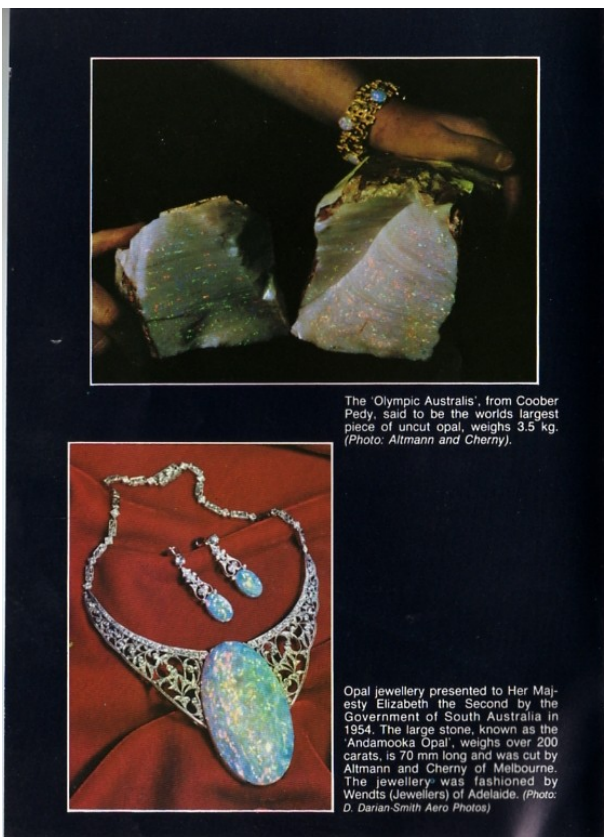




OPAL in South Australia

MINERAL INFORMATION SERIES



The 'Olympic Australis', from Coober Pedy, said to be the worlds largest piece of uncut opal, weighs 3.5 kg. (Photo: Altmann and Cherry).

Opal jewellery presented to Her Majesty Elizabeth the Second by the Government of South Australia in 1954. The large stone, known as the 'Andamooka Opal', weighs over 200 carats, is 70 mm long and was cut by Altmann and Cherny of Melbourne. The jewellery was fashioned by Wends (Jewellers) of Adelaide. (Photo: D. Darian-Smith Aero Photos)

DM 00004

HISTORY OF OPAL

Opal has a long history and opal artefacts several thousand years old have been discovered in a cave in East Africa.

The Romans established opal as a gemstone, obtaining their supplies from traders in the Middle East. They believed that the gem came from India and the Roman name *opalus* is based on an ancient Indian word *upala* meaning precious stone. The Romans valued opal above all other gems, believing it to combine the beauty of all precious stones.

The opal so eagerly sought by Rome probably came from open cut mines in Hungary. These remained the only source of European opal until the Spaniards returned from the New World with many fine examples of Aztec opal.

In the late 18th and early 19th centuries, opal fell out of favour in Europe. It was associated with pestilence, famine, and the fall of monarchs. Underground mining had also begun in the Hungarian deposits and much of this opal was allowed to dry out too quickly and became crazed. The demand for opal diminished and the Hungarian mines closed.

When Australian opal appeared on the market in the 1890s, the Hungarian mines promoted the idea that Australian opal was not genuine, probably because gems with such brilliant fire had not been seen before.

The first discovery of common opal in Australia was made near Angaston (S.A.) by the German geologist Johannes Menge in 1849. Production of precious opal began at White Cliffs (N.S.W.) in 1890, from Opalton (Qld) in 1896, and at Lightning Ridge (N.S.W.) in 1905.

Opal was discovered at Coober Pedy in 1915, where mining became established after the First World War, and at Andamooka in 1930. During the depression of the 1930s, when few people could afford luxuries, the industry declined. However, in 1946 major new finds stimulated mining and since then there has been a spectacular increase in production. Now over 80 per cent of world production comes from the South Australian opal fields.

WHAT IS OPAL?

Opal is a form of silica, chemically similar to quartz, but containing water within the mineral structure. Precious opal generally contains from 6 to 10 per cent water and consists of small silica spheres arranged in a regular pattern.

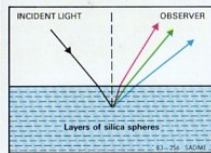
Opal occurs in many varieties, two of which are precious opal and potch.

Colour in precious opal is caused by the regular array of silica spheres diffracting white light, and breaking it up into the colours of the spectrum. The diameter and spacing of the spheres controls the colour range of an opal.

Opal colours also depend on the angle of light incidence and can change or disappear when the gem is rotated.

In potch opal, the silica spheres may be absent or too small or irregularly arranged to produce colour.

Scanning electron micrographs (x 40 000)



4

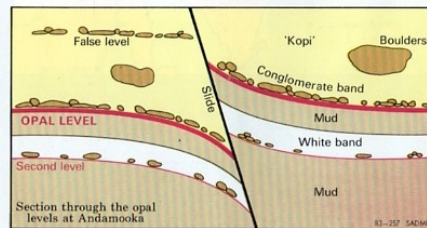
Geology of Opal

All precious opal in South Australia occurs in rocks affected by weathering during the Tertiary Period, some 15 to 30 million years ago.

The weathering process broke down minerals of the country rock to produce kaolin and soluble silica. It also created cavities in the rock by dissolving out soluble minerals and fossil shells. These cavities, together with faults and fractures, provided pathways for underground water containing the soluble silica released by weathering.

After the period of weathering, changes in climate caused lowering of the underground water table which carried silica-rich solutions downwards to form the opal deposits.

Opalised fossil shells from Coober Pedy 15052



5



COOBER PEDY

Coober Pedy is the largest opal producing centre in Australia. The field is situated in the Stuart Range nearly 1 000 km north of Adelaide from where it may be reached by regular air and coach services.

The township of Coober Pedy has shops, hotels, caravan and camping areas and a drive-in cinema. Many of the locals prefer to live underground in dugouts where it is cool in summer and warm in winter; several dugouts and mines are open for inspection.

Opal was discovered here in 1915 by a 14-year-old boy who was camping with his father's gold prospecting party, and by 1916, Big Flat was established as the principal field. After the First World War, an influx of miners caused a major increase in production. The dugout style of living introduced by these ex-soldiers gave the field its name which is derived from the Aboriginal *kupa piti* meaning 'white man's burrow'.

Opal workings now extend for nearly 40 km around the township and local tours are available. Once off the bitumen, roads are rough and dusty, becoming impassable after heavy rain.

Opal is found up to 30 metres below the surface and occurs in horizontal levels or in steeply dipping slides. Distribution of the levels and slides is unpredictable and may not persist from one claim to the next.

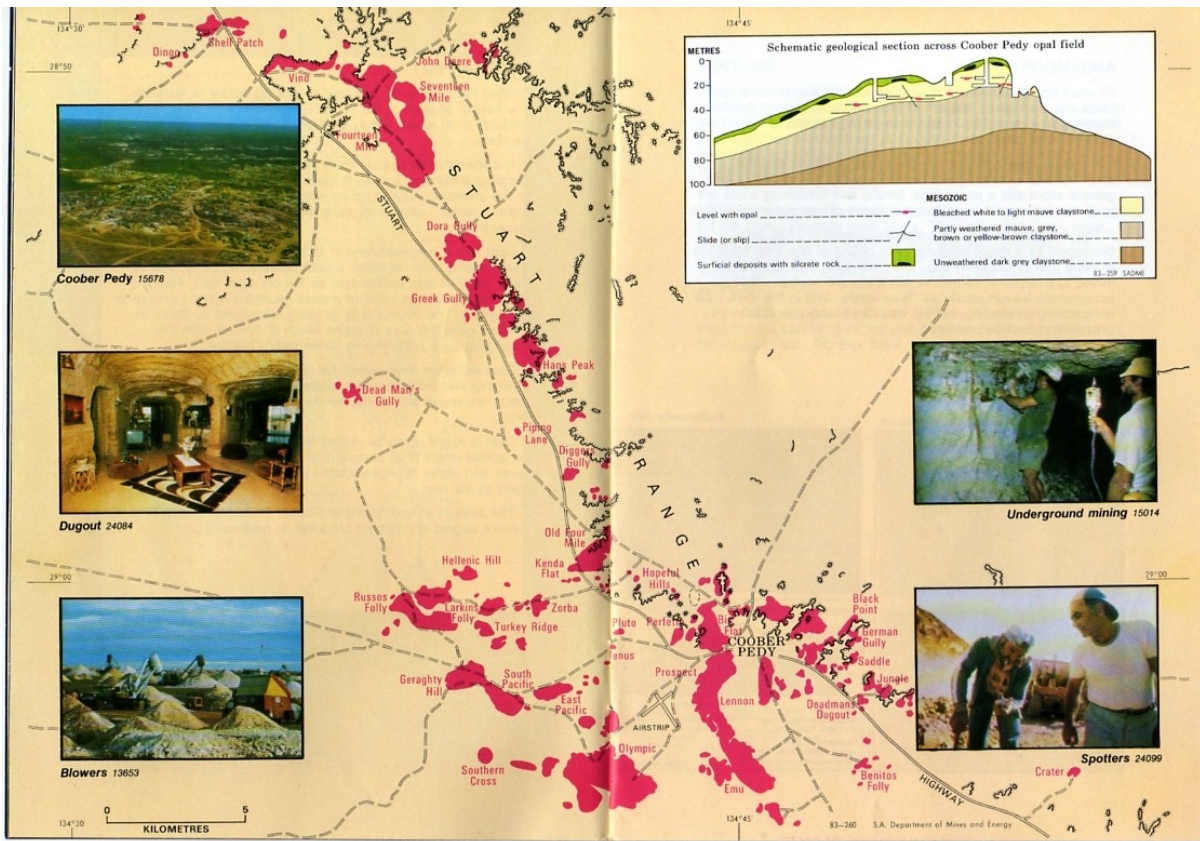
The amount of opal found at Coober Pedy makes this field the world's largest and richest producer of precious opal.

Information on air flights, coach services, and accommodation bookings may be obtained from:

The SA Tourist Bureau	RAA Travel Service
18 King William Street	14 Hindmarsh Square
ADELAIDE, 5000	ADELAIDE, 5000
Tel. (08) 212 1644	Tel. (08) 223 4555

or most travel agents

7

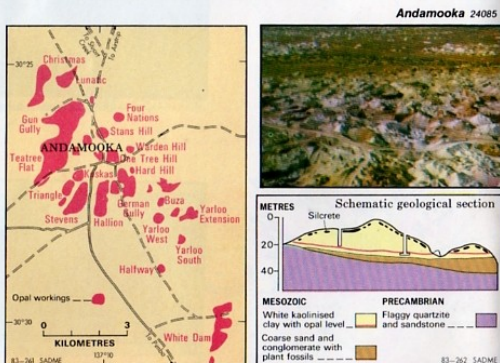


ANDAMOOKA

Situated about 600 km north of Adelaide, the Andamooka opal fields are reached by 150 km of unsealed road leaving the Stuart Highway at Pimba. This road becomes impassable to two-wheel drive vehicles after rain.

A regular coach service operates from Adelaide and the township has a motel, guest house, caravan and camping area, general store and a post office. Mining and fossicking areas are open to visitors and tours to local places of interest are available.

The Andamooka opal field was discovered in 1930 and developed as a major producer with output at one time equalling in value that of Coober Pedy. The main opal level has been mined to a depth of 20 metres but there are several shallower occurrences known locally as 'false levels'. Within the level, opal is randomly distributed, infilling voids and cracks, and its presence cannot be predicted.

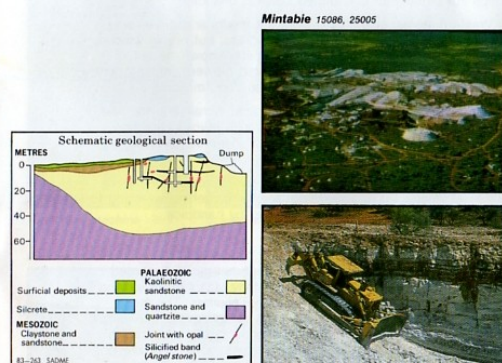


MINTABIE

Aboriginals were selling black opal in Coober Pedy from an unknown locality as early as 1919. Coober Pedy miners, eager to discover the source, eventually located it along an escarpment at Mintabie 350 km northwest of Coober Pedy. From 1931, mining was small scale but in 1976 heavy earth-moving equipment moved into the area and, since then, continuous mining has resulted in many large finds.

Mintabie may be reached along a 50 km rough road branching off the Stuart Highway near Marla. The settlement has a store, postal service, public telephone and licensed restaurant. The nearest motel accommodation is at Marla but camping areas without power or facilities are available. Local tours can be arranged.

Permission for tourists to visit Mintabie is required under the Pitjantjatjara Land Rights Act and must be obtained from Anangu Pitjantjatjara Inc., PO Box 2584, Alice Springs, NT 5750.



MINING OPAL

Opal is one of the few minerals which can still be extracted economically by a miner working alone.

The simplest form of mining is by shaft sinking with a pick and shovel. Driving along the level is then carried out with picks and explosives. When traces of opal are found a handpick or screwdriver is used.



Nowadays most shafts are sunk by Calweld-type drills which are used to excavate holes about one metre in diameter using an auger bucket. This rig is also used for prospecting and the opal fields are pitted with abandoned Calweld drillholes.

Waste material, or mullock, from the shafts and drives was originally lifted in buckets by hand windlass, but power winches (Yorke hoists) or automatic bucket tipplers, known as self unloaders, are now used. Truck-mounted blowers, which operate like vacuum cleaners, are also used for lifting mullock.

Since the 1970s, there has been a rapid increase in the use of mining machines. Tunnelling machines with revolving cutting heads and small underground front-end loaders, called boggers, have been introduced.

Bulldozers are employed to remove overburden and expose the level where it is shallow. Spotters follow behind watching for opal and the seam is then worked over by handpick.

Noodling

This is the process of searching through heaps of discarded mullock for pieces of precious opal. Many locals make a living out of this method and it is popular with tourists. The most productive heaps are those excavated by bulldozers where opal may have been crushed or overlooked by careless operators. Noodling machines in which mullock is passed on a conveyor under an ultra violet light are also used.

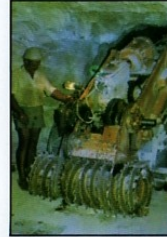
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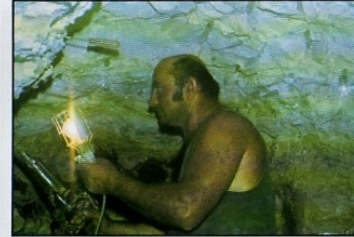
Calweld drill 24083



Bulldozer and spotters 24086



Tunnelling machine 15015



Driving along the level at Andamooka 13772

Hand winch 13754



Blower 13685



VALUE AND PRESENTATION

Attempts have been made to establish guidelines for determining opal prices but they have been largely unsuccessful because of the gem's infinite variation in colour pattern.

The main factors influencing the price paid for opal are:

- **background colour**—black opal (a gem with a dark background) is more valuable than clear opal (crystal opal) which in turn is generally more valuable than white or milky opal.
- **dominant fire colour**—red-fire opal is generally more valuable than a predominantly green opal, which in turn is more valuable than a stone showing only blue colour.
- **colour pattern**—harlequin opal, where the colour occurs in patches, is generally more valuable than pinfire opal where the colour is in small specks.

There is a marked difference between the value of uncut opal compared with the value of cut and polished stone.

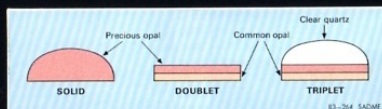
Opals may be cut and polished in a number of ways, depending on the nature and thickness of the colour band. Under the Trade Standards Act, all opal sold in South Australia must be labelled clearly to show the type of opal and how it is presented.

Solid (Cabochon)

If the opal is sufficiently thick most cutters prefer to produce the opal as a solid cut *en cabochon*.

Doublet

A thin veneer of opal may show enhanced colour with a dark backing. This can be achieved by cementing either black or grey silica material or a thin slice of common opal to the back of the opal with epoxy resin.

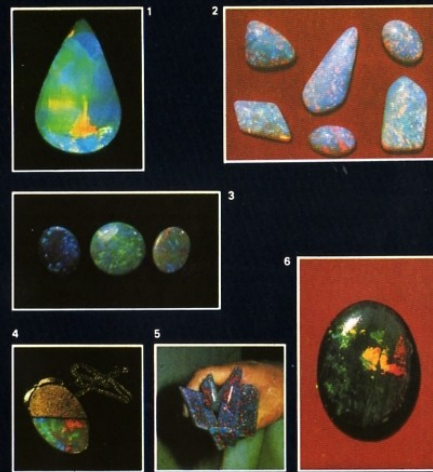


14

Triplet

To protect the opal from abrasion, a slice of quartz may be used to cap the thin opal veneer producing a three-tiered gemstone known as a triplet. This type of gem can display brilliant colours. It is a cheaper method of presentation and can enhance the appearance of the opal.

An expert gemstone and jewellery evaluation service is available at the Australian Mineral Development Laboratories, Flemington St, Frewville 5065, Tel. (08) 791 1662.



1. Solid opal cabochon 24097
2. Solid crystal opal 24093
3. Solid black opal 24092
4. Opalised fossil shell pendant 24096
5. Opal triplets before final shaping 24091
6. Andamooka matrix opal 24094

15

Matrix Opal

Matrix comprises precious opaline silica as an infilling of the pore spaces in silty claystone; it generally shows fine pinfire colour in the natural state. The colour may be enhanced by soaking the specimen in a sugar solution and then boiling in acid to deposit carbon in the available pore spaces, resulting in a dark background. Matrix opal is only found at Andamooka and is generally cut and sold *en cabochon*.

Synthetic Opal

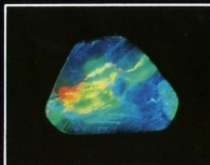
Synthetic opal, such as Gilson, is opaline silica produced in the laboratory and having a similar structure to that of precious opal.

The following observations can help to differentiate between natural and synthetic opal:

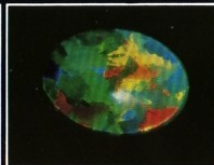
- synthetic stones generally show brighter colours, and colour patches are often larger than in natural opal.
- colour grain boundaries are generally highly irregular in synthetic opal.
- within each colour grain in synthetic opal there are numerous sub-grains producing a distinctive snakeskin pattern.
- synthetic material generally shows a more ordered array of colours since artificial material does not duplicate the intricate pattern of natural opal.

Imitation Opal

This is non-opaline material such as coloured tinsel set in clear plastic or epoxy resin.



Precious solid opal 24095



Gilson synthetic opal 15007

OPAL MINING AND THE LAW

The Mining Act does not affect the fossicker who searches for minerals as a recreation and without any intention of selling them. Casual noodling by tourists is encouraged although permission should be obtained from the miner when noodling on active claims.

For those wishing to mine or prospect for opal, a Precious Stones Prospecting Permit is required. This allows the holder to prospect within a Precious Stones Field and to peg out a Precious Stones Claim. It does not authorise disturbance of ground by machinery or explosives. A claim must be registered within 14 days after pegging out. "Declared equipment"—e.g. bulldozers and tunnelling machines—may only be used on registered claims. A claim must be pegged out over any area where noodling is undertaken commercially.

Further details on claim pegging, registration, and mining conditions may be obtained from the Department of Mines and Energy, 191 Greenhill Road, Parkside, SA 5063, telephone (08) 274 7500, or from the Department's area officers at Andamooka, Coober Pedy, Marla and Mintabie.



Noodling at Mintabie 24100

GLOSSARY OF MINING TERMS

<i>Driving</i>	excavating horizontally underground.
<i>Fossicking</i>	searching for minerals as a recreation.
<i>Level</i>	a near-horizontal layer associated with opal formation.
<i>Mullock</i>	waste rock.
<i>Noodling</i>	searching through heaps of rejected material for precious opal.
<i>Painted lady</i>	a boulder split along a fracture to reveal a coating of opal.
<i>Potch</i>	opaline material generally milky white in colour and which does not show any play of colours.
<i>Slide (or slip)</i>	a near-vertical fault displacing the level.
<i>Solid Shell</i>	a fossil shell filled with precious opal.
<i>Spotters</i>	people engaged to follow behind a bulldozer and search for precious opal.
<i>Traces</i>	encouraging small pieces of precious opal found during prospecting or mining.

FURTHER READING

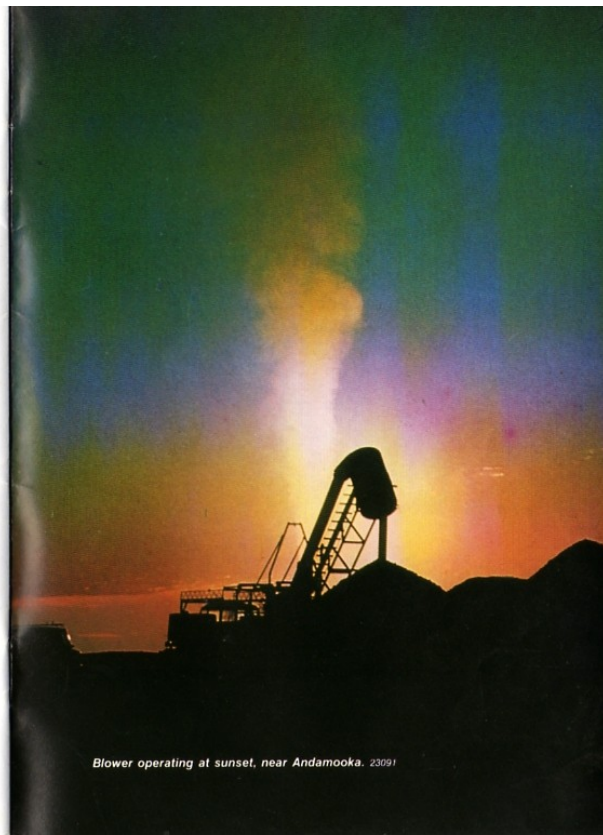
The book *Opal: South Australia's Gemstone* gives detailed descriptions of South Australian opal occurrences, the geological formation of opal, and current mining methods. It is available from the Department of Mines and Energy.

This brochure was prepared with the co-operation of the Australian Gem Industry Association (S.A. Branch).

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S.A. DEPARTMENT OF MINES AND ENERGY
191 GREENHILL ROAD, PARKSIDE 5063

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Blower operating at sunset, near Andamooka. 23091