

AUSTRALIA AND THE LURE OF GOLD

Australia is a country and a continent by itself, which shared part of its geological history with India. Continental drift separated the two land masses. The Australian minerals industry has a long and important history- It is the economic lifeblood of Australia and has helped develop the nation create high standard of living that people enjoy today. The exploration and extraction of gold has changed so many aspects of life in Australia. Country's settlement patterns, transport routes, immigration policies, vegetation, architecture and water supplies can be attributed to gold discovery. Australia is the world's third largest gold producer (nearly 3001), after South Africa and USA- Gold is the third largest non-petroleum export adding \$5 billion into the country's economy and generating huge employment. Australia underwent tremendous technological advances in mineral exploration industry that flourished with massive private capital investment, with governmental infrastructure and regulatory support. Australia can boast of having the faith and the know-how to move mountains to produce gold.

I present here the gist of a fascinating Story that appeared in *"The Australian Geographic"* ("Gold - How our lust for lustre has changed the face of Australia" by Ken Eastwood, v.72, Oct-Dec.2003, pp.52-71), celebrating Australia's rich gold history. A great read about the gold, story and how a bright, yellow, remarkable metal, gold, shaped a nation. The author has laboured to put all the sequence of events and facts in the form of a story, from interesting conversations he had during his research and expeditions to gold fields. The story headline is printed in the background of gold nuggets. Story begins with the remarkable metal's distinctive characteristic of gleam, glittering and radiating warmth of hard won gold - the most precious thing in the world.

What this heavy metal means for different people: to sportspeople, gleaming gold is the pinnacle of their careers. A ring of gold is a symbol of union, adoration and faithfulness to a bride and groom. This soft, easily worked metal has symbolised power, opulence and beauty for more than 5000 years. A lump of gold can be beaten into a sheet or stretched into a thread. It's reflective properties and conductivity has been used in spacecraft, buildings, in high-tech gear such as cameras, computers, cars' air bags. In preserving equipment such as undersea telecommunication gear, gold is used as it does not corrode in harsh environments. Interestingly, gold's overwhelming use is not serious! 80 per cent of 2,300 tonnes of currently

produced gold every year in the world ends up as jewellery. 30,000 tonnes of bullion and about one-quarter of all the gold ever produced sits in the bank vaults doing nothing.

Author gives a historical account of gold rush in Australia and narrates the story about how in the days of gold rush, thousands gave up jobs and family life to very remote places, risking injury, sickness in the unsanitary conditions and even death. Many gambled their lives to walk across waterless tracts of land pushing meagre belongings in wheelbarrows. In those days gold served as a society leveller. Oxford scholar, policemen or labourer, their background meant nothing - only how tirelessly they work and whether lady luck decided to say "g'day". Author proudly states that the search for this metal, both historically and today is so quintessentially Australian.

Gold rush spread to every corner of Australia, like the outbreak of a disease. Gold fever started in 1851 at Ophir, near Bathurst in New South Wales, spread virulently to Victoria in the area known as the Golden Triangle, between Bendigo, Ballarat and Stawell. In the first half of the 1850's this resulted in the population of Victoria being quadrupled. Queensland was hit in 1870s and 1880s and finally Western Australia in the 1890s. Shafts were dug every few meters and trees were put to the axe for firewood or for timber. Many people were lured to the goldfields and few realised the hardships ahead. The diggers used to sing "I made a fortune in a day, and spent it in a week!" The gold rush has never stopped. Fossickers are rarely seen without metal detector, headphones and sunglasses clamped on their heads. The nugget size did not matter, "as long as it is yellow" they did not throw it back.

Author went fossicking with fossicker north of Bendigo. He was warned that if they found something big he has to keep his mouth shut about where they found it. There was a bloke a couple of years back found a good patch of gold. He must have had too many drinks, but he was talking about his find in the pub that night. There were 38 cars at that site in the morning after!

The story brings out past gold fields killings: scene of full circle fighting with guns and gold licence. Murders, violence and riots became almost common place in the early gold fields. Diggers were everywhere and fuelled by xenophobia. Asian invasion, bad conditions, the crippling cost of mining licences, overbearing policing and government corruption were reasons for the fights. The famous site of one of the bloodiest altercations - the Eureka Rebellion at Ballarat in 1854 is mentioned (now is a peaceful

park) This brutal battle of Eureka has been memorialised in verse, song and art including painting by eyewitness as they were overrun by the army and police troopers. Some escaped, some wounded while others were beaten to death.

The licence cost was an outrageous 30 shillings a month, irrespective of whether or not gold was found. Miners had no right to vote. Licence hunts demanded that diggers produce then licence at any time. Having a wash or being at the bottom of the shaft was no excuse. Not producing licence means punishment of fines, being chained to a log or hard labour. Problems escalated when troops arrived to help keep control. The troops were met by the angry diggers who pelted them with rocks. The military and police stormed the stockade. Outgunned and outnumbered, the diggers were in an ugly bloody bath. Diggers and troops were killed. A royal commission was set up to examine gold fields conditions. As a result, the miners got their rights, everything they had fought for - the abolition of gold licence and the right to vote.

Some interesting conversation author had with underground miners and their body language, all of their own. They call rest of us 'moths' because we like the light. They work solid 12 hours shifts. They don't get sun burnt or skin cancer. The temperature is always the same, winter or summer and there are no flies. They have their own body language while underground, they should not look anyone directly in their face, because miner's lamp will temporarily blind them. Underground miners therefore point their heads slightly away from and shift their eyes sideways. Because of this ingrained habit old hands even do it above ground.

The story tells diagrammatically where to find gold. "Gold is where you find it", is a cliché commonly used by fossickers. Despite the geological rules, it regularly seems to break those rules - as if had a mind of its own. Geology tells us where gold deposits are most likely to be concentrated. The magma (hot fluids) carry gold particles from deep below the surface. The liquids move through weaknesses in the earth's crust, gold drips out of solution as it cools. By long term erosion or earth movement, gold rich veins can become exposed and gold is concentrated on the surface as the veins break down. Ancient creeks and rivers washed the exposed nuggets and grains of gold can be found down-stream. The story is accompanied by a spectacular photograph of Kalgoorlie's Super Pit (nearly 2 km across, 3 km long and reaching depths of 400 m). This is the Grand Canyon of Australian gold mines. The legendary Golden Mile - the richest square mile of gold-bearing dirt in the world. Charts and maps are provided showing today's

industry, world production, golden years of discoveries and countries that produced more than 45 tonnes of gold in 2002. Gold rush spread to virtually every corner of Australia, like the outbreak of a disease. Series of gold rushes, and the development of transport and settlement patterns are highly influenced by the discovery of gold.

Step-by-step processing of gold from dirt to dazzle has been given. Mining, crushing, grinding, leaching, electro-winning, smelting and refining. The story discusses about big money involved in the industry. Today's gold mine does not come cheap and the high-tech is the go. Fleets of heavy trucks and equipments and each truck capable of drinking up to 5000 litres of fuel a shift and chewing up 3.5 million worth of tyres in its life time. From this one can imagine the cost of mining.

Author presents a balance sheet of environment and states that "like any large-scale, vibrant industry, gold production has an impact on the environment. Those for and against the industry don't always agree on the best ways to minimise that impact". Accidents do occur and protocols are ignored. Associated problems are cyanide spills, killing of animals and damaging river ecology, salt water being pumped from many big mines to stop them from flooding. Some salt water is used to process the gold, and some is spread on the dirt road to keep dust levels down - leaving thick layers of salt on the surface. Much is stored in on-site reservoirs. Sulphide roasters are needed in some cases to help process the gold-bearing dirt. That can create poisonous gases such as sulphur dioxide and arsenic trioxide. In some mines bacteria are used to break down the ore. Alternative to roasting. New mines are faced by local community opposition to proposed gold mining sites. Gold companies are winning awards for revegetation. Fuel for fires - three million ha of woodlands around Kalgoorlie were destroyed for the gold fields over 65 years from 1893. Such major changes to the environment are part of gold's legacy.

While listing the associated risk, gold mines nowadays have to operate on huge scale to remain economically viable. 60% of the world's mining software has been developed in Australia. This will give an extra edge for systematic mining. Most operations are recovering gold from ore with no more than 1 to 5 g/t. Kalgoorlie Super Pit, a massive scar on the earth which only produces nearly 28 tonnes of gold per year. A sudden drop in the price of gold could affect not just profit or loss, but the jobs of employees. Story tells "When gold goes wrong, Kalgoorlie goes wrong. Town goes through good years and bad years, depending on the gold price. It's no wonder why a pub in the main street has a sign that every few seconds flashes the latest world

gold price". Still gold is essential to the economy. It is the biggest Australia's manufactured export and can be a good investment portfolio apart from wives always want to wear gold.

During the course of researching this story, author finds the percentage of overseas control of Australian gold production. It has been called the Great Australian Gold Robbery. Overseas interests have robbed the king's share of Australia's gold production (30% Australian, 20% South African, 23% USA, 25% Canadian, 2% European/other). The foreign ownership has gone from 20% to 70% in five years. No one seemed to notice the increasing foreign control of \$5 billion export industry. It is like having all our farms owned overseas. It has become an accepted corporate reality in an era of increasing globalisation. People look at each

other on a regular basis to take over companies and plan for a coup.

The story on the history and industry of gold ends with the discussion about how all this money and effort being spent to produce gold - a generally non-essential product than other basic materials with greater practical utility such as nickel or aluminium. Why one would not ever get excited about other than this magical metal gold. The answers were 'gold is fabulous to look at and it has got this mystical power- it has got millenniums of history'.

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INDIAN PENINSULAR PRECAMBRIAN TERRAIN AND METAL POTENTIAL: A NEW APPROACH

Sediment hosted base metal deposits range in age from 900Ma to 2600Ma in tectonically active intracratonic settings within fault-controlled basins. Indian Precambrian metallic deposits present remarkable contrast in terms of their metal distribution and litho-tectonic association. The geological setting when compared to metallogenic and geological setting elsewhere on global scale provides scope for re-assessment of the Proterozoic terrain with respect to its metal potential. Mineral deposits available at shallow depths have already been discovered by virtue of their signatures on surface in form of ancient workings and gossanisation etc. but, deep-seated metal deposits which could be available in the existing conducive geological setting need to be studied and discovered. Future discoveries will depend on the input of modern exploration technology available based on integrated geological models.

Introduction

Mineral resources play an important role in the development of any society. They provide raw material for building, chemical, metal industries and fuel for industrial purposes and opportunity for earning livelihood. India depends to a great extent on the early and middle Precambrian for its need of metals as, the late - Precambrian and the post-Cambrian history of sedimentation is very limited in the Indian subcontinent since they are mostly

platform or intracratonic in nature, without much of magmatic/volcanic activities in the basins, which are the major source of metal concentrations. A vast area of Western and Central India is covered by the Deccan Trap, which so far has not shown any major metalliferous concentration. The known Lead-Zinc occurrences/resource in various geological environment in India is shown in Fig.1.

There is a significant preferential distribution of lead-zinc occurrences/prospects in Aravalli/ Delhi basins as

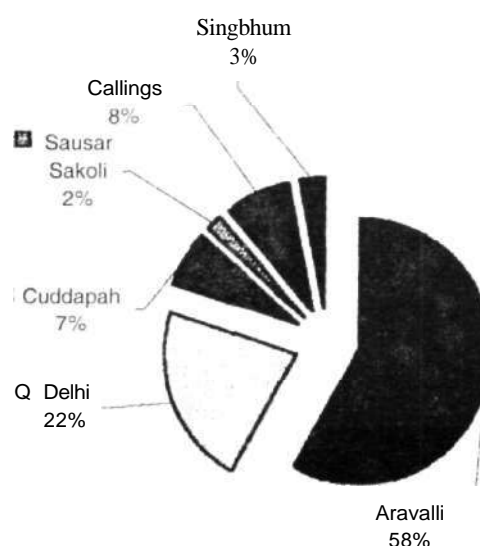


Fig.1. Distribution of Pb-Zn deposits by geological environments.