

Centenary Conference—AusIMM

Reviewer: P.R. Janisch

The progress of mining and metallurgy in Australia and their contribution to that nation's economy closely parallel those of South Africa.

Australia's was the second of the three great gold rushes of the nineteenth century. It was centred on Bendigo and Ballarat in Victoria, and occurred in the 1850's, a few years after California's forty-niners. The California goldfield also gave birth to the now common term for a tabular gold-bearing deposit—a 'reef'. Amongst the fortune-seekers were sailors who had jumped ship on hearing of the riches to be found on land. When the gold ran out, and with it the money, the sailors found themselves 'stuck on a reef'. But others, more canny, had accumulated the means to move on, and some came to the Transvaal on the news of the Barberton discoveries. One of them was George Harrison.

Comparatively, Australia had the edge in coal and metals, and South Africa in precious commodities. Otherwise, historical similarities outweigh the differences. Particularly, on both sides of the Indian Ocean and within a year of each other, mining men formed the societies that are today The Australasian and The South African Institutes of Mining and Metallurgy.

South Africans will commemorate one hundred years of the Institute's existence on 24th March next year. The Australians held their Centenary Conference from 30th March to 4th April this year, the last of these days coinciding with their Institute's hundredth birthday. Conference preprints, bound in a handsome volume, now make a very readable collection of current practice description and an admirable historical record. And although it probably did not intend to do so, the volume* contains a great deal that is applicable to our own situation. I shall try to distil it out, at the cost of omitting much of importance and fascination.

MINERAL DEPOSITS

Mining has been portrayed by some as a sunset industry. **B.J. Skinner**, a Conference guest from Yale, in Connecticut, disagrees. While focus may change, substitution does not reduce the need for materials. Americans currently consume about 20 tons of minerals per head per year. The equivalent global figure is 8 tons. As standards increase, and as heads become more numerous, the need will grow. If supply is to keep pace, prices will have to increase to cover the cost of mining less-attractive orebodies, the energy used, and the environmental protection measures that must be taken. This also assumes that these orebodies will actually be found (at some expense) beneath the cover of younger rocks.

Skinner mentions one particular consequence of this growth in mineral utilization. Humans themselves have become a geological force. To meet their needs, earth's 5.5 billion people dig out 44 billion tons of materials to use directly and indirectly in feeding, clothing, sheltering, warming, cooling, and entertaining themselves. Compare

* The Conference Proceedings can be ordered from The Australasian Institute of Mining and Metallurgy, Clunies Ross House, 191 Royal Parade, Parkville, Victoria, Australia 3052.

this with the estimated annual 16.5 billion tons of sediment and dissolved solids transported to the sea by all the world's rivers. This, above all, quantifies the environmental cost that the mining industry will have to meet.

Two papers described notable recent mineral discoveries in Australia. One of these, Century in northwestern Queensland, was the result of extended exploration perseverance. The general region had been investigated for more than 40 years. Zinc and lead geochemical anomalies had been identified over the period but, only by painstaking geological and structural analysis supplemented by geophysics, was the orebody eventually outlined.

J.V. Main, chief geologist to CRA, observes that exploration is an essentially long-term business, demanding sustained levels of expenditure. Target selection is a crucial, but imprecise science. How and why deposits occur where they do is not yet fully understood. New types exist that do not respond to the exploration techniques that found known deposits. A corollary to this, that world-class orebodies can still be found, even on surface, in well-explored terrain. No area is ever fully explored.

R.N. Smith describes the copper-uranium-gold-silver deposit at Roxby Dawns as a case in point. A conceptual model had been developed for the formation of sediment-hosted copper deposits through the oxidation of basalts. The Stuart Shelf province of South Australia seemed to fit the concept. Certain lineaments were recognized that reflected deep basement structures. Geophysical measurements then identified the Olympic Dam area for drill-testing. The deposit was found in the first hole at a depth of 336 metres below flat-lying sedimentary rocks.

Eighteen years of subsequent study has refined the model, but the discovery of 450 million tons of measured and indicated resources remains an exploration classic.

MINING AND METALLURGICAL PROGRESS

Mount Isa in Queensland has been producing lead and zinc since 1925. Two of its senior management team, **B.J. Sullivan** and **C.F. Clifford**, review technical developments during that time as a series of significant step-changes superimposed on a continuous evolutionary process. The eight they have isolated and highlighted may prompt discussion of an equivalent South African list:

- geophysics in mineral exploration
- atomic-absorption spectroscopy and X-ray fluorescence spectrometry in assay laboratories
- hydraulic fill
- sintered, carbide-tipped steel tools for rock drilling
- ANFO blasting agents
- non-explosive tunnelling, in particular raiseboring, which they regard as an irreversible change because the skills it replaced have now been lost
- new materials improving resistance to heat, fatigue, corrosion, and wear
- electronic communication, information processing, process control, and automation.

Sullivan and Clifford mention productivity gains but note that they have mostly happened in parallel with increasing capital intensity. The industry, they say, is still plagued by a high lost-time and injury frequency, ore dilution, long material-in-progress cycles, low availability of plant and equipment, and continuing excessive use of labour and energy.

World class performance in mining would be characterized by

- rapid capital recovery
- low cost per ton
- short material-in-progress cycles
- low labour input
- high employee involvement and contribution
- zero injury rate
- high ore recovery
- low ore dilution
- low energy usage.

Their opposite numbers at Kalgoorlie, **M. Cutifani** and his colleagues, describe the organization of resources at the Super Pit, where several pre-existing pits and underground mines have formed one operation moving 50 million tons of rock a year. All pit activities are undertaken by contractors. The whole operation is monitored continuously in a search for maximum efficiency.

The metallurgical content of the conference was low. **R.J. Batterham** of CRA, explains that Australia has a history of purchasing metallurgical know-how, but that technology worldwide is now becoming more aligned with corporate goals. Leading-edge developments will not be as widely available as in the past. Australia's competitive disadvantage will compel her to cultivate her own expertise.

As if to emphasize this point, one of the other four metallurgical contributions comes from BATEPRO in Johannesburg.

Australians do, in fact, have a remarkable track record of metallurgical innovation. Missing from the Conference were papers on the Siros melt process and its off-shoots: ISAsmelt and Ausmelt for basemetals, and HIs melt for the direct smelting of iron ore with coal.

Batterham also alludes to the growing need to mine and extract minerals without generating waste production, and quotes a mission statement for Dupont Australia:

'We will reduce emissions until there are none. We intend there to be no waste; we will recycle all by-products, and where possible will turn them into products.'

For Dupont's sake one hopes that Australia does not behave like California and turn lofty aims into law.

MINERAL ECONOMICS

Over the 20 years to 1990, according to **R.J. Macdonald**, the Australian mining industry generated a negative real rate of return. So why did investments, to the tune of \$A 70 billion, continue over this period? It depends on when and for what periods you do your calculation. Analysed for different holding periods 5.5 per cent per annum gives a better approximation, allowing for cycles in asset prices.

Since empirical evidence in Australia and abroad suggests a real-term cost of equity of less than 7 per cent, MacDonalD remains puzzled that mining companies continue to expect minimum rates of 10 to 15 per cent for capital budgeting purposes.

The level of investment in mining since 1960 exceeds \$A 90 billion, with a further \$A15 billion spent on exploration. With about \$A1 million spent per employee, this capital intensity creates, and continuously demands, high labour productivity.

In a well-constructed and wide-ranging paper, **P.J. Christensen** sets out the requirements for foreign investment and laws governing mining in Indonesia, Vietnam, Malaysia, the Philippines, and Thailand. More comprehensively, **S. Bordia** describes the mining industry of Papua New Guinea.

South Africans might usefully heed the points made by **R.T.H. Aldous** on the subject of world mining investment.

There is increasing confidence in the stability of many third world and developing countries, which is now attracting exploration and investment capital previously directed at established mining economies in North America, Australia, Europe, and Southern Africa. Some of the projects requiring capital and technology in the CIS, Africa, and Latin America are technically very attractive. The end of the 'cold war' and the influence of the IMF are gradually changing their risk profile for mining investment.

Mining companies that grew rapidly in the recent gold boom are now finding competition to be tight in the traditional economies. This forces them to look offshore in the face of difficult working conditions, higher operating costs, and foreign cultures. Several are projects with risk/return equations at least as favourable as at home. The trend is fuelled by developing countries marketing their mineral exploration and mining potential, selling off government mines, and creating the stable, attractive fiscal and political regimes that draw foreign investment.

The obvious risk involved in spending into these economies is in many cases offset by grade and tonnage advantage, and the movement away from developed economies is accelerated by ecological and environmental pressures back home. In the light of these trends, it is probable that a significant proportion of Australian mining investments will move offshore during the 1990's. The challenges for Australians are

- managing risk and investment in foreign locations
- looking for projects in the lowest quartile of operating costs
- exporting expertise ahead of North American, South African, and European competitors
- tapping into broader equity markets.

This also creates a challenge for the Australian government, which is to keep some exploration and development capital at home by creating fiscal, environmental, and land-access policies that remain attractive to mining companies.

THE GUILT INDUSTRY

The Australian reputation for forthrightness was preserved in a keynote address delivered by **Hugh Morgan**, of Western Mining.

While the Conference largely and correctly concerned itself with traditional issues—how to explore, bog, bore, and fire more effectively, and productively—the more pressing problems in Australia are now cultural, rather than economic or technical.

Since 1788, Australians have been building things—roads,

railways, mines, farms, factories, city halls, opera houses, and universities. Public and private architecture has been the outward and visible sign of a growing and confident civilization. Faith and confidence, more than physical resources, created the society now inherited. This culminated in post-war immigration, which increased the population by 53 per cent between 1950 and 1970.

It was in the late 1960's that the 'guilt industry' took wing. It held that Australian prosperity and freedom are possible only because Aborigines are poor and dispossessed.

The highwater mark was reached with the recent Mabo case in the Australian High Court, which had the result that Crown ownership of minerals becomes challengeable, and compensation to original owners becomes payable. For the mining industry, property rights and security of title have become bargaining chips in the politics of Aboriginal separation.

On top of this, Australia now faces demands voiced by 'spokesmen' for over-populated Asian countries to accommodate 300 million refugees on its wide open spaces.

The mining industry has been set up as a scapegoat by the guilt industry. In resisting the imputation, as it must, the industry must also vigorously defend the ideals that brought Australian federation to fruition in 1990.

ENVIRONMENT AND HERITAGE

As befits a Conference of this nature, many papers covered environmental responsibility and the heritage and history of mining in Australia. In a way, there is a connection between the topics. While there is nothing in the environmental area that is unfamiliar to South Africans, the history is of interest, and it closely mirrors our own, particularly in the nature of the personality that emerged over some 150 years.

Wonderwater lives up to its name environmentally*

Sasol Coal's Wonderwater strip mine extension to the Sigma underground colliery at Sasolburg applies one of the most stringent environmental control procedures to be found on any mine in South Africa.

The high level of attention given to all aspects of the environment—ranging from control over water and dust to prevention of visual and noise 'pollution'—is to a large extent due to the fact that the mine is located close to residential settlements.

The strip mine, established to augment the aging Sigma mine's production, is situated north-west of Sasolburg. The nearest residential suburb of Sasolburg is only 3 km away, while riverside properties on the Transvaal side of the Vaal River north of the mining site are 2 km away as the crow flies.

Mining has proceeded with a minimum of disruption to the lives of these communities. Prior to, and during establishment of the mine, Sasol Coal carried out a comprehensive communications programme to ensure that all queries and problems were addressed. This included meetings with all concerned groups to explain the economic necessity of the project for the future prosperity of Sasolburg as well as address environmental concerns.

Such groups included the River property Owners Association, local environmental groups, the Department of Water Affairs, the Sasolburg Town Council, the Sasolburg Chamber of Commerce, and all Sigma employees.

Wonderwater management strictly applies a policy of responding to, and dealing with any complaint within 24 hours of it coming to their attention. 'As soon as we receive a complaint, a senior member of staff communicates with the person concerned to establish first hand, the exact nature of the complaint and to reassure him or her that the matter is receiving immediate attention at top level. We then try to remedy the problem as quickly as possible,' says Riaan Rademan, manager of the Wonderwater project.

Most of these groups have commended Sasol Coal for its open-handed and responsive approach.

But equally crucial to the success of Wonderwater's environmental programme to date, since the R115 million project got under way in August last year, has been the thoroughness with which the mine has attended to the

environmental problems themselves. The result is a comprehensive control and monitoring system.

In addition to the stringent environmental control systems which were planned well in advance of the project getting underway early this year, Mr Rademan initiated the establishment of a 100 ha game park on the mine property closest to the Vaal River. This innovative scheme is close to the wetlands area which is being established on an old sand mining site and which is aimed at attracting more bird-life into the area.

The first game, which includes gemsbok, takbok, zebra and ostriches, was moved into the new game park at the end of July.

The integrated water management system at Wonderwater is similar to that which has been successfully applied at Sasol Coal's other strip mine, Syferfontein, near Secunda.

The system, designed by Dr Ian Green and Mr Chris Waygood of Jones and Wagener Incorporated, consists of a network of dams and canals in which the 'dirty water' emanating from the workings is allowed to settle and is re-used for dust-suppression, while clean water—run-off water from the sand dumps—may be channeled via the canal systems into the wetlands area or directly into the Vaal River.

Water monitoring is done automatically and continuously by means of strategically placed solar-panel driven data-loggers which take readings every 10 minutes round the clock seven days a week.

Other environmental measures applied at Wonderwater are:

- automatic continuous monitoring of ground vibrations and sound by means of seismographs. Blasting is done in daylight on week-days.
- Automatic and continuous dust monitoring from a weather stations established on site especially for the purpose. In addition twenty dustfalls buckets are dotted around the area. The Atomic Energy Board collects and analyses the contents monthly.
- Rehabilitation of dumps. In consultation with the Chamber of Mines' rehabilitation unit, Sasol Coal has already planted a 'cocktail' mixture of grass species on the first of the dumps at Wonderwater.

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AusIMM centenary

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He addressed the gathering as follows.

'Mr President, distinguished guests, ladies and gentlemen. Mr Hannes Hoffman, the President of The South African Institute of Mining and Metallurgy was scheduled to attend this Centenary Conference as a delegate, but unfortunately had to withdraw at the last minute. He has asked me to convey his congratulations and good wishes to The Australasian Institute of Mining and Metallurgy on this significant occasion, and he has also asked me, as Corresponding Member of Council, resident in Australia, to present this plaque to Mr Allister McLeod, President of the AusIMM, on his behalf. The inscription reads *Presented to The Australasian Institute of Mining and Metallurgy on the occasion of their centenary 1893-1993 from The South African Institute of Mining and Metallurgy.*

'I would like to take this opportunity to inform you all that The South African Institute of Mining and Metallurgy has its 100th birthday on 24th March, 1994, and will be holding its Centenary Conference there at that time. With the changing face of South Africa, the mining industry is having to re-think its philosophies and planning for the



Mr Roy Swan (left) presenting the SAIMM plaque to Mr Allister McLeod, President of the AusIMM

future, and a visit in 1994 would be intriguing from many aspects. I urge you all to give consideration to such a visit. I know you will find it extremely interesting, and I know that you will receive a very warm welcome from the SAIMM.'

The Conference was a great success—well-organized and well-attended, with a high standard of presentations. The Annual General Meeting, held on Sunday, 4th April, was of particular interest because it was the actual day, one hundred years before, that the inaugural meeting of the AusIMM had been held.

Understanding mining taxation*

KPMG Aiken & Peat's Tax Practice has published *A Guide to Mining Taxation in South Africa*, which covers the law prevailing after the amendments passed in June 1993.

Where a mining project has been successful, the payback to the investor is very often a significant one, and over the years the sector has been a consistent contributor to the State's coffers by way of taxes and the State's share of profits. However, in view of the risks and delays which face the investor, the State has had to provide some form of compensation to attract investment. This has been accomplished via the tax treatment of mining operations which has developed differently in some ways from that applicable to other forms of trade.

Mining has consequently become a rather specialized area of tax law and this has tended to create the impression that it

is subject to a completely different set of rules. This is certainly not so. KPMG Aiken & Peat has prepared this guide to assist:

- mining executives with no financial background—providing an appreciation of the impact of tax on the success of a mining operation
- mining tax advisors—providing a ready reference to the Act and the case law
- potential investors in mining shares—providing a basic understanding of how the tax treatment of mining differs from that of others types of operation.

The Guide is available from all KPMG Aiken & Peat offices.

* Issued by Lyrr Thurston, Marketing & Communications Department. KPMG Aiken & Peat. Tel. (011) 332-7365.

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- Tree planting. Early this summer, Sasol Coal will plant more trees between the mining site and the Vaal River to protect riverside residents against unsightly mine workings. This will add to indigenous trees which already partially achieved this.
- Indigenous garden. This has been established at the entrance to the mine by a local property owner. It contains plants reclaimed out of the mining area.

Work on the Wonderwater strip mine project commenced in August last year. The mine started producing coal in January, with current production running at about a third of planned full production of 2,8 million tons per annum, which is scheduled to be reached by July next year.

* Issued by J. Kraft Public Relations, P.O. Box 28552, Kensington 2101. Tel (011) 614-8587 or Fax (011) 614-6805. On behalf of Sigma Collieries, P.O. Box 32, Sasolburg 9570. Tel (016) 76-0000 or Fax (016) 73-3810.