

### ***Everything has its limitations Iron ore cannot be educated into gold - Mark Twain 1906***

The papers in this issue are of a pragmatic nature and they provide examples of new applications and improved operating procedures for the well-known physical beneficiation processes. This involves meticulous plant work, and the focus is on optimization in step-by-step engineering improvements. However, spiral concentrators feature in a new application in recovering chromite from tailings from the UG2 platinum reefs. This is now feasible and likely to be improved further with new comminution technology.

There is a great amount of attention to coal fines upgrading for power production and, most excitingly, the plans to combine chromite recovery with electric power generation from coal fines are well in progress. Equally exciting is a recent press announcement about the success of new process technology to make it economically feasible to recover metallic iron from the mountains of waste titaniferous magnetite at Phalaborwa.

I came across the quotation from Mark Twain at the head of this comment. Allowing for some poetic licence to interpret the word 'gold' as a synonym for 'untold wealth', this shows how modern idiom can change the impact of old adages. One assumes that the process, developed by a South African research group, would have application to other low grade ores for steelmaking and would add significance to the advances reported in this issue on upgrading iron ores.

I have used the old terminology of 'ore dressing' as being synonymous with physical beneficiation, the topic of the conference from which the selected papers were derived. This was done deliberately to create an opportunity to record the contribution made by the late Jack Levin, the founder and head of the Ore Dressing Division at the Government Metallurgical Laboratory and the National Institute of Metallurgy (NIM), the forerunners of Mintek. He was the godfather to a host of researchers in mineral processing in South Africa. Many mining engineers and metallurgists derived their knowledge in ore dressing from the courses provided at the universities by disciples of Jack Levin. As indicated in the previous issue of this Journal we are fortunate that mining engineering is receiving much support. I must comment that the training in ore dressing is an essential component of mining, as it is in metallurgical engineering. It is a corner stone in mineral mining and processing.

There is a theme evident in many of the papers in this issue and most others dealing with beneficiation. What are waste discards today can be new starting materials for tomorrow.

Tomorrow is already here, and it might be of interest to the reader to illustrate this theme in an area of the country where Jack Levin and his ore dressing division at NIM were actively involved. This of course included all the mineral provinces of the country, but the area he enjoyed most and to which he made many contributions is Namaqualand, the home of Namakwa Sands, referred to in a paper in this issue. Perhaps the greatest contribution was to provide the technology for the development of the refractory minerals such as corundum, silliminite and andalusite at Pela on the banks of the Orange River.

It was during the war years that assistance was given to Peter Weidner to recover the strategic tungsten mineral, scheelite, from waste dumps using jigs mounted on a truck and water carried

## Ore Dressing

Written by RE Robinson

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from the river in oil drums. Weidner went on to millionaire status and established his Eldorado at Tantalite Valley midst some of the most beautiful mineral/mountain scenery in the world. This valley is the site of a pegmatite deposit of tantalite and lepidolite, one of the few lithium bearing minerals. NIM was much involved in work to predetermine, from the wall-zone micas, the internal composition and value of a pegmatite. There are of the order of 150 000 pegmatites reportedly identified in this mineral province, providing opportunities for many small mining entrepreneurs with good probabilities of finding lithium and other valuable mineralization.

NIM's ore dressing personnel were involved in the Langebaan deposits, the first local source of phosphate prior to Phalaborwa. I am sure the tailings and low-grade sections of the mine will be amenable to improved methods of beneficiation and provide phosphate nutrients for the inevitable food and fuel production in sundrenched Namaqualand.

The ore dressing division played a pivotal role in the debate of the 1970s, as to whether the Black Mountain, Aggenys and Gamsberg deposits (the largest mineral discoveries of base metals in the Northern Cape) should be developed as large low grade base metal deposits using NIM technology, or to allow the richer sections to be mined by conventional methods by the international companies at optimum shareholder profits. The outcome is history and the high grade operations have now been closed. But I am sure that these will be revitalized as the base metal prices increase and the lower grade deposits around the world have to be revisited. The most pleasurable of the NIM assignments was to the State Alluvial Diamond Diggings at Alexander Bay, where NIM's ore dressing division had a standing contract to provide test work and technical advice. The technical team was flown to Alexander Bay by the 'crayfish' flight, a monthly feature of the SA Air Force whose assignment included loading the hold of the Dakota with freshly caught crayfish for the officers' mess. This was in the shadow of the giant diamond operations of the Consolidated Diamond Mines on the Namibian side of the Orange River. At the time, this was the largest earthmoving operation coupled to physical beneficiation processes in the world.

The NIM ore dressing division had and still has a big impact over all areas in South Africa. But these reminiscences might be an appropriate window in the attempt to create jobs and revitalize a most fascinating area with a huge historical background and immense tourist potential.

This, in terms of sustainability, must be coupled with mineral and mining activity which I am sure can be activated, not the least by contributions in ore dressing technology.

There is a proposal that has received a measure of approval to establish a solar power park in Namaqualand. There are thoughts of additional electrowinning and smelting possibilities.

But solar power can take many forms. In Namaqualand it also means frost-free food and fun: food in the form of exotic fruits and luxury items for the markets of Europe, a business already well established at the gold mines at Carletonville; and fun for hordes of tourists in a yearround gateway to sunny South Africa with historic and game park attractions equal to the best available, and an internationally sized airport at Upington to cater for 100 000 tourists a year and many thousands of tons of food freight in return flights to Europe.

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In the light of the experience in 'megaton' opencast seashore mining of diamonds and considering the forecasts and substantial research funding of Richard Branson, I must repeat my frequent reference to algae and suggest that sea water cultivation of algae for aviation biofuels must be seriously considered in the desert coastal areas of Southern Africa. A mini pilot plant is available at the nearby Walvis Bay where the red plumed flamingos are thriving on the crustaceans feeding on the algae in the lagoons of the seawater salt recovery plant. My calculations are that this plan is well within the bounds of conceptual feasibility.

No doubt we can ignore the modern Mark Twains who will object to our claiming carbon credits by using food for flamingos to provide fuel for the highflying jets.