 + map	Reprint	The Geology of the lower Sabi Coal Field	W. H. SWIFT; W.C. WHITE; J. W. WILES; B. G. WORST.	
B 44/2 + map	Reprint	Gold Deposits and Mines	J. W. WILES	
B 46 + map	Reprint	The Geology of the Country around Mangula Mines, Makonde and Hurungwe Districts	J. G. STAGMAN	
B 47 + 1 sheet (Snake Head)	Reprint	The Great Dyke of Zimbabwe	B. G. WORST	
B 49 + map	Reprint	The Geology of the Country around Chinhoyi and Banket Makonde District	J. G. STAGMAN	
B 52 + map	Reprint	The Geology Middle Sabi Valley	W. H. SWIFT	
B 58 + map	Reprint	The Geology of the Country around Masvingo & The Bikita Tinfield	J. F. WILSON	
B 59 + map	Reprint	The Geology of the Country south and West of Shurugwi	C. W. STOWE	
B 64 text	Reprint	THE Geology of the Country around Kadoma	N. W. BLISS	
B 67/1 + map	Reprint	Geology of the Country around Kwekwe	N. M. HARRISON	
B 69 text	Reprint	Check List of the Minerals of Zimbabwe	SUSAN M. WARNER	
B 80 text	Reprint	An Outlook of the Geological History of Zimbabwe	J. G. STAGMAN; N. M. HARRISON; T. J. BRODERICK; V. R. STOCKLMAYER.	
B 83 + map	Reprint	The Geology of the Belingwe- Shabani Schist Belt	A. MARTIN	
MRS 22 map	Reprint	Base Metal and industrial Mineral Deposits of Zimbabwe	D. S. BARTHOLOMEW	
MRS 23 map	Reprint	Gold Deposits of Zimbabwe	D. S. BARTHOLOMEW	
SR 43 + map	Reprint	Explanation of the Geological map of the Country east of Kariba	T. J. BRODERICK	
SR 45 text	Reprint	Explanation of the Geological Map of the country West of Beitbridge	M. K. WATKEYS	
SR 46 text	Reprint	Explanation of the Geological Map of the country South of Mwenezi, Mwenezi and Beitbridge Districts	T. J. BRODERICK	
SR 48 text	Reprint	Explanation of the Geological Map Vungu and Gweru river Valleys, Gweru , Kwekwe and Bubi districts	N.M. HARRISON	

NEWS from the MINING INDUSTRY

Forbes Mugumbate
fmugumbate@gmail.com

Changes at the Ministry

There have been some changes at the Ministry of Mines and Mining Development following inauguration of the new government after the July 2018 General Elections. While Hon. Winston Chitando retained his position as Minister, the Permanent Secretary, Munesu Munodawafa, was reassigned to the Ministry of Environment, Tourism and Hospitality Industry as permanent secretary. The new Secretary is Onesimo Moyo, an accountant. Onesimo is not new to the Ministry having been at one stage General Manager at the Minerals Marketing Corporation of Zimbabwe (MMCZ). Polite Kambamura, an engineer, was appointed Deputy Minister of Mines. Valentine Vera, a long-serving member at the Ministry, who was principal director responsible for Value Addition, Research and Beneficiation, retired after reaching the statutory age. Dr Mercy Manyuchi is now the director responsible for Value Addition and Research.

Changes have also been made at provincial offices following appointments of new directors. The following are the provincial directors:

Province	Director	Profession
Mashonaland West	Sibongubuhle Mpindiwa (Acting)	Geologist
Mashonaland Central	Malcom Mazemo	Metallurgist
Mashonaland East	Forbes Mugumbate	Geologist
Manicaland	Omen Dube	Mining Engineer
Masvingo	Tariro Ndhlovu	Geologist
Midlands	Nelson Munyanduri	Geologist
Matabeleland North	Farai Ngulube	Mining Engineer
Matabeleland South	Tichaona Makuza	Mining Engineer

ED rejects the Mines Bill

The President of Zimbabwe has returned the Mines and Minerals Amendment Bill of 2015 to Parliament stating that sticking issues must be addressed before he can sign it into law. If, however, other concerns are raised in addition to the President's observations, then the whole process of consultation will have to be renewed. Various stakeholders, including the Chamber of Mines of Zimbabwe and the Zimbabwe Prospector's Association (ZPA), have criticised the proposed law over several controversial provisions. The Chairperson of the Parliamentary Portfolio Committee on Mines and Energy, Themba Mliswa, has also criticised the Bill, going to the extent of suggesting that a new Act is required rather than amendment to the existing one.

The Chamber of Mines of Zimbabwe is not happy with the definition of strategic minerals, which is so broad that it covers nearly every mineral and so elastic that more minerals could be reclassified in future under the "any other mineral" clause. The Chamber is also uncomfortable with provisions seeking to transfer administrative aspects of the pegging of claims from the principal Act to subsidiary legislation.

The Minerals Marketing Corporation of Zimbabwe Board finally appointed
Minister Winston Chitando has appointed a new seven-member Board for the MMCZ. This appears to be in response to a grilling of the Permanent Secretary, Onesimo Moyo, by Legislators over worries that further delays in appointing the board might perpetuate the old situation where the Ministry undermined corporate governance ethos by directly running the parastatal without a board.

David Murangari will chair the Board. Other appointments include Chamber of Mines of Zimbabwe chief executive Isaac Kwesu, former Hwange Colliery Company Limited board member Jermister Chininga, Rose Mukogo, Ignatious Tichivangana, Dr Mercy Manyuchi and Ester Maravanyika.

Gold - its glitter and gloom
Gold production has hit the 30t mark before the year has ended. This is the highest production recorded in this country since maintenance of production records started. The high production has been attributed to the small-scale mining sector that is now contributing about 60% to national production. This follows various interventions such as the Reserve Bank of Zimbabwe's Gold Development Initiative Fund (GDIF) established in 2016 to support gold mining operations in the country. The fund has already disbursed almost $100 million. Fidelity Printers and the Zimbabwe Miner's Federation (ZMF), an umbrella body for small-scale miners in the country, have recently intensified awareness campaigns across provinces where they are encouraging miners to sell their gold through formal channels. The Ministry has also warned custom milling centres against underhand dealings ranging from under-declaration of production to the wanton disregard of regulations. Pursuant to this, Gold Mobilization teams occasionally swoop on these operations to enforce their compliance with regulations. The ultimate goal is for the country to reach a production target of 100t per annum.

The gold production trajectory is, however, facing challenges emanating from foreign currency and cash shortages in the country. Gold producers have threatened to suspend operations because a foreign-exchange shortage has left them with insufficient funds to cover production costs. Producers are only allowed to retain 30% of the proceeds of gold sales, which is not adequate to cover the recurrent costs of mining. The foreign currency and cash shortages are so severe that production at a number of gold mines has virtually stopped, resulting in retrenchment of workers. Metallon Corporation Chief Executive Officer, Mzi Khumalo, went to the extent of considering paying suppliers in gold while Rio Zim threatened to take legal action to force the central bank to pay it in dollars for part of its output. This resulted in closure of the Cam & Motor, Dalny and Renco mines until the situation had resolved. Negotiations with the Reserve Bank have eased the foreign currency retention by gold producers to 55%.

Muzarabani oil euphoria
A news item that raised a lot of excitement and debate was the announcement by President Mnangagwa that Invictus Energy Limited of Australia had confirmed the potential for oil in the Cabora Bassa Basin following a re-evaluation of data generated by Mobil some 25 years ago. The announcement by the President was interpreted by many to suggest that oil had indeed been discovered. Both the Ministry of Mines and Invictus had to frantically clarify the correct position. Invictus has reinterpreted the Mobil data in view of modern technology and an increased understanding of petroleum geology, and

concluded that the basin has high potential for the occurrence of gas and petroleum. The basin probably represents the largest undrilled but seismically defined onshore play in Africa. Invictus noted that the deep lacustrine source rock type in the Cabora Bassa Basin was not widely regarded 25 years ago as having significant oil generating potential. However, recent multi-billion barrel oil discoveries in onshore African rift basins, such as the Albertine Graben in Uganda and the Lokichar Basin in Kenya, whose source rocks are from deep lacustrine sediments, suggests good potential for prospects in the Cabora Bassa Basin. The Invictus exploration programme is progressing with the aim of drilling the first exploration well in the Cabora Bassa Basin in 2020. If indications are promising, there is provision for a production sharing agreement to be signed with Government.

Local representatives of Invictus include our own fellow geologists Paul Chimbodza and Brent Barber. We wish to congratulate these two for their insight and resourcefulness, which has brought focus on Muzarabani.

The Lithium Magic

Lithium is touted to be the mineral of the future. One of the most valuable uses of lithium is as a component of high energy-density rechargeable lithium-ion batteries. Because of general concerns over the carbon dioxide footprint and the increasing cost of hydrocarbon fuel, lithium may become even more important in large batteries for powering all-electric and hybrid vehicles. This could create a large demand for lithium. China alone will produce 4.5 million electric cars - all needing lithium-ion batteries within the next two years.

Zimbabwe is blessed with a great potential for this commodity associated with pegmatites in various parts of the country. Stories publicizing Zimbabwe as an important source of lithium continue to dominate in newspaper reports. In addition to the world-renowned Bikita lithium deposit, several new projects are under investigation.

Following the resolution of ownership wrangles over the Kamativi dump, the Zimbabwe Lithium Company (ZLC) now expects to complete a pilot plant leading to production of 4000 tonnes per month of lithium concentrates in the second quarter of 2019. The company is confident of securing funding for a plant. ZLC, in which Canadian-listed miner Chimata Gold Corporation has a 19% shareholding, is in a joint venture with the ZMDC to extract lithium from a tailings dump at Kamativi.

The Kamativi tailings were deposited over the period 1936 to 1994 and are derived from the mining and processing of the tin and spodumene-bearing lithium-caesium-tantalum ("LCT") pegmatites there. At Kamativi spodumene is the predominant lithium mineral present, with minor amounts of cookeite, zinnwaldite, petalite and amblygonite being present.

A comprehensive presentation on the Arcadia lithium project located near Harare was delivered to the Geological Society Zimbabwe at the Summer Symposium this year. The deposit is considered to be one of the world's largest hard rock lithium resources. Prospect Resources fully owns the project, which it is estimated that it will produce an average of 75,000 tonnes per annum of spodumene and 155,000 tpa of petalite concentrates during its 20-year mine life. Production is expected to start towards the end of 2018, ground-breaking having taken place.

Premier African Minerals has reported discovery of more lithium deposits at its Zulu Mine in south-central Zimbabwe. The Zulu lithium project near Fort Rixon, has an estimated 20.1 million tonnes resource base grading 1.06% lithium oxide. Premier, which also owns 49% of RHA Tungsten Mine near Kamativi is drilling at Zulu prospect to expand the main mining zone. The new zone has the potential to exceed the already substantial resources and exploration target shown for the Main Zone.

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Australian mining prospecting company, Six Sigma Metals Limited, reported that it had intersected high-grade lithium in a reverse circulation drilling programme at its Shamva Lithium Project in Zimbabwe. The drilling was undertaken at the high-priority Bonnyvale prospect and confirmed high-grade lithium mineralization in spodumene-rich zones continuing at depth below surface outcrops and old workings. Highlighted assay results from two boreholes include 8m at 3.08% from a depth of 1 metre, including 5m at 4.38% below 2 metres; and 32m at 1.42% from surface to include 12m at 2.45% from 18 metres and 5m at 3.83% from 19 metres. Sample analysis of the nearby Loch Ness prospect has also revealed encouraging results with numerous grades over 2% to a maximum of 4.82% lithium oxide. Further discoveries are highly likely in this area.

Prospect Resources Plc, which operates the Arcadia project near Harare, has entered into a 90-day option agreement to acquire the Lipropeg Lithium Project in Bindura, as it seeks further growth to its resource base in lithium. Prospect signed the option agreement with local firm, Pegmaton Resources to acquire the Lipropeg Lithium Project 16 km southeast of Bindura. Prospect wishes to explore for lithium over an area within a 200 km-radius of Arcadia and intends to commence its exploration programme immediately. The first phase will consist of mapping, soil and rock chip sampling and ground magnetics. The follow-up phase will be results-driven, but likely consist of infill soil sampling followed by trenching, and then appropriate short-hole RC percussion drilling.

Botswana Diamonds walks-the-talk in Zimbabwe

Botswana Diamonds and its joint venture partner in Zimbabwe, Vast Resource, are implementing what they promised. The company is stepping up exploration activity at their concession in the Marange Diamond Fields. The decision comes after they received a preliminary geological assessment on the property, which shows several targets for the presence of modern alluvial diamond placer deposits. The report reveals that grades typically range from 100-200 carats per hundred tonnes (cpht), although Vast Resource believes there is potential for grades that might reach as high as 3000 cpht.

Zimbabwe Consolidated Diamond Company (ZCDC) auctions diamonds at last

The ZCDC, which for some reason has been stockpiling its diamond production, finally auctioned 423 066.43 carats to generate $28.3 million. A single carat was auctioned at an average price of $67. The buyers came from United Arab Emirates, India, Israel, Belgium, Canada, Hong Kong, Namibia and South Africa.

It was the country's first sale of the precious stone since February this year as ZCDC had temporarily exited the market ostensibly to allow for development and implementation of an effective diamond value management framework and establishment of a robust marketing and sales strategy. The new strategy is expected to see ZCDC conducting regular diamond sale tenders locally through MMCZ. The diamond mining company will, however, create contact selling arrangements for big parcels and ensure market

diversity by exploring lucrative selling opportunities in Antwerp, Dubai and Shanghai, among other key markets.

Meanwhile, ZCDC has begun to extract conglomerate diamonds. The diamond mining company recently announced plans to increase production of diamonds by 488% to 10 million carats in the next five years from 1.7 million carats produced last year. This would place Zimbabwe as one of the top five rough diamond producers in the world.

Hwange Colliery struggles

The Government has put the ailing coal mining firm under Administration to allow it to recover and potentially return to profitability. Hwange Colliery Company Limited (HCCL), which has been performing badly for several years, has been changing management regularly but without a turn of fortunes for the company. Justice, Legal and Parliamentary Affairs Minister, Ziyambi Ziyambi, appointed an Administrator, Mr Bekithemba Moyo, together with two assistants.

In its first six months to 30 June, 2018 the company reported a $23 million loss compared to $24.5 million in the same period last year. The firm has a legacy debt of $352 million, and had entered into a Scheme of Arrangement with creditors. HCCL has been honouring the terms of the Scheme until recently, resulting in the suspension of managing director Mr Shepherd Manamike and finance and administration executive Mr Tawanda Marapira on allegations of sabotage and incompetence. The company has old equipment which has resulted in high production costs. Employees are owed up to $70 million. The company is considering selling Hwange Town in an effort to pay off their obligations.

The Eldorado disaster

We conclude this contribution with a sad story at the Eldorado Mine that saw the lives artisanal miners perishing underground in the old mine. Twelve to twenty suspected illegal miners were reported dead after a mine shaft collapsed at the mine outside Chinhoyi. The mine was formerly operated by Chinese but had since become a hub for illegal gold miners from as far afield as Midlands, Masvingo and Matebeleland.

Join the Geological Society of Zimbabwe Facebook Group

GSZ Research and Development Fund

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

SEG Timothy Nutt Memorial Fund
(Up to US$1500.00 available for 2018)

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

Strong preference will be given to those applicants who are SEG Student Members.

To become an SEG Student member visit www.segweb.org/join

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

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

Grants are expected to be fully utilized by April 30 following the calendar year in which they are awarded / dispersed. .

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

A 2018 Research Grant application form may be downloaded from
www.segweb.org/StudentResearchGrants

Student Research Grants Committee c/o Assistant for Student Affairs, Society of Economic Geologists Foundation 7811 Shaffer Parkway, Littleton, CO 80127-3732 USA

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Conferences

Geological Society of Zimbabwe

P O Box 1719
Causeway, Harare
Zimbabwe

Zimbabwe Mineral Resource Conference
HARARE - 2020

Dates: To be Announced

The Zimbabwe Mineral Resource Conference – 2020, which will be preceded and followed by geological field trips, will be sub-divided into two morning and two afternoon sessions. It will focus on highlighting the exploration and mining potential in the country.

The four Conference sessions planned are:

- Base Metals and IRMs: Moderators - Drs Tony Martin & Sharad Master
- Chrome and Platinum: Moderators – Drs Martin Prendergast & Allan Wilson
- Gold: Moderators – Drs Paul Dirks & Mark Tsomondo
- Carbon – Diamonds + Fossil Fuels: Moderators - Drs Rosemary Falcon & Hielke Jelsma

Keynote speakers will include Allan Wilson, Hilke Jelsma, Mark Tsomondo, Martin Prendergast, Paul Dirks, Rosemary Falcon, Sharad Master and others.

Interested contributors are requested to submit abstracts of their proposed papers to: barber.brent@gmail.com

GEOLOGICAL SOCIETY OF ZIMBABWE: CONTACT DETAILS OF MEMBERS OF THE EXECUTIVE COMMITTEE FOR 2018

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