Australia’s 21st Century Gold Industry

Delivering value for Australia since 1851

165 YEARS
'In the eyes of most Australians, gold belongs to the romantic past. But as this book shows, it remains a mighty industry.'

Professor Geoffrey Blainey AC | Historian

Australia’s 21st Century Gold Industry

**282t**
PRODUCTION
Australia produced 9 million troy ounces in 2015-16, 10 per cent of global gold production.

**$16b**
EXPORTS
Export earnings in 2015-16. Australia exports gold to more than 55 countries.

**$2.4b**
ROYALTIES
Royalties paid by the industry since 2005-06. In 2014-15, the industry paid $317 million.

**27k+**
EMPLOYMENT
More than 27,000 people were directly employed by the gold industry in 2015.

**$143k**
HIGH WAGES
Average wages in the gold industry exceed $140,000 – 70 per cent above average.

**Cadia**
Newcrest Mining Limited discovered the Cadia Hill orebody in 1992. Today, Cadia is one of Australia’s largest gold mining operations. Since commercial production began in 1999, Cadia has produced more than 9 million ounces of gold.

Image courtesy: Newcrest
Gulgong miners
Miners try their luck at Gulgong in New South Wales (circa 1870). Records show the area produced 555,205 ounces of gold between 1870 and 1927, although the true figure is thought to be closer to 1 million ounces.

Image courtesy: State Library of New South Wales
The rush for Australian gold, which so excited the world, has never ended.'

Geoffrey Blainey AC
165 golden years

Australia’s first big rush in search of gold began in 1851.

The searchers set out from Sydney on foot or horseback or sitting in coaches and carts, and slowly crossed the Blue Mountains. Reaching a winding creek not far from the present rural city of Orange, they found tiny pieces of gold – thousands of them – in shallow soil.

So many people set out for this gold rush called Ophir that the whole economy of eastern Australia seemed to be facing chaos.

The government in Sydney shrewdly resolved that all gold diggers should buy an expensive licence. They hoped that those diggers who found no gold would return to their old jobs on the wharves, sheep stations, building sites and even shops and schools.

A few months later, near the wool ports of Melbourne and Geelong, gold was found over a vast area. Some, embedded beautifully in white quartz rock, was found by shepherds watching their sheep.

A few of the huge ‘nuggets’ of gold, found close to the surface of the ground, were so valuable that just one piece, the result of a few hours of digging, could enable the discoverers to do no more work for the remainder of their life.

Within a year, the tent towns of Ballarat and Bendigo were world famous, and were attracting men – and a few women – who boarded fast sailing ships in Liverpool and other British ports for the long voyage to Melbourne.

Speed was considered essential and many ships, with their tall masts and massive sails, captured the favourable winds far out to sea and saw no land all the way between the English coast and the hills close to Port Phillip Bay and Melbourne.

By 1855, Australian gold diggers were joined on several new goldfields by numerous strangers who had walked from villages in south China to Hong Kong and Guangzhou where they crowded into small sailing ships bound for Victoria.

The golden 1850s transformed Australia. In the space of ten years the population trebled. This was the equivalent of today’s Australia, with its 24 million people, totalling 72 million within the next ten years.

Spurred by gold, Victoria dominated the continent’s economic and political life. Melbourne swept past Sydney, retaining the title of the nation’s largest city for half a century. By 1860, the average Australian probably had the highest standard of living in the world. Their wealth, and their demand for so many goods that could not be produced here, revitalised British commerce and shipping.

For several years, when Britain was the world’s greatest exporter, 15 per cent of its exports went to Australia. Even the United States joined in this profitable long distance trade, one of its glamorous exports to the gold towns being shiploads of raw winter ice cut from Boston ponds. In slowly crossing the equator, the ships inevitably lost much of their ice in the heat.

Year after year, the seekers poured into the main gold ports. Their first nervous response on arrival was to ask: ‘Is there any gold left? Has it all been dug up?’

'The golden 1850s transformed Australia. In the space of ten years the population trebled ... By 1860 the average Australian probably had the highest standard of living in the world.'
The understandable fear that the richest gold would be mined out was nullified by the finding of rich lodes at great depth. By 1890, some Bendigo shafts descended ‘half a mile’ into the hard gold-bearing rock. By the First World War, they were down a mile.

The gold rushes, beginning in the south east corner of the continent, went right along the Pacific coast of Queensland, across the Northern Territory and along the Indian Ocean in Western Australia, creating scores of gold towns, large and small, along the way.

Kalgoorlie, the greatest of all the goldfields and still busy, was discovered in 1893.

Western Australia’s many goldfields, nearly all standing in arid terrain, have dominated the industry for more than a century.

Today, in the eyes of most Australians, gold belongs to the romantic past. But as this book shows, it remains a mighty industry.

Far more gold is now mined than in the most stirring year of the 1850s. The industry has revived and then declined, but with the most remarkable revival beginning in the 1980s. Indeed each year it produces three times as much gold as was mined in the most exciting years of the 1850s.

The early prospectors, with their pick and shovel, found the first signs of most of Australia’s valuable deposits of gold. But the latest technology and ingenious methods of exploration occasionally find massive lodes which the early diggers simply missed.

The leading New South Wales mine today is at Cadia, close to the little creek at Ophir where the first rush of 1851 occurred. Cadia produces each month far more gold than Ophir produced in its short working life.

So the rush for Australian gold, which so excited the world, has never ended.
Gold exists in greater abundance in Australia than any other country in the world.

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Warning
Please be aware that this publication may contain the names or images of Aboriginal and/or Torres Strait Islander people who may now be deceased.
Gold
Symbol Au
Atomic number 79
Mass number 196.96
Melting point 1063°C
Boiling point 2087.8°C
Density 19.32 g/cm³
Malleability High
Ductility High
Durability High
Conductivity High

Image courtesy: iStock
The 21st century rush for gold

Demand for Australian gold is at a 10 year high. Australia's modern gold mining industry is at the heart of the global gold resurgence.

Gold exists in greater abundance in Australia than any other country in the world. Modern technology and the pursuit of a proven global currency during uncertain times are driving the modern rush for this highly-prized metal. At the heart of this global resurgence is Australia's modern gold mining industry.

Australia is the world's second largest gold producer after China, with 282 tonnes of production in 2015-16, the highest level in 13 years.1 Australia has the world's largest share of economic gold reserves and is also a large contributor to the global gold trade with exports valued at more than $16 billion annually.2 Australia is a key player in the global gold industry.

Gold demand

Gold's unique properties are in demand. Chemically inert, gold's non-reactivity makes it safe for use in the human body. It is also the most malleable of the metals, which means it can be beaten into thin sheets and used as a shield against heat and light. Gold is also a ductile metal, which means it can be transformed into thin wires or threads for use in jewellery and clothing. It is also a highly conductive metal, which means it can transfer heat and electricity, making it the metal of choice for high end electronics.

Annual 2015 gold demand was 2,415 tonnes (35 per cent) for investment, including central banks and other institutions; and 331 tonnes (8 per cent) for technology. Global gold demand in 2015 was 24 per cent higher than a decade ago.3

It is estimated that about half of all gold in above-ground reserves exists in the form of jewellery. The contemporary aspiration to own and give gold in the form of jewellery transcends national boundaries. The rising economic power and emerging consumer class of East Asia is a long-term driving force for gold demand; with China and India the largest markets for gold jewellery.

For private investors and central banks, gold and gold-backed products are a proven currency that is a ‘safe haven’ for wealth and an important means to diversify investment portfolios. Investment was the largest component of gold demand in the first half of 2016, reflecting heightened uncertainty generated in part by unparalleled loosening of global monetary policy, according to the World Gold Council.4

Gold’s unique and enduring qualities are also finding new markets and applications in the 21st century. While the electronics sector dominates industrial demand for gold, its unique properties and the advent of nanotechnology are driving new uses in medicine, engineering and environmental management.

1 Outer space
Gold-coated visors help protect astronauts’ eyes from dangerous rays in space. Gold is also used on various surfaces of spacecraft, including the windshields of jets, as well as modules and space stations because of its high resistance to solar radiation. Back on earth, city buildings like the Royal Bank Plaza in Toronto, also benefit from gold’s reflective properties. Its 14,000 windows are coated with a thin layer of 24 carat gold – around 2,500 ounces – to reflect light and reduce power bills.

24 carat
GOLD FACTS
Nanotechnology

Gold’s enduring qualities are finding applications in the 21st century that the Egyptian pharaohs could never have imagined. The number of published patents using the words ‘gold’ and ‘nanoparticles’ has grown from virtually zero in the 1990s to more than 1,500 in recent years.

Researchers are finding that gold’s application as a nanomaterial – a nanometre is one billionth the size of a metre – can be used to deliver drugs into the human body; to create conducting plastics and specialised pigments; or advanced catalysts which can purify water or air.

The nanotechnology boom has opened up a new frontier of early detection, diagnosis and treatment of diseases. Gold nanoparticles are being used to target and deliver antibodies directly into cancerous tumors. They are also being engineered to attach to cancer-related proteins to aid earlier detection of some cancers, such as prostate cancer.

In the developing world, simple and cost-effective diagnostic tests are making inroads into the detection of malaria. Gold nanoparticles drive a colour change if malaria is present in a drop of blood applied to a test strip. According to the World Health Organisation, 319 million malaria rapid diagnostic tests were sold in 2013.

Gold nanotechnology is also revolutionising health analytics. One company is using gold electrodes and wires just a few hundred nanometers thick on skin patches that monitor patient hydration and inflatable balloon catheters that measure a person’s heartbeat. Serpentine gold wires elongate when the polymers stretch, according to the MIT Technology Review, and the electrodes measure electrical impedance in cardiac tissue or moisture levels in the skin.

Environmental nanotechnology is also gaining momentum, finding new solutions to old problems. Specially designed
Medieval nanotechnology

The first nanotechnologists were medieval artisans. They discovered that mixing varying amounts of gold chloride in molten glass created tiny gold spheres that reflected light and produced different colors. Stained-glass windows are some of the earliest examples of nanotechnology at work. The Lycurgus Cup – a 4th century Roman glass cup – is another. The incorporation of nanoparticles centuries ago makes it appear either red or green depending on the direction of the light.

At nanoscale, gold displays unique properties which scientists around the world are still unravelling, but the prognosis is good. Gold promises to be the alchemy of the 21st century and its increasing application in the medical field, as well as across industry and the environment, indicates demand for Australia’s gold will remain strong for decades to come.
**Supply dynamics**

On the supply side, mine production has tended to constitute 60 to 70 per cent of total supply, with recycling, net central bank sales and net producer hedging (the selling forward of unmined gold) forming other supply components to varying degrees.

Global mine production is forecast to increase by 1.3 per cent to more than 3,260 tonnes in 2016 and to increase 1.7 per cent to around 3,320 tonnes in 2017.9

While gold mine production is relatively inelastic, the gold recycling industry provides an easily traded supply of gold when it is needed, thereby helping to stabilise the gold price. World recycled supply reached 361 tonnes in early 2016.10 Gold producers added 83 tonnes to the hedgebook in the first half of 2016, as a number of gold producers partially locked in higher prices to safeguard cash flow.11

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**Gold price**

There are a number of gold exchanges around the world where both physical gold and gold futures contracts are traded. These include the London Bullion Market Association, COMEX in New York and the Shanghai Gold Exchange. Gold prices reflect a variety of international market factors but arbitrage opportunities between markets tend to result in similar prices around the world.

Prices of all other forms of gold, including dealer prices, are based on the prices in these markets. The higher gold price in 2016 has been supported by strong investment demand against the backdrop of investor concerns about low interest rates and the strength of world economic growth.

For Australian gold producers, the lower Australian dollar has benefited the industry where the gold price is at record levels.
Electrical conduit

Highly conductive to electricity, gold has been used in telecommunications equipment since the 1930s. From fuses to switches to microchips in computers and mobile phones, gold is a preferred material for its high conductivity and its resistance to corrosion. Even the identification microchip implanted in the family pet likely contains gold.

GOLD FACTS

Image courtesy: Newmont
Australia's rich endowment

Gold exists in greater abundance in Australia than any other country in the world, and is mined in all states and the Northern Territory.

Gold reserves

Australia has the largest gold reserves in the world with more than 16 per cent of global gold (9,100 tonnes at the end of 2015).

Australia is also the world’s second largest gold producer after China, with 282 tonnes of production in 2015-16, the highest level in 13 years. This makes Australia a key player in the global gold industry.

The Yilgarn Craton in Western Australia is Australia’s premier gold province with major Archean greenstone-hosted deposits such as Kalgoorlie, Granny Smith and Boddington.

Overall, about 43 per cent of economic resources of gold occur in Western Australia. South Australia’s Gawler Craton hosts the major iron oxide-copper-gold-uranium Olympic Dam deposit and the Northern Territory hosts the world-class, low-sulphide, quartz vein Tanami deposit.

Australia’s eastern states host many substantial gold deposits in a range of styles and provinces including Fosterville in Victoria (quartz-vein related), Cadia in New South Wales (porphyry gold copper) and Mount Carlton in Queensland (epithermal).

Global gold reserves (%)

Source: Geoscience Australia, United States Geological Survey

Space rocks

Nearly all the gold on earth came from meteorites that battered the planet more than four billion years ago. At least, that’s the theory held by most scientists today and the subject of a 2011 paper which appeared in the journal, Nature. Scientists believe a 200 million-year-long meteorite shower brought 20 billion billion tonnes of space rock – rich with gold and precious metals – to earth. Hot liquids that flowed through the gold-bearing rock millions of years subsequent delivered the veins of gold we mine today.

24 carat

GOLD FACTS
Gold production

Gold is mined in all Australian states and the Northern Territory. It is the primary output of about 75 operations in Australia with many drawing resources from two or more deposits and from both open-cut and underground mining operations. Several mines also produce gold as a by-product from the production of other commodities.

In 2015, Western Australia accounted for around 68 percent of Australia’s gold production, followed by New South Wales (12 per cent), Queensland (6 per cent), Northern Territory (6 per cent), South Australia (4 per cent), Victoria (3 per cent) and Tasmania (1 per cent).13

The industry supports more than 27,000 local jobs and business supply chain opportunities across regional Australia. The flow-on benefits from investment, exploration, refining activity, exports, taxes and royalty payments further highlight the industry’s importance to the nation 165 years after the original gold-inspired ‘mining boom’.
### Top 10 gold producing countries 2015

*Source: United States Geological Survey*

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China</td>
<td>16%</td>
</tr>
<tr>
<td>2</td>
<td>Australia</td>
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<tr>
<td>3</td>
<td>Russia</td>
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<tr>
<td>9</td>
<td>Uzbekistan</td>
<td>3%</td>
</tr>
<tr>
<td>10</td>
<td>Ghana</td>
<td>3%</td>
</tr>
</tbody>
</table>

Image courtesy: AngloGold Ashanti
Edible gold

Edible gold is having another moment. Gold leaf, flakes and dust are garnishing everything from donuts to hot dogs, appearing in social media feeds across the globe. Nestle Australia even got in on the act this year, releasing a 24 carat gold-coated Kit Kat to celebrate the Chinese New Year. Edible gold is not a new concept. Italian nobility embellished their meals with gold leaf, and gold dust tea has been a tradition for centuries in parts of Japan. Chemically inert and safe to digest, gold costs between $50 to $60 per gram. It contains no taste, texture, calories or expiration date.

Gold extraction and processing

The mining process includes controlled blasting, hauling, crushing, leaching, processing and beneficiation. The process varies depending on the individual mine. An indicative path is as follows:

1. Mining Ore is defined from waste rock and excavated by blasting and hydraulic diggers. Dump trucks haul the rock to the Run of Mine (ROM) pad.

2. Crushing The ROM feed — ore in its natural state — is crushed by the primary crusher to a size of less than 300 mm. It is then transported by conveyor to the coarse ore stockpile which feeds the secondary crusher. The secondary crushing circuit uses a range of methods including cone crushers, rod milling, mineral sizers and high-pressure grinding rolls.

3. Grinding A semi-autogenous grinding (SAG) mill reduces the ore to between 1 and 4 mm. This fine ore then proceeds to the ball mill in which steel or cast iron balls grind it to a fine slurry. The water will typically include water from dewatering the mine, from embankment underdrains and water that is decanted from the tailings storage facility. Excess water is pumped into a water treatment plant and treated to the required standards before discharge to the environment.

4. Leaching The slurry is fed into large steel leach tanks where a weak cyanide solution is combined with oxygen in a process known as carbon-in-pulp. As the cyanide and oxygen react, the gold in the pulp dissolves.

5. Adsorption The slurry passes through a series of adsorption tanks containing carbon granules where the gold adheres to the carbon. Filtering the pulp through screens separates the gold-bearing carbon.
6. Elution and electrowinning  The loaded carbon is fed into an elution or desorption column where the bullion is washed off. The barren carbon is recycled. The wash solution is passed through electrowinning cells which cause the gold to collect on stainless steel cathodes. The remaining components of the slurry (mainly finely ground rock) are pumped to a tailings storage facility where solids settle and compact. This facility is carefully managed to prevent release of any materials and is subject to stringent environmental regulation.

7. Bullion production  The gold-bearing cathodes are rinsed to yield a sludge which is dried, mixed with fluxes and put into the furnace for smelting. After several hours, the molten material is poured into moulds to produce bars of doré bullion. These low-purity bars are then sent to a refinery for further processing.

Refining

Three refining processes are used at the Perth Mint in Western Australia:

1. In the chlorination process, chlorine is introduced to melted bullion in a crucible furnace. The gas reacts with silver and any remaining base metals to form chlorides, bubbles of which rise to the surface of the molten bullion and are removed. The molten, refined gold is then cast into bars.

2. The electrolytic process involves dissolving gold from the bullion (anode) in a chloride solution and redepositing the gold on a pure gold or titanium cathode. Silver remains on the anode. The cathodes are melted and cast.

3. In the aqua regia process the unrefined bullion is dissolved in a mixture of nitric acid and hydrochloric acid. The addition of sulphur dioxide gas precipitates the gold. The fine metallic powder is then melted and cast.
A gold ‘carat’

Carat is a measure of gold purity or fineness — not to be confused with ‘carat’, the unit of weight applied to precious stones, such as diamonds. The word itself derives from the carob seed, which gold merchants used to balance scales in ancient Asian bazaars. It was decided a pure gold coin weighed the same as 24 carob seeds, which is how 24 carat became the measure for gold purity. Pure gold is very soft, so metal alloys, such as copper or silver, are typically blended to make jewellery. An 18 carat ring is therefore 18 parts gold and 6 parts another metal; 12 carat gold is 12 parts gold, 12 parts another metal, and so forth.
Building wealth for Australia

The value of Australia’s gold exports has more than doubled over the past decade, and the outlook remains strong.

Exports

Australia’s gold exports were valued at more than $16 billion in 2015–16, more than the combined exports from beef, wool, wine and cheese.14

Gold is Australia’s third largest mineral export and sixth largest export earner overall, representing 6.5 per cent of Australia’s total merchandise exports.15 Australia’s gold exports are forecast to total a slightly higher $16.3 billion in 2016–17.16

Most gold mined in Australia is refined locally before being exported. As a result, Australia is not only a major producer and exporter of gold, it is also a key player in the gold refining industry. Perth Mint refinery in Western Australia is one of the largest in the world.

Value of exports 2015–16
Source: ABARES, Department of Industry, Innovation and Science

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Value (A$)</th>
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<tbody>
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<td>Gold</td>
<td>$16b</td>
</tr>
<tr>
<td>Beef</td>
<td>$8.4b</td>
</tr>
<tr>
<td>Wool</td>
<td>$3.4b</td>
</tr>
<tr>
<td>Wine</td>
<td>$2.2b</td>
</tr>
<tr>
<td>Cheese</td>
<td>$829m</td>
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</table>
Taxes and royalties

Australia’s gold industry is an important contributor to government revenues in the states and territories, and federally. Payments to government include:

- Company tax
- Royalties
- Payroll tax
- Stamp duty
- Exploration security deposits
- Mine safety levies and a host of other state and local government charges.

Mineral royalty payments represent a direct return to the community from the discovery and extraction of gold resources. The gold industry paid almost $2.4 billion to state and territory governments in royalty payments alone in the decade to 2014–15. Gold royalties in 2014–15 totalled about $317 million, more than double the level of a decade earlier.17

Given its share of Australian production, around 69 per cent of gold royalties are paid to the Government of Western Australia where gold royalties accounted for 4.4 per cent of total minerals royalty receipts in 2014–15, up from 3.7 per cent in 2013–14.18

The taxes and royalties paid by the gold industry help to fund education, health, transport and community infrastructure and other government services.

### Royalty payments by the gold industry

Source: Deloitte Access Economics

#### Gold facts

**World’s largest gold bar**

The world’s largest gold bar weighs 250 kilograms and was manufactured by the Mitsubishi Materials Corporation. It stands 17 centimetres high, measures 45.5 centimetres by 22 centimetres at its base and is displayed at the Toi Gold Museum in Japan. The bar’s gold content was valued at US$3.68 million in 2005. It was revalued in October 2014 at around US$10.33 million.

**24 carat**

**GOLD FACTS**
Perth Mint refinery realises gold’s value

Western Australia’s Perth Mint is the premier gold refinery in Australia and one of the largest in the world with turnover of $6.6 billion in 2014-15.

The Perth Mint employs more than 300 people and its refinery is a major supplier of gold bars to China and India. It also refines gold mined in New Zealand, Papua New Guinea, Fiji, Thailand, Malaysia, Laos and the Philippines.

The facility refined 99 per cent of Australia’s production of gold doré in 2014-15 – the semi-pure gold bars created at minesites and transported to the refinery for further purification. It can convert hundreds of tonnes of fine gold into value-added products of 99.95 to 99.99 per cent purity every year, including gold bars, coins and granules.

In 2011 The Perth Mint cast the world’s largest gold bullion coin, the Australian Kangaroo One Tonne Gold Coin (pictured), estimated to be worth around $60 million.
Investing in regional Australia

The gold industry plays a significant role in the economic and social fabric of regional communities across Australia.

Employment

More than 27,000 Australians are employed directly in the gold industry, nearly double the level of 10 years ago. The industry in turn supports an estimated 55,000 jobs, the bulk of which are in regional and remote centres.

Australian gold companies employ a highly-skilled and increasingly diverse workforce that includes engineers, environmental scientists, geologists, geophysicists, mathematicians and financial professionals, as well as a wide range of skilled trades.

High productivity means wages in the industry average more than $140,000 per annum.

Australia’s gold industry promotes workplace diversity and gender equality through active strategies tackling barriers to female participation and promotion.

Stefanie Loader is Chair of the New South Wales Minerals Council and Managing Director of the CMOC-Northparkes Mines copper and gold mine. In 2015, the Northparkes E48 block cave underground mine became fully automated – a world first – generating higher production rates and moving people from underground to an air-conditioned control room.

Stefanie is also an advocate for creating a more diverse industry.

‘Research has shown that great teams are diverse in gender, age, cultural background and thinking styles. We are becoming a more diverse industry in terms of talent but there is more that we can do,’ she said.

Stefanie began her mining career in 1994 as an exploration geologist in Western Australia motivated by exposure to the industry through internships under a Rio Tinto scholarship for Women in Science.

‘My commitment is that every time a role becomes vacant, I challenge the hiring manager to think about how else that work could be done, and describe the role in terms of capabilities and skills, not years of experience or other more traditional hiring patterns.’

Direct employment (2006 and 2016)
Source: Department of Mines and Petroleum Western Australia, MCA estimates

<table>
<thead>
<tr>
<th>Year</th>
<th>Employment (2006 and 2016)</th>
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<td>2006</td>
<td>9,775</td>
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<td>2016</td>
<td>27,300</td>
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The acid test

It’s a common phrase used in conversation every day, but few realise ‘the acid test’ had its beginnings on the goldfields. Meaning ‘a sure test’ or ‘to determine conclusively’, the phrase was borne out of the need to distinguish gold from other metals. Prospectors and dealers would use a drop of nitric acid on a suspect find, which would dissolve metals other than gold more readily. The goldfields drew all sorts of shady characters trying to sell fake gold – ‘the acid test’ ensured honest dealings.
Making a difference in the Pilbara

Newcrest supports positive social and economic outcomes for Indigenous Australians under a 2015 Indigenous Land Use Agreement with the Martu people, the traditional owners of the land surrounding Newcrest’s Telfer gold mine in the Pilbara, Western Australia.

Under the agreement, Newcrest will pay more than $18 million over five years to the Western Desert Lands Aboriginal Council and a trust for the benefit of the Martu people, after which a revenue-based payment from mining in the agreement area will apply.

The agreement, the most significant in the mine’s 40-year history, formalises the already strong relationship between the miner and the Martu people, and builds on a broad range of initiatives that are delivering positive social and economic outcomes.

More than 400 Indigenous people, mostly Martu, have participated in Newcrest’s Telfer training programs, and many have gone on to work at Newcrest or in other areas of the mining industry.

Newcrest continues to provide employment and training opportunities, strengthened heritage protection, and transparency in planning and environmental protection.
Regional development

Australian gold mining companies work closely with community stakeholders to ensure economic and social benefits from gold mining are enduring and sustainable. In some regional and remote centres, gold companies are the main source of economic activity helping ensure local communities remain stable and viable.

As well as being important providers of employment, apprenticeships and skills development opportunities, gold companies often play a significant role in the communities in which they operate and are often directly involved in helping build and maintain social and physical infrastructure in regional centres.

Ensuring Aboriginal and Torres Strait Islander peoples share in opportunities flowing from the gold industry is a key focus of company activity. Through greater employment of Indigenous Australians and engagement of Indigenous businesses (as suppliers, joint venture partners or sub-contractors) the gold industry has recognised that the first Australians are vital stakeholders in the industry’s growth and success.

The gold industry’s approach to working with Indigenous communities is founded in mutual respect and the recognition of Indigenous Australians’ rights in law, interests and special connections to land and waters.

CASE STUDY

Yuendumu diesel mechanics workshop

Newmont’s Tanami gold mine in the Northern Territory assists young Yuendumu community men learn the skills they need to become diesel mechanics.

The Mt Theo Mechanics Training Workshop was established in 2007 by the Walpiri Youth Development Corporation with financial support from Newmont and in partnership with Central Desert Shire Council and the Yuendumu Shire Service.

The workshop provides local mechanical repair services while giving Indigenous youth a positive and meaningful job. After training, apprentices are offered jobs in Yuendumu and a number have taken up employment at Newmont’s Tanami mine.
Supporting tourism in Kalgoorlie

Kalgoorlie Consolidated Gold Mines (KCGM) supports sustainable projects in the Kalgoorlie-Boulder community, such as the Hannans North Tourist Mine.

Development of the tourist mine began in 2012 with the relocation of KCGM’s Super Pit Shop, funded through the KCGM Community Investment Program. Today the tourist mine is a favourite destination of school groups keen to learn about mining history and get close to modern mining machinery. It is also a stop on the Indian Pacific Railway tours.

The signs are positive that the tourist mine can become a sustainable, self-operating ‘not for profit’ business in the future.

Custom-designed opportunities for SMEs

AngloGold Ashanti Australia’s (AGAA) approach to contracting at its Tropicana gold mine in Western Australia supports the development of Indigenous businesses, including for the Wongatha people and the Tjuntjuntjara community.

AGAA has custom-designed some of the contracts at Tropicana to overcome the challenge of scale for new Indigenous entrants.

By unbundling and designing a number of smaller contract packages in construction and operations, several Indigenous companies are now thriving at Tropicana.

Triodia Mining operates the light vehicle workshop and delivers cross-cultural training, and Bundarra has the day works contract.
Employer of choice for gender equality

St Barbara is recognised as an employer of choice for gender equality with Managing Director and Chief Executive Officer, Bob Vassie, an ambassador of the Workplace Gender Equality Agency pay equity campaign.

St Barbara’s commitment has seen the company narrow its pay equity gap to 15 per cent, compared to 17 per cent for the mining industry and 24 per cent for Australian companies.

In 2016, 23 per cent of St Barbara’s employees were women (compared to 16 per cent for the mining industry), with many in leadership roles across the company. In 2015, 33 per cent of its non-executive directors were women, and 82 per cent of women return to work after maternity leave.
Death by gold

Ecuador’s Jivaro tribe were so excessively taxed by the Spanish governor in 1599 that they poured molten gold down his throat. It’s not the only time gold has proven an effective, albeit brutal, means of execution. The Romans and enforcers in the Spanish Inquisition are also believed to have killed using molten gold. For fans of *Game of Thrones*, this might explain the inspiration for the molten gold ‘crown’ used to dispose of Daenerys’ brother Viserys.

Fosterville pioneers bacterial oxidation

Newmarket Gold’s Fosterville Gold Mine near Bendigo is one of only 10 mines in the world to use the innovative bacterial oxidation (BIOX) process. The process involves bacteria ‘feeding’ on sulphide ores to liberate the gold particles and is less energy intensive than conventional minerals processing.

Following a transition to coarser ore types during 2016, the bacterial process is now used alongside a gravity circuit to maximise gold recoveries. Using the gravity circuit enables the capture of gold particles that may have been lost during the grinding process or transferred to the flotation tailings.

Operating since 2005, Fosterville poured its one millionth ounce of gold in February 2016. The mine, which employs more than 400 people from the surrounding community, delivers approximately $90 million in economic benefits to the Bendigo region annually.
An industry driven by innovation

From the minesite to the refinery, Australia’s gold industry has a long history of innovation.

The application of new technology and innovative processes enables Australia’s gold industry to continue to unlock new resources, boost productivity, protect the environment, enhance worker safety and generate additional value for the wider community. Innovation is central to the industry maintaining Australia’s comparative advantage.

The industry has a large number of innovation partnerships, including:

- cooperative research centres, CRCMining and CRC ORE (Optimising Resource Extraction)
- collaborations with many higher education institutions
- industry-led research group AMIRA International, including through the AMIRA Gold Processing Technology project.

Together these partnerships are addressing the challenge of extracting gold from lower grade and complex ores at open-pit and underground operations. They are also developing new means to boost the efficiency of gold separation and concentration processes in line with increasing environmental conditions and stakeholder expectations.

A high level of innovation is the primary means to overcome so-called ‘depletion effects’. These effects include the running down of resource deposits, increased effort required to process saleable ores from extracted material, the adoption of more complex methods of extraction in expanded mines, and the extraction of deposits that are further away or deeper in the ground.

The CSIRO recognises the important role played by innovation in the discovering of new resources. ‘Regolith and geochemistry advancements aided in the discovery of 14 Australian gold deposits, two of which were valued at over $12 billion.’

The AMIRA Gold Processing Technology project is a collaborative industry funded project which has operated since 1984. The project is based at Curtin University’s Western Australian School of Mines.

Over the past 30 years the project has covered a wide range of topics within the general areas of gold ore processing and environmental management of tailings. The current $3.7 million project is focused on three themes: technology transfer and professional development; models and optimisation; and future ore processing.

Gold bullion ATMs

The first gold bullion vending machine, plated in 24 carat gold, was unveiled at the Emirates Palace Hotel, Abu Dhabi in May 2010. Designed to make ordinary people comfortable investing in gold, the Gold to Go brand now operates more than a dozen ATMs at highly secure locations in seven countries, including the United Kingdom and the United States. A computer inside the ATM tracks gold prices in real time and prices its products, including gold bars, coins and jewellery, accordingly.
3D seismic surveying strikes gold

AngloGold Ashanti Australia is improving its geological understanding of the ore bodies at its Tropicana gold mine in Western Australia by utilising 3D seismic technology.

The innovative application helps target deep directional drill holes. Drilling based on the model generated by the surveys is now supporting a study into an alternative, low-cost approach to mining the depth extensions of the Tropicana ore body.

Seismic surveys have not typically been used in hard rock mining based on the belief that hard rock is more difficult to image than the more amenable sedimentary basins that host hydrocarbons in oil and gas.

CASE STUDY

Cooling efficiencies

St Barbara is a leader in the application of absorption refrigeration technology at its Gwalia operation in Western Australia.

The company has introduced a new cooling system that uses waste heat energy from the power plant to cool air to around 9 degrees celsius for use in the underground mine. As well as doubling cooling capacity, the new, more energy-efficient chiller plant has cut carbon emissions significantly.
Rare metal
Gold owes its status as a precious metal to its rarity. In 2014, total gold mined throughout human history was estimated at around 183,600 metric tonnes. Using reasoning applied by Forbes.com, all the gold ever mined could fit in four Olympic-sized swimming pools. To give further perspective, more steel is poured in one hour around the world than gold has been poured since the beginning of recorded history. Gold may not be the rarest metal – platinum takes that title – but it is the most desirable of the precious metals.

24 carat
GOLD FACTS

CASE STUDY

Innovation drives Australia’s largest underground mine

One of the world’s most advanced and innovative gold mines can be found 25 kilometres south of Orange in central-west New South Wales.

Newcrest began developing the Cadia East deposit in 2010 and has invested over $2 billion to build the first underground panel cave of its kind in the country. Part of Newcrest’s Cadia Valley Operations, Cadia East is at the forefront of mining innovation, using a cutting edge bulk-caving technique and the latest technology to deliver safe, low-cost production.

Innovative process engineering enabled a faster production ramp-up at Cadia East’s Panel Cave 1 than any comparable underground mine in the world. This was achieved through high-capacity transportation design, intensive pre-conditioning, an innovative undercutting strategy and a high-efficiency loading configuration.

Newcrest worked closely with Codelco, a Chilean mining company with expertise in bulk underground mining techniques, to develop the technology and maximise efficiency at Cadia East.

Cadia East is Australia’s largest underground mine and when it reaches full capacity it will be one of the largest tonnage hard rock underground mines in the world with a potential life of more than 30 years.
Environmental sustainability

Australia’s gold industry is a global leader in science-based, responsible and accountable environmental management.

Scientific understanding, technologies and community expectations are constantly changing and this has been matched by substantial progress in the Australian gold industry’s environmental performance over the past few decades.

Australia’s expertise is world renowned with the industry working closely with research organisations on innovation and knowledge transfer.

Life-of-project management

Environmental stewardship begins many years before mining takes place. Major development approval processes involve comprehensive environmental, cultural and social impact assessments all of which require extensive stakeholder engagement. Companies comply with Australia’s mature and comprehensive Environmental Impact Assessment processes covering mine development and operation.

During a mine’s operation, gold companies comply with environmental regulations using a mix of on-site environmental monitoring and improvements, investment in environmental offset programs, research and conservation, as well as ensuring land is rehabilitated during and after operations.

Many mining companies voluntarily implement environmental management and conservation programs in excess of government requirements as part of their commitment to the communities in which they operate and in which their employees live.

Rehabilitating mined land for agriculture, conservation or community use post-mining is fundamental to the industry’s regulatory and social license. With careful, science-based planning and progressive rehabilitation throughout a mine’s life-cycle, companies can minimise the area of disturbance and achieve a final land use that is both stable and sustainable.

Industry has continuously improved the way land is managed and rehabilitated. It is the industry’s goal that previously mined land is available for future economic activity, conservation or community use.

Ocean of riches

The world’s oceans are awash with gold – nearly 20 million tonnes, in fact. But its concentration is so dilute that each litre of seawater contains about 13 billionths of a gram of gold. Undissolved gold deposits also exist in and on the seafloor, but there is no cost-effective way to extract it. Not that it hasn’t been tried. Nobel prize winning chemist Fritz Haber attempted to recover gold from seawater in the 1920s. Unfortunately, he proved more successful at developing chemical weapons than he did recovering gold from the ocean.

24 carat

GOLD FACTS
Cyanide management

Cyanide is a widely used and valuable industrial chemical. Sodium cyanide plays a key role in extracting gold and can liberate associated metals such as silver, copper and zinc.

The use of cyanide, as with other industrial chemicals, is strictly and comprehensively regulated by government, predominantly at the state level, through legislation covering mining, environmental protection, health and safety, and dangerous goods management including transport and poisons handling.

Importantly, Australia’s gold industry continues to implement and refine management systems and operational controls to improve its performance in relation to cyanide management beyond the expectations established by regulation.

The industry supports ongoing development of management measures that are based on sound science and are proven to be effective in minimising the hazards and risks associated with the use of sodium cyanide.

Many Australian gold companies are signatories to the International Cyanide Management Code for the manufacture, transport and use of cyanide in the production of gold. The Code is a voluntary initiative developed by industry with its stakeholders under the auspices of the United Nations Environment Programme (UNEP) and the then International Council on Metals and the Environment (ICME).

The International Cyanide Management Code is intended to further assist in the protection of workers and communities, avoid releases to the environment and enhance response actions in the event of accidental exposure or release. Signatories are required to demonstrate compliance through independent third-party professional audits of systems and practice.11
CASE STUDY

Protecting the brush-tailed phascogale

Mandalay Resources’ Costerfield gold mine in central Victoria supports the conservation work of the Whroo Goldfields Conservation Management Network which builds, installs, and monitors nest boxes for the protection of the endangered brush-tailed phascogale (a carnivorous Australian marsupial).

Following the clearance of several large native trees for the construction of a groundwater evaporation facility, Mandalay Resources sponsored the network to build and install 10 nest boxes in the vicinity of the facility. Routine inspection of the boxes shows they are occupied by the brush-tailed phascogale.

Mandalay Resources has adopted the brush-tailed phascogale as a site mascot to publicise its current endangered status.

CASE STUDY

Operating alongside the black cockatoo

The Newmont Boddington Gold’s Black Cockatoo Management Plan – approved by the Commonwealth Department of Environment – sets out a framework to manage the impacts of the mines’ operations on black cockatoos. The plan identifies opportunities for achieving positive conservation outcomes, such as the protection of existing habitats and the restoration of disturbed land.

The plan is integral to Newmont Boddington Gold’s commitment to manage all aspects of its operational footprint and represents a key component to the overall environmental management strategy for the site. It is subject to continuous revision based on the outcomes of stakeholder consultation, regulatory requirements and research partnerships.
Ancient alchemy
Across cultures and centuries, gold has been at the centre of the quest for a universal human elixir. The Egyptians believed ingesting gold could purify the body, mind and spirit. For centuries, the Chinese believed gold could cure or prevent everything from small pox to measles. Some rural villagers still cook their rice with a gold coin to replenish the mineral in their bodies. In medieval Europe, gold pills and baths were popular. Alchemists mixed powdered gold into drinks for patients with sore limbs.

Water
Gold companies are active participants in a leading practice water accounting framework developed by the MCA for the responsible management of water – critical to gold industry operations.

The framework allows mining operations to account for and to report water use in a consistent way. This industry-driven initiative aims to build greater understanding and community confidence in the way water use is managed and reported.

Accountability
The commitment to operate in a sustainable manner has also been formalised in a number of voluntary industry frameworks internationally and nationally. Many Australian companies commit to principles developed with the International Council for Mining and Metals (ICMM).

Companies also report their performance using benchmarks such as the Global Reporting Initiative. These approaches are incorporated in company policies and practices.

Furthermore, top Australian producers are members of the MCA which includes a commitment to Enduring Value – The Australian Minerals Industry Framework for Sustainable Development, which provides guidance for the implementation of the ICMM principles and commit companies to continuous improvement in environmental performance.

24 carat
GOLD FACTS
Newcrest is planning a progressive rehabilitation program of waste rock dump slopes which are more compatible with the local landscape at its Telfer gold mine in the Pilbara. This new approach is the result of a 10-year research project between Newcrest and the University of Western Australia, which included an extensive ecohydrology study and physical trials focused on replicating the natural ‘mesas’ – landforms with flat tops and concave slopes – found in the Pilbara.

The research sought an alternative to the traditional surface-ripped, berm and bench-style slopes, which are often damaged by erosion.

The project found that the mesas offered a number of advantages over traditional waste rock dump rehabilitation methods, including a smaller footprint, lower environmental disturbance, reduced levels of erosion and greater visual integration with the natural landscape. They also involved lower construction, repair and maintenance costs.
Unlocking future investment

Gold production begins with exploration and Australia remains one of the world’s biggest untapped minerals exploration targets.

**Exploration**

Gold accounted for 44 per cent of Australia’s total mineral exploration expenditure as of June 2016. This is more than double its share five years ago and at levels last seen in 2004, before the mining boom.

In 2015-16, Australia’s total gold exploration expenditure was $548 million, an increase of 39 per cent as compared over 2014-15 and gold’s share of Australia’s total minerals exploration expenditure was 39 per cent as well. Since the turn of the century, gold exploration expenditure has totalled $8 billion.

Australia’s share of global gold exploration expenditure in 2015 was 9 per cent, down from 22 per cent in 2002, but up from 7 per cent in 2012.

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**High tech gold mine**

A tonne of personal computers yields more gold than 17 tonnes of gold ore, according to the US Geological Survey. Old electronics, such as printers, mobile phones and cameras, contain gold-plated circuit boards, connectors, sockets, ports and pins. Tech companies are cashing in on this gold mine of their own making by rolling out recycling programs. Apple’s recycling program for old iPhones and iPads reaped the tech giant almost a ton of recoverable gold in 2015, according to its Environmental Responsibility Report. The total value of its haul? Around £28 million.

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**24 carat**

GOLD FACTS
Between 2002 and 2015, 66 projects developing new gold mines or expanding existing operations were completed in Australia, with a total investment value of almost $13 billion. There are a further 21 gold projects in the pipeline with a combined capital expenditure value of approximately $4.3 billion.

However Australia’s easily found, economically viable, non-ferrous mineral deposits have already been discovered and, to a large extent, exploited. The last big deposit (>6 million ounces of gold) discovered in Australia was in 1993, more than two decades ago.

The UNCOVER partnership between Australia’s federal, state and Northern Territory governments, industry and academia is an important initiative to address the challenge of discovering potentially vast deposits that extend deep under a thick layer of sediment or cover.

The AMIRA Roadmap for Exploration Under Cover is a practical outcome of the UNCOVER partnership outlining a new long-term research and development strategy for the minerals industry and for collection of new pre-competitive geoscience data needed to help locate new mineral deposits, including gold.
Above the line and below the ground, the future of gold is bright in Northern Australia

The 2015 White Paper on Developing Northern Australia recognised gold mining (among other minerals) as an industry with bright growth prospects above the Tropic of Capricorn.

Approximately 18 per cent of Australia’s known gold reserves are in Northern Australia, including the currently largest undeveloped gold project in Australia – Vista Gold’s Mt Todd mine site. Located around 50 kilometres north of Katherine and 250 kilometres south of Darwin, the site has proven and probable reserves of 5.9 million ounces of gold. Vista Gold is working to obtain the necessary permits for the mine prior to making a final investment decision on the project worth an estimated $1 billion.

Newmont’s underground gold mine in the Tanami Desert produces approximately 435,000 ounces of gold annually. Tanami is a fly-in-fly-out operation 540 kilometres northwest of Alice Springs. Newmont has announced a US$120 million expansion to its Tanami operations which will increase gold production by approximately 80,000 ounces a year when completed in 2017.

Newcrest’s mines at Telfer in the Great Sandy Desert of Western Australia produce around 500,000 ounces of gold annually. Telfer is a fly-in-fly-out operation with growth opportunities in the near mine environment, including a number of semi to advanced exploration targets. The Telfer project also contains a large regional tenement package that extends over 1,000 square kilometres with a number of targets identified for further exploration.

Housewives of India

Households in India hold 11 per cent of the world’s gold stock, largely in jewellery and savings. That’s about 18,000 tonnes of gold – more than the combined reserves of the United States, IMF, Switzerland and Germany. Macquarie estimated the haul at $950 billion in its 2011 report, India’s fatal attraction, around 50 per cent of India’s nominal GDP in dollar terms. Gold plays an important role in Indian culture. India is the world’s largest gold consumer, followed by China.

24 carat
GOLD FACTS
Fort Knox
Shrouded in secrecy and protected behind a 25 ton blast proof door lies the gold vault of the United States Bullion Depository at Fort Knox, Kentucky. Lined with granite walls, the vault holds 147.3 million ounces, or 4,600 tonnes, of the official gold reserves of the United States, according to the World Gold Council. At a rate of $1,750 an ounce, that makes it worth about $258 billion. The world’s largest stockpile of gold bullion, however, lies in a vault five stories below ground inside the Federal Reserve Bank of New York. It holds 530,000 gold bars, or 6,700 tonnes – around 25 per cent of the world’s gold reserve – although belongs largely to foreign governments. At its peak in 1973, the Reserve held more than 12,000 tonnes of monetary gold.

GOLD FACTS

Image courtesy: World Gold Council
Securing tomorrow's prosperity

A robust policy agenda is required to maximise the sustainable development of Australia's rich gold endowment.

Australia’s gold industry has a bright future if the right policy settings are in place. Resource endowment alone will not guarantee a sustainable future for the industry which supports tens of thousands of jobs and generates billions of dollars in export revenue for Australia.

In order to maintain and strengthen Australia’s position as a major gold producer and exporter, there must be renewed and continuous efforts to improve the industry’s competitive standing to attract ongoing investment in expanded exploration and increased productivity. In short, Australia must be competitive in global capital markets. This is a challenge for all who benefit from a healthy and vibrant gold industry in Australia.

Securing the future of Australia’s gold industry demands a robust policy agenda, including on:

- **Competitive taxation**: Australia’s mining industry faces a heavy tax burden compared to competitors. Australia’s company tax rate is too high for a capital hungry country. A more competitive company tax rate in line with the OECD average is essential to drive investment in gold mines.

- **Stable fuel taxation**: Stable arrangements for fuel taxation are vital to industry competitiveness and grounded in sound tax policy rationale. Regional industries rely on off-road use of diesel and gold mining is particularly reliant on diesel. Any reduction to fuel tax credits would constitute a new tax on the industry and regional and remote Australia.

- **Workplace productivity**: High wage jobs depend on high productivity workplaces. Simplified agreements and agreement-making will support jobs and productivity growth at Australia’s gold mines.

- **Foreign investment**: The development of Australia’s mining industry has benefited from $295 billion so far in foreign direct investment. Encouraging ongoing foreign investment is critical to the future of Australia’s gold industry.

- **Streamlined approvals**: Delays and uncertainty in project approval processes pose a major risk to the industry’s global competitiveness. State processes should be fully accredited under the EPBC Act to create a single assessment and approval process. This will encourage more investment while upholding high environmental standards in Australia’s gold industry.

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**Golden thread**

A single ounce of gold can be beaten into a transparent sheet measuring 9 square metres, or drawn out into a thread or wire 80 kilometres long. That would stretch the span of the Sydney Harbor Bridge almost 70 times! Gold thread has been used by tailors, dress makers and artisans for centuries, embellishing everything from ancient Chinese courtier robes to medieval tapestries. Pure gold is so malleable it can be molded by hand.

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**22 carat**

GOLD FACTS
• **Ongoing innovation:** A stable R&D tax incentive supports innovation in the gold industry, including collaboration with Australian universities. It is important to continue R&D partnerships between miners and researchers, including through the cooperative research centres. Innovative exploration and recovery techniques will continue to enable profitable extraction of relatively low-grade ore deposits.

• **Enhanced exploration:** Exploration is analogous to market research; it is fundamentally exploring for business. It is important to maintain the Exploration Development Incentive and public support for the UNCOVER initiative. Access to more pre-competitive geological data is also important to support development of Australia’s gold industry.

The gold industry continues to enrich Australia 165 years after the first rush at Ophir. From exports to jobs in remote communities, from innovation to best-practice environmental management, Australia’s gold industry is a vital part of our sophisticated modern 21st century economy. More than a rich seam from our past, Australia’s gold industry is a national asset worth valuing, now and in the future.

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**Earthquakes**

Can earthquakes create new gold deposits? The answer is yes, according to Australian researchers Dion Weatherley and Richard Henly. Their 2013 study, published in *Nature Geoscience*, showed a link between gold and quartz seen in many of the world’s deposits. Deep below the earth’s surface, water carries high concentrations of carbon dioxide, silica and elements like gold. Rapid depressurisation when smaller secondary faultlines widen during an earthquake can cause the mineral-laden water to crystallise almost instantly. This, they found, can forge tiny gold veins on nearby surfaces.

**24 carat**

GOLD FACTS

Image courtesy: AngloGold Ashanti
Believe it or not, gold flows through our veins – albeit in very small quantities. Gold is one of the many elements (not least oxygen, carbon, hydrogen and nitrogen) that make up the human body. Fortunately it exists in such small quantities as not to encourage human harvesting. You would need 40,000 people to reap enough gold to make one 8 gram gold sovereign, for example. A 70 kilogram human contains about 0.229 milligrams of gold; equivalent to a .22 millimetre squared cube. On today’s gold prices, that’s a return of about 1.2 cents per person.
Gold development and expansion projects completed since 2002
Source: Department of Industry, Innovation and Science

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<td>Nullagine Gold project (WA)</td>
<td>Millennium Minerals</td>
<td>87</td>
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<tr>
<td>Cadia East (NSW)</td>
<td>Newcrest</td>
<td>1900</td>
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<td>Carosue Dam (Red October) (WA)</td>
<td>Saracen Minerals</td>
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<tr>
<td>KalNorth (Lindsay’s) (WA)</td>
<td>Kal North</td>
<td>70</td>
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<tr>
<td>Meekatharra Gold Project (WA)</td>
<td>Reed Resources</td>
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<tr>
<td>Mt Carlton (Silver Hill) (QLD)</td>
<td>Evolution Mining</td>
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<tr>
<td>Murchison (WA)</td>
<td>Silver Lake</td>
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<td>Andy Well (WA)</td>
<td>Doray Minerals</td>
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<td>Tropicana Joint Venture Project (WA)</td>
<td>AngloGold Ashanti/Independence Group</td>
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<td>Tomingley (Wyoming) Gold project (NSW)</td>
<td>Alkane Resources</td>
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<td>Hera (NSW)</td>
<td>Aurelia Metals</td>
<td>73.5</td>
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<td>Central Murchison (WA)</td>
<td>Metals X</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$12.6 billion</strong></td>
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Endnotes


Rush
Australia’s 21st Century
Gold Industry

A Minerals Council of Australia and Chamber of Minerals and Energy of Western Australia publication.

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