



# *SEGments*

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# Scientific Expedition Group Inc.

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- \* The promotion and running of expeditions of a scientific, cultural and adventurous nature.
- \* The furthering of knowledge, understanding and appreciation of the natural environment.
- \* Promotion of the values and philosophy of wilderness.
- \* Enabling people to learn the skills required for planning and running expeditions, and to develop sound field techniques.

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**Cover photograph:** Flared slopes on Pildappa Rocks near Minnipa, Eyre Peninsula.  
Photo: Terry Krieg



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Chris Wright

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### WICHELINA EXPEDITION 2015

northern Eyre Peninsula. At the time of impact it is estimated that the crater was ten times the size of Adelaide.

Quoting Dr Barovich, she notes (in 2006) that "scientists believe catastrophic asteroid impacts have changed life on Earth in the past". Further "up until about 600 million years ago, life on Earth was pretty simple. Bacteria and algae ruled the planet. The appearance of more complex species was almost instantaneous. .... Some scientists suggest that an intense period of global glaciation caused the flowering of life at this time. But some Australian scientists suggest that the cause of this burst of life was truly out of this world."

There have been many interesting and surprising events in South Australia's geological history, and SEG expeditions take us to some wonderful places where we view and photograph diverse rock formations and landscapes that are the result of these events. On these expeditions I invariably struggle to understand the local geology, reaching back into the recesses of my brain to my Uni days, but I usually remain confused. A SEG member Terry Krieg has contributed a seminal article "The Geology of South Australia - A History" in which he describes the extraordinary geology of South Australia, where in Terry's words "Few comparable areas of earth contain such a diverse range of rocks in both age and lithology" (nature and composition).

Terry has explained the origin of the rock formations that many SEG expeditioners will have seen at Arkaroola, Bimbowrie, Hiltaba, the Gawler Ranges and the Gammon Ranges. He has studied the Flinders Ranges closely and has some gems to tell us about that wonderful part of South Australia. You will be surprised to discover the treasures that are literally in our backyard. The twenty kilometre Brachina Gorge Geological Trail passes through 150 million years of earth's history in which complex life on earth evolved.

In the spectacular Brachina Gorge there are fourteen geological layers in a pile five kilometres thick that can be traced as you move along the Brachina Trail. The sediments which formed these rock layers were deposited on an ancient sea floor that covered part of what is now South Australia. The sea is known as the Adelaide Geosyncline. From Terry's article we learn about the ancient marine environments that existed at the time of deposition of each of the many sedimentary layers, and the characteristics of the rocks that formed to make up the Adelaide Geosyncline.

Helen Johnson

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### EDITORIAL

In an article "*In the line of fire*" printed in The Advertiser Review January 2006, Adelaide University lecturer Dr Karin Barovich describes the likely consequences of a serious asteroid impact in the north of South Australia. In fact 580 million years ago a large asteroid five kilometres in size hit South Australia resulting in "just about the biggest impact crater in the country". Today the crater, a circular dry salt lake, is known as Lake Acraman, and it is on Yardea Station (adjoining Hiltaba Station) in the Gawler Ranges on

# THE GEOLOGY OF SOUTH AUSTRALIA - A HISTORY

Terry Krieg



Murphy's Haystacks, Eyre Peninsula. Photograph Dr Mike Lusk

## Introduction

The geological history of South Australia spans an enormous length of time from the latter part of the Archaean Era to the present, the Holocene Epoch (Figure 1). The absolute age of South Australia's oldest rocks is about 3.2 billion years, more than half the age of the earth which is 4.6 billion years. Eight geological provinces cover the entire state and areas beyond (Figure 2).

## Definitions of rock origins

*Metamorphic rocks:* Rocks which are formed deep beneath the surface of the earth by the transformation of other rocks (while in their solid state) in mineral composition and rock texture, by heat, pressure and chemically active fluids.

*Sedimentary rocks:* Rocks which result from the accumulation and compaction of sediments weathered and eroded from pre-existing rocks.

*Igneous rocks:* Rocks which result from the cooling and crystallization either on the surface (volcanic) or at depth (plutonic) of molten magma.

*Orogeny:* The process of mountain building.

*Ma:* Million years

## South Australia's Geological Provinces

With reference to Figures 1 and 2, in the north-west of the state lie Mesoproterozoic very high grade metamorphic rocks of the Musgrave Province, bounded on the south by Neoproterozoic and Palaeozoic sedimentary rocks of the Officer Basin. Further south lie the Tertiary sedimentary limestones and sandstones of the Eucla Basin. The central region of the State is dominated by Archaean and Proterozoic igneous and metamorphic rocks such as schists, gneisses, quartzite and marble of the Gawler Craton. The Gawler Craton is flanked on the east by Neoproterozoic/early Palaeozoic sedimentary rocks of the Stuart Shelf and Adelaide Geosyncline. To the east lie the Paleoproterozoic to Mesoproterozoic igneous and metamorphic rocks of the Curnamona Province. North of that lies the vast Palaeozoic/Mesozoic Eromanga Basin (Great Artesian Basin), which include the late Paleozoic Cooper, Warburton and Pedirka Basins. To the South of the Curnamona Province lies the Tertiary Murray Basin. Other Tertiary sediments, mostly limestones, shales and sandstones are found in the Eucla and Lake Eyre Basins.

**Figure 1 South Australia —A Relative Geological Time Scale**

Compiled by Terry Krieg Feb 2015

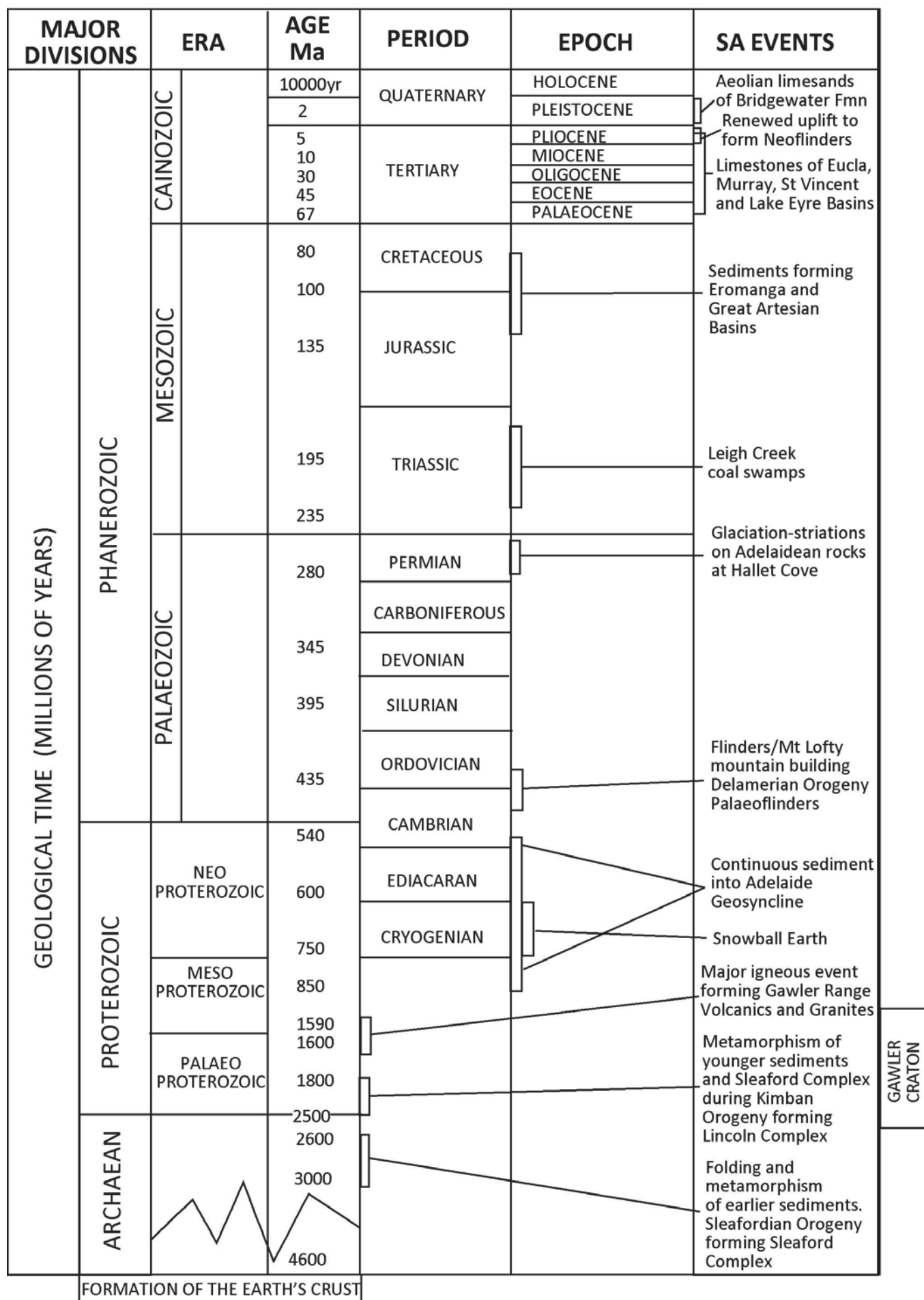




Figure 2 Simplified Geological Map of South Australia showing positions of major blocks and sedimentary basins

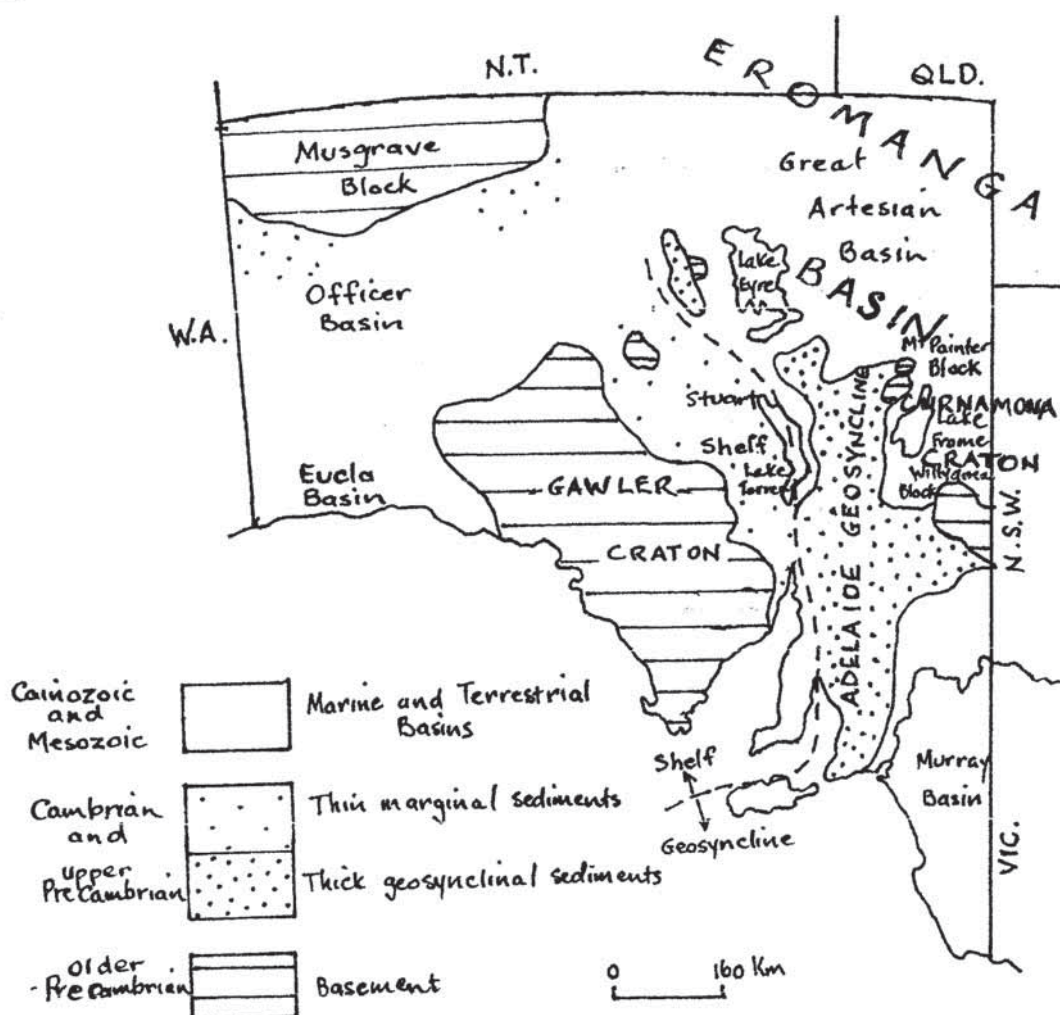
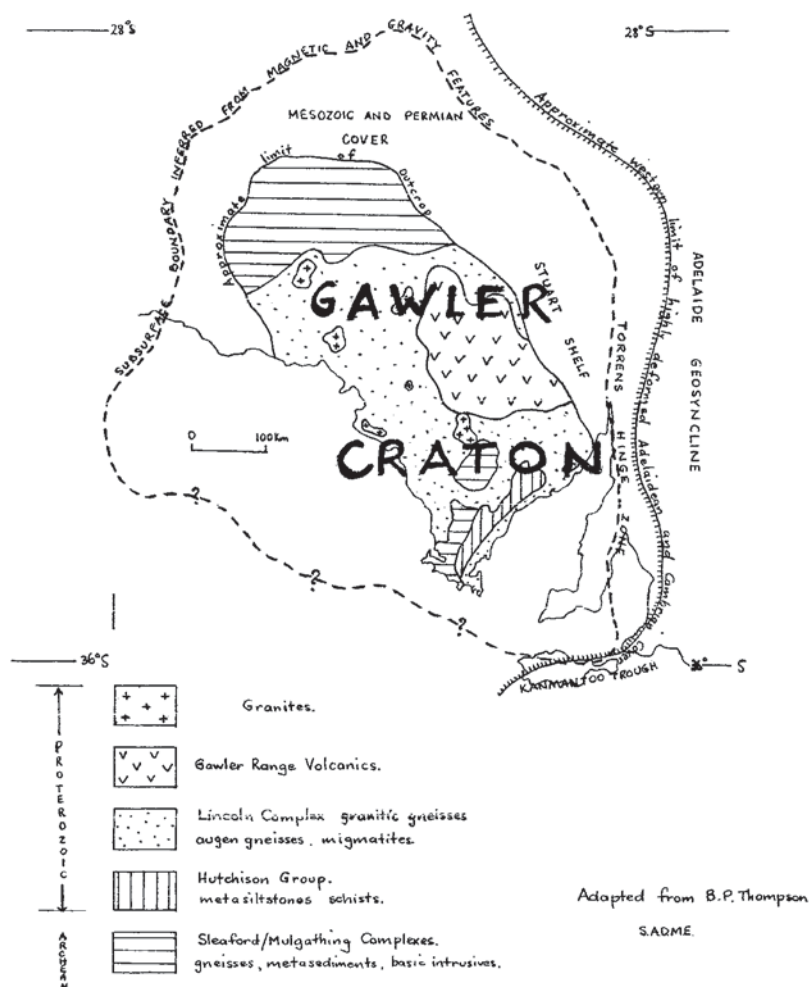


Fig 3: Chart of the Gawler Craton



Few comparable areas of the earth contain such a diverse range of rocks in both age and lithology (nature and composition of rocks). The two provinces most accessible for study are the Gawler Craton and the Stuart Shelf/Adelaide Geosyncline. Research and interpretation of both regions have continued for well over a century.

## The Gawler Craton

**Origin:** The oldest rocks in the Gawler Craton (Figure 3) are 3,200-3,100 million year old granites near Iron Knob on Eyre Peninsula. Further west on Eyre Peninsula, pre-existing source rocks, 3,000-2,700 million years old were metamorphosed and deformed during Sleafordian Orogeny. A great diversity of crystalline gneisses and basic intrusives resulted. These rocks are referred to as the Sleaford Complex.

Much later, in the Palaeoproterozoic, 2,000 million year old granites were intruded in the Cleve Hills area, while from Port Lincoln to Port Neill and also on Southern Yorke Peninsula; granites of the Donington Suite were intruded at 1,850 million years ago. Hutchison Group metamorphosed sedimentary rocks comprising metasiltstones, quartzite, marble and schist were laid down between 2,000 and 1,730 million years ago. Both were metamorphosed about 1,730-1,690 million years ago during the Kimban Orogeny accompanied by the intrusion of granites.

About 1,590 million years ago, well after the Kimban Orogeny, an attenuated igneous event gave rise to the Gawler Range Volcanics associated with intrusive granites of the Hiltaba Suite (Figure 4). Many of these granites outcrop and have been weathered to beautifully rounded shapes with flared slopes (see front cover) and other interesting sculptural forms including pits, pans, rilles and tafoni (hollows). Pildappa, Tcharkulda and Ucontitchie Rocks, Mount Wudinna and

especially Murphy's Haystacks are fine examples of these naturally sculptured forms.

The Gawler Range Volcanics originated by the melting of mantle and deep crustal rocks to produce huge volumes of felsic magma and much smaller volumes of mafic magma. Felsic magma produces light coloured igneous rocks called granite, and mafic magma produces dark coloured igneous rocks called basalt. These magmas erupted from several widely separated centres, most probably along fissures. Later in the event, huge outpourings of thick sheets of porphyritic dacite and rhyolite occurred (igneous rocks with predominant minerals of feldspar and quartz). A porphyry has coarse crystals called phenocrysts set in a finer grained matrix. The coarse and fine textures indicates two stages of cooling; slow cooling at some depth during which the phenocrysts form and then rapid cooling when the remaining magma, which now includes the coarse phenocryst, is brought to the surface and cools quickly to form the fine matrix. The final stage of this igneous activity formed the Gawler Ranges, covering an area of about 25,000 square km to a depth of up to 2km, or about 40-50,000 cubic km of extrusive igneous rock. The Ranges are amongst the *largest* of such outpourings found on earth. During the cooling of the magma, polygonal joint systems developed in the rock giving rise to the columnar jointing prominent throughout the ranges. "Organ Pipes" is a common name given to many of these groups of jointed column structures. Expeditioners to Hiltaba Station would have seen examples of jointed column structures (Figure 5).

The Gawler Craton, formed over about a billion years, has settled down and earth movements have ceased. It is now a very stable part of the earth's crust. It is also very rich in some large and valuable mineral deposits including: copper, uranium, gold, iron and graphite which are mined now or will

be in the future. The large Olympic Dam copper mine at Roxby Downs also contains the worlds largest uranium deposit (approximately 25% of the known world reserves). We sell yellowcake to 22 countries, but strangely haven't yet decided to use our own uranium for the production of clean, green, abundant, cost-effective, emissions-free base load energy for ourselves.



Fig 4: Hiltaba suite granites at Pretty Point on Hiltaba Station Photo: Jill Tugwell





**Fig 5: Jointed columns (Organ pipes) in porphyritic dacite, Yardea Station, Gawler Ranges**

## The Adelaide Geosyncline and the Stuart Shelf

**Origin:** During hundreds of millions of years of weathering and erosion, the rocks of the Gawler Craton produced sediments which were then carried into the Adelaide Geosyncline. The rocks formed from the consolidation of these sediments and their subsequent folding and uplift, now form the Mount Lofty/Flinders Ranges mountain range described later.

A geosyncline is a major depression in the earth's crust, usually a sea, which collects sediments from the surrounding land over a long geologic period. About 850 million years ago the land which is now South Australia was divided by a shallow sea. This has been named the Adelaide Geosyncline (Figure 2). To the west of the Geosyncline lay an ancient continent (the Gawler Craton). Sediments weathered from the old continent, were carried by rivers, glaciers, the wind and gravity into the shallow sea. The sea was continually changing its shape, size and depth and hence the environment of deposition of the sediments was continually changing. Sediments coming into the geosyncline were varied resulting in many different layers in composition and texture being deposited in the geosyncline. Consequently the rocks which eventually formed were varied. Sandstones, shales, limestones and tillites (rocks and boulders deposited from melting glaciers) are common.

Over a period spanning about 350 million years in the Neoproterozoic, an enormous pile of different sedimentary layers built up. The pile was deepened as the sea floor sank along the Torrens Hinge Zone, a major fault along the eastern edge of the Gawler Craton. The maximum depth of sediments varies throughout the ranges but in the central part it is about 15 kilometres deep (10 times the depth of Grand Canyon).

Of particular interest in this huge pile are rocks which formed during the Cryogenian Period, between 700 and 600 million years ago. The climate of the entire earth was highly variable and included several very cold periods during which much of the earth's surface was glaciated (sometimes called "Snowball Earth"). At Arkaroola in the Northern Flinders Ranges, massive thicknesses of the Bolla Bollana tillite, about 660 million years old are exposed (Figure 6). The same rock is found in the Sturt Gorge near Flinders University. The rock layers which occur near the top 5 km of this huge pile, spanning from about 650 to 500 million years ago, formed when multi-celled animal life had its beginnings. These layers are exposed in the world-famous, spectacular Brachina Gorge.

### Brachina Geological Trail - Flinders Ranges

The Enorama shale is the oldest of the 14 geological layers making up the Brachina Geological Trail in the Flinders Ranges. The Enorama shale is overlain by limestone and shale of the Trezona Formation containing stromatolites, built by cyanobacterial mats (formerly known as blue-green algae). These and other single-celled bacteria were the first life forms on earth and first appeared about 3.5 billion years ago (Figure 7).

Next are the 600 million year old tillites of the Elatina Formation. Following the glaciation of the Cryogenian, the earth warmed and fine grained dolomite (limestone), the Nuccaleena Formation, lying immediately above the Elatina Formation was deposited. Its base is marked with a bronze disc (Golden Spike), indicating the base of the official world



**Fig 6: Bolla Bollana tillites (dark region in centre) at Stubbs Waterhole, Arkaroola. Photo by Mara Pearson**





**Fig 7: Fossil structures called stromatolites, Enorama Creek, Brachina Geological Trail, Flinders Ranges**

the late Dr. Reg. Sprigg in 1946 (Figure 11). The Rawnsley Quartzite is resistant to weathering and so forms many of the higher ridges occurring throughout the Flinders Ranges including the rim of Wilpena Pound, the nearby Chace, Druid and Elder Ranges, the Stirrup Iron Range and Reaphook Hill to the east, and Mount Hack and the Gammon Ranges in the north. The Rawnsley quartzite layers dip at mostly fairly steep angles, but in the Gammons they have remained relatively flat (Figure 12). This has led to the formation of many steep-sided near vertical gullies found on the Gammon Plateau. One of SEG's pluviometers is perched on a narrow ridge between

type section of rocks of Ediacaran age (Figure 8). The Ediacaran Period was recently added to the Relative Geological Time Scale. The increasingly younger layers above are the Brachina Formation (shale), the ABC Range quartzite, and the Bunyeroo Formation (shale) (Figure 9). The Bunyeroo Formation has a coarse debris layer within the fine shale. The debris was blasted from the Gawler Ranges about 580 million years ago when an asteroid slammed into the earth (forming Lake Acraman on Yardea Station), and showered billions of tonnes of Gawler Ranges rock into the shallow sea. The debris sank to the sea floor and became included in the finer deeper water Bunyeroo Formation sediments building up at the time. The Wonoka Formation (a calcareous siltstone and limestone) follows, then the brilliant red Bonney Sandstone and finally the top layer of the type section, the orange Rawnsley Quartzite (Figure 10).

The Rawnsley Quartzite contains Ediacaran fossil impressions of soft-bodied organisms resembling jellyfishes, worm and sea pens. These animals are the oldest so far discovered multi-celled organisms (metazoans), and were first discovered by

precipitous gullies.

The four layers which complete the Brachina Trail belong to the early Palaeozoic (Cambrian Period) and include the Parachilna Formation (limestone) containing fossil worm burrows, the Wilkawillina Limestone containing a fossil coral/sponge organism (*Archaeocyatha*), the Billy Creek Formation (shale) containing Trilobites and the Wirrealpa Limestone containing Brachiopods.

The rocks of the geosyncline are divided into six groups. Youngest to oldest they are the Lake Frome Group and the Hawker Group (both Cambrian). The Cambrian was the time when more diverse and abundant life forms evolved on earth. The remaining four groups under the Lake Frome and Hawker Groups which complete the whole 350 million year old pile are: the Wilpena Group (Ediacaran Period) (contains Brachina Trail rocks), the Umberatana, Burra and Callana Groups/Mt Painter Complex (all Cryogenian Period). These groups are described well in the Royal Geographical Society of SA Monograph Series, Volume 5 "Lake Eyre South" pp 9-14.

During the Cambrian Period the whole pile became unstable and the sea floor rocks were buckled, folded and uplifted to form a high mountain range perhaps 6,000 metres high, the Palaeoflinders. Some of the same sedimentary layers deposited on the stable Gawler Craton were not disturbed and have remained flat. This area is the Stuart Shelf (Figure 2). Flat topped hills (mesas) are a feature of the weathered and eroded Stuart Shelf.

Over the following 495 million years, the Paleoflinders were weathered and eroded to an almost flat plain. Deep meanders winding through the gorges in both the Mount Lofty and Flinders Ranges today indicate rivers meandering across the plain maintained their winding course as the land rose slowly around them during rejuvenation. This renewed uplift began about five million years ago during the Pliocene



**Fig 8: Author pointing to the Golden Spike at base of Ediacaran Type section, Brachina Geological Trail, Flinders Ranges.**





**Fig 9: Dipping shale beds of Brachina Formation near Blinman, Flinders Ranges**

and has formed the present day Mount Lofty/Flinders Ranges, the Neoflinders.

The peninsulas and gulfs were also formed at this time during major faulting causing some blocks to be left above sea level (peninsulas and ranges) and others below sea level (gulfs). Occasional earthquakes occurring in the ranges today indicate the uplift is continuing.

It's easy to see why this sequence of Neoproterozoic and Cambrian sediments is so important in the geological history of the earth. With the Gawler Craton and the Adelaide Geosyncline, South Australia really is blessed with a great diversity of geological landscapes.

The fossil record found in the Mesozoic and Cainozoic basins in South Australia is also an impressive story (Figure 1). An article titled "The Phanerozoic", in the *Geology of South Australia*, Volume 2 published by Mines and Energy SA (1995), is a complete source of relevant information. The Eromanga Basin is the most important of all of the sedimentary basins in Australia (Figures 1 and 2). It is very large covering almost one fifth of the Australian continent and includes the Great Artesian Basin. Other basins included in it are the Cooper, Warburton and Pedirka Basins. They are composed of sandstone and mudstone units and were formed during the early Jurassic to mid-Cretaceous Periods. All of these basins, especially the Cooper and Great Artesian Basins, together making part of the Eromanga Basin, are critical as sources of water, oil and gas in South Australia. The Scientific Expedition Group has conducted biological surveys at Coongie Lakes (1988), Witjira Conservation Park (2003) and Marqualpie Wells (2008) in the Eromanga Basin.

The South Australian geological history of more recent times, especially as it relates to the hotly debated issue of Global

Warming (Climate Change) warrants some consideration. Changing (rising) sea levels are of major concern to many in this debate. There is compelling evidence in South Australia of sea level changes since the Pleistocene Ice Age. Along the south east, south central and west coasts, there are many kilometres of coastal cliffs. They are composed of calcareous sands of the Bridgewater Formation. The cliffs are remnants of extensive coastal sand dunes built up by the wind blowing across an exposed continental shelf (the source of the lime sand derived from broken shell fragments) when the sea level was about 100 metres lower than it is today. Ice ages are characterized by cooler (glacial) and warmer (interglacial) phases. Current rising sea level indicates that we are at present in an

interglacial phase. The current rising sea is undercutting the old partly consolidated dunes to form the cliffs along the coast. Related to that, is the series of inland parallel dune ridges trending north west/ south east across the south east of



**Fig 10: Contact between red Bonney sandstone (left) and orange Rawnsley quartzite (right), Brachina Gorge, Flinders Ranges**



the state. Each dune ridge represents a stranded shoreline, formed during a pause as the sea level rose or fell in response to either a warming or cooling climate.

I hope this brief account of part of South Australia's geological history will encourage you to research and read more widely about our wonderful and geologically blessed state.

*Thanks are due to Dr Wolfgang Preiss for up-to-date information, especially on the Gawler Craton.*

Photos by Terry Krieg unless otherwise attributed.

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**Editors Note:** The Brachina Geological Trail story has been celebrated in a CD, titled "*Brachina-a journey through time in words and music.*" Poem and narration by Terry Krieg, music composed by Nick Krieg, and musicians appearing Nick Krieg, Don Burrows and Kevin Hunt. The CD is available from the Terry Krieg.

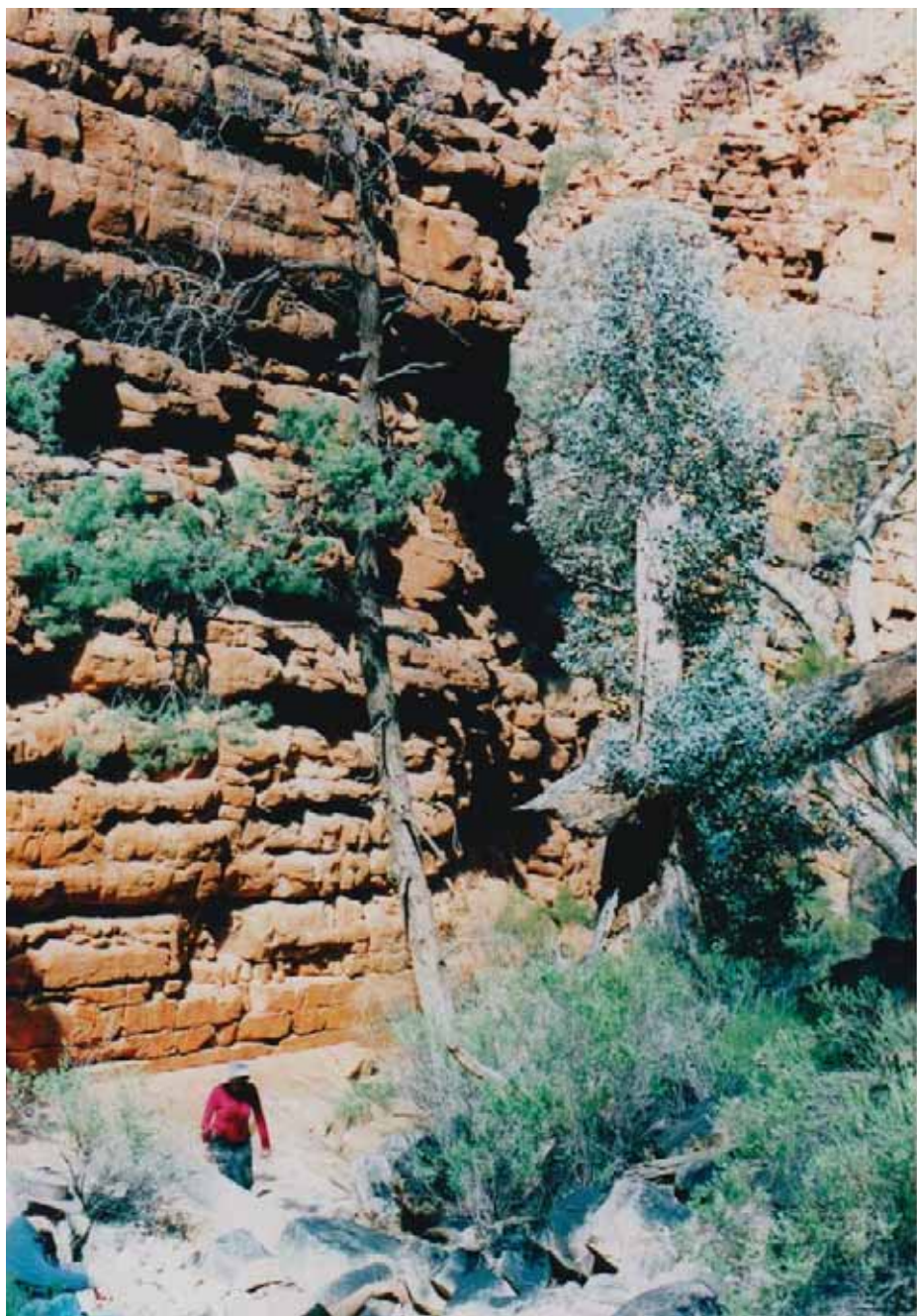
Terry's book "*Walking with Warren: during one half life*" has been reviewed in SEGments (March 2014) and is available from the author.



**Fig 12: Well bedded and weathered Rawnsley quartzite near Bunyip Chasm, Gammon Ranges**



**Fig 11: Ediacaran fossil, *Dickinsonia costata*, a flattened segmented worm, in Rawnsley quartzite, Ediacara, Flinders Ranges**





# THE FERN GORGE PUZZLE

Ray Sinclair-Wood

One of the photographs opposite page 136 in Warren Bonython's 1971 book, *Walking the Flinders Ranges*,<sup>1</sup> is captioned 'Entrance to Fern Gorge', and has baffled many Gammons hikers for decades. They say about it, 'But that's Bunyip Cranny!' Which, of course, it is. In addition, for a long time now Fern Chasm has been 5½ km roughly WSW from Bunyip Cranny—it's even further west than Rover Rock Hole.

On the *Illinawortina* 1:50,000 Topographic map, Bunyip Chasm is shown but not Bunyip Cranny. (Many hikers have also wrongly thought the Chasm and the Cranny are the same.) The Cranny is at GR 224 301, and is just inside the mouth of a side creek off Balcanoona Creek. You climb a small waterfall up into the Cranny—in Bonython's photo there's a tree trunk placed to help climbers, and you can see how narrow the Cranny itself is above the waterfall. This narrow part leads to a second small waterfall, above which the Cranny opens into what Bonython describes on page 133 as a small amphitheatre (GR 224 314):

*We also visited Fern Gorge, that secret place near the head of the Balcanoona Creek discovered by the Greenwoods decades earlier. The narrow entrance was blocked by a great wedged boulder, or chockstone, over which we climbed, and then we followed a six-foot defile to the small, steep-sided amphitheatre at its end, but we failed to find any ferns.*

On the northern side of this amphitheatre is Nightmare Falls, which you climb up to get into the creek leading into Bunyip Chasm. The passage doesn't make clear if Bonython considered the Cranny, or the amphitheatre, or both to be Fern Gorge.

After his August 1947 Gammons hike, he had an article, 'Grandeur of the Gammon Ranges', in Adelaide's *The Advertiser*.<sup>2</sup> It contains the same photo as in his book, but captioned 'Climbing the chockstone at the entrance to the "Gorge of Ferns"', and he refers to it using that same name in the article's text, and also says, 'The giant ferns which grew there years ago were no longer to be found. Perhaps they had died out during the recent drought.' I've found that name, 'Gorge of Ferns' in another place too,<sup>3</sup> and wonder if it were the Greenwoods' original name for it.

However, on the *Illinawortina* sheet, Fern Chasm is shown as the creek from GR 175 288 up to 166 300. As I said, its mouth is all of 5½ km roughly WSW from Bonython's Fern Gorge. (The upper creek branching from Fern Chasm at 169 298 to 167 304 is Blue Chasm, whose name comes from the quality of the blue light you sometimes get in it, and not from the name 'Blue Range'.)

So this for decades was the Fern Gorge Puzzle: how did Fern Gorge migrate 5½ km from where it originally was to where it now is? The terms 'Gorge' and 'Chasm' were thought by most hikers to be interchangeable, or nothing more than cartographers simplifying geographical terminology.

Bonython also says of the brothers Gordon 'Smiler' (1889–1979) and Bentley (1904–61) Greenwood that the two of them 'had explored the margins [of the Gammons] between the Wars, discovering interesting Fern Gorge' (page 127; my



italics). Ben Greenwood, one of Bentley's two sons, told me that this hike was made before they took up the Arkaroola station in 1937, but is unable to date when they visited Fern Gorge any better than that. However, he did recently discover a small folded black card containing four numbered and captioned photos of his father's and uncle's hike to Fern Gorge.<sup>4</sup> Unfortunately, there isn't a date in the captions or on the card anywhere.

Photos 2 and 4 (numbers are in left hand bottom corner) are of the cars they used to drive to what looks like Loch Ness Well on the Balcanoona Creek. Number 4 shows a car driven up on a stump, with its offside front wheel in the air. The single caption to both is 'At foot of Gammon Range'. In both photos there are swags on the front mudguards. Perhaps they camped overnight at the Well before going on their hike, though it's only about four kilometres from the Well to the Cranny—however they may have hiked higher still up the Balcanoona Creek. Photo 1 is an uninteresting one captioned 'Creek in Gammon Range.', presumably of the Balcanoona Creek taken on their hike up it. But the most fascinating one, photo 3 (above), is a rather poor and torn photo taken from within Bunyip Cranny itself, looking out to the Balcanoona Creek. It's not the torn photo itself, but the torn photo rephotographed.

You can faintly see three men in it—two sitting at the very lip of the first waterfall itself, and one standing, leaning back, on the left. So including the photographer, four people went on the hike, two unknown. However, Ben Greenwood is unable to identify his father and uncle in it. This photo's caption says 'Creek where ferns grow in Gammon Range.'





Where did the name 'Bunyip Cranny' come from that replaced 'Gorge of Ferns'/'Fern Gorge'? It was given that name in 1952 by Bill Melbourne and Bob Sexton of the 1st Linden Park Rover Crew, after the Linden Park Scout Group's Bunyip Mascot. You'd suspect the name to have been given with the Arkuru serpent in mind, similar to the McLachlans of Balcanoona station having it in mind when they named Loch Ness Well. But Bob Sexton assured me this was not so when they named the Cranny.

Ben Greenwood suggested that we may be able to narrow down the date of his father's and uncle's hike up to Fern Gorge if we can identify and date the cars in photos 2 and 4. Well, the car in photo 4 is similar to but not identical to a great number of cars of around 1925 that we've examined so far. It also looks fairly new for an outback car of that time.<sup>5</sup>

It's possible if the car at the back in photo 2 was Bentley Greenwood's, that it's his 1926 Maxwell Dodge. Ben Greenwood has a photo of this Dodge being driven over Wywhyana Creek on Arkaroola in 1939. But the back of the roof in the latter photo looks more rounded.<sup>6</sup>

However, the look of the two cars does suggest that their hike was perhaps in the middle or second half of the 1920s. And if Bonython's reference in the first quote above from his book to 'decades earlier' than 1946/47 ('decades' plural) is correct, that suggests their hike was no later than 1926/27—the minimum of two decades earlier. But all of that is only supposition at present.

Bonython says that 'Smiler' and Bentley Greenwood 'discovered' Fern Gorge (page 127). However, Gordon Lillecrapp (1929– ) who grew up on and lived at the old Yankaninna station until the late 1950s, told me in December

2014 that it was their father, W.B. Greenwood (1854–1920)—known as 'W.B.'—who discovered it, even earlier. Not only did 'W.B.' discover it, he says, but he placed his '1' 1' brand (with an upside-down 'Y') on the cliff below the first waterfall leading up into Bunyip Cranny. Gordon Lillecrapp says he saw this brand clearly when he himself visited Bunyip Cranny during his time at Yankaninna. Peter Wyld and I saw it in the 1960s, but by then it was so badly weathered that it was difficult to make out. It is/was on the left hand side as you face that waterfall.

Of course, when you talk about who 'discovered' Fern Gorge you ignore how early pioneers and prospectors in the region very likely walked up Balcanoona Creek and found it earlier still. In 1899 *The Advertiser, Adelaide* has an article about the Worturpa Goldfield which says, 'When Mr. Napier left the field on Sunday morning there were quite 400 men at Worturpa...', and that 'Prospectors are also traversing the country for miles around in the hope of dropping on another Golden Hole.'<sup>7</sup> With most of 400 men eagerly searching for gold in all directions from Worturpa, which is very close to Fern Gorge/Bunyip Cranny, it would be remarkable if none of them poked up the Balcanoona Creek.

The map (see page 13) is a portion of one published in 1899 showing the newly-proclaimed Worturpa Goldfield.<sup>8</sup> It's not attributed, but it's clearly the Pastoral Plan of the day, which is not to scale, nor very accurate. However, it does show that the Balcanoona Creek runs right up through the Goldfield's centre. And it's not at all difficult to walk up Balcanoona Creek all the way to the top of the Blue Range. In fact there are very few gorges in the Gammons that you can't walk up easily, though sometimes with a bit of a scramble. Bunyip Chasm and Fern Chasm are exceptions.

But the Greenwoods' discovery is the earliest recorded one that I know of.

This still leaves unsolved the puzzle of how Fern Gorge moved 5½ km WSW to where it is today, and was renamed Fern *Chasm*. The answer to this comes from an account of an early Gammons hike done by four members of the Adelaide Bushwalkers from Friday 28th May to Tuesday 8th June 1948 (that club had been founded 17th October 1946). They were Arthur 'Lin' Richardson, Colin and John Crisp, and Lionel Lever. They hiked from the old Yankaninna station homestead<sup>9</sup> where it then was (7½ km NE from Gammon Hill) down to the Warraweena station homestead, over twelve days, with one depot in Italowie Gap.

The Gammons part of their hike was from the Yankaninna homestead, over the station's bridal path across the Yankaninna Range to Yackie Waterhole,<sup>10</sup> then up to the Blue Range at Prow Point, and down through Blue Chasm and Fern Chasm into Terraces Creek and the Italowie South Branch. From there they visited Rover Rock Hole, which Lin named Cleft Peak Waterhole,<sup>11</sup> climbed Cleft Peak and Mt McKinlay, and followed the Italowie Creek out to Italowie Gap via Grindell Hut. Grindell Hut was at that time the original one known earlier still as Worturpa Hut,<sup>12</sup> which is behind the present one that was built by Balcanoona station in the 1950s.

Cleft Peak Waterhole was renamed Rover Rock Hole on a five-day Gammons hike in August 1954 by Johnny Alpers, Jim Bullock, Ian Gray, Rob Neill, Brian Wall, and Kim Young of the St Peters College Rover Crew. Kim told me in January 2015 that



they hiked down to it from the Blue Range. ‘Rover Rock Hole’ is the name that’s survived.

Lin Richardson’s detailed account of this hike, ‘Story of a Gammon Range Walk’, is in the ABW’s newsletter, *Tarndanya* (renamed *Tandanya* in 1970), of May, June, and July 1949. Copies are in the State Library of South Australia.<sup>13</sup> The passages relevant to the naming of Fern Chasm are from the May issue:

*On April 29th [before their hike] Lionel saw Warren Bonython who planned to be in the Gammons a few weeks before us and who gave us information about waterholes [;]*

and on the third day of their hike, when they’d come down off the Blue Range through Blue Chasm into the present Fern Chasm:

*Very soon we came to the lip of another drop and here we were amazed to see ferns growing at the bottom. By scrambling along one wall, around a corner of rock and then climbing down, we reached the ferns. [...] These ferns were of interest, as further east under Benbonyathe [Hill] is ‘Fern Gorge’. There are no ferns now but ferns grew there when it was found. We called this place Fern Chasm and the creek after it.*

Presumably Bonython had told Lionel Lever when they met before this hike that there were no ferns in the then Fern Gorge at that time. In fact ferns appear and disappear from time to time in both the original Fern Gorge (in both Bunyip Cranny and Bonython’s small amphitheatre), and the present Fern Chasm, as well as in other Gammon Ranges gorges, depending on the season.

Before the 1:50,000 Topographic maps *Nepabunna* (1976) and *Illinawortina* (1977) first appeared, hikers in the Gammons used various sketch maps made over the previous thirty years (see Author’s note at end of article).<sup>14</sup> Later sketch maps usually incorporated information from any earlier maps their makers could get hold of. Some show Fern Gorge at Bunyip Cranny, and others show Fern Chasm at its present site. This contributed earlier to the confusion that the photo in Bonython’s book helped to perpetuate.

It’s an example of poor nomenclature. To name Fern Chasm though elsewhere there’s already a Fern Gorge was bound to lead to confusion. At any rate, the Greenwoods’ original name, Gorge of Ferns/Fern Gorge for what’s now Bunyip Cranny, has disappeared from there—or, you might say, ‘moved’ 5½ km roughly WSW.

## References

<sup>1</sup> C[harles] Warren Bonython, *Walking the Flinders Ranges* (Adelaide: Rigby Ltd, 1971).

<sup>2</sup> *The Advertiser*, Adelaide, 27th September, 1947, 11.

<sup>3</sup> ‘60 Square Miles of Gammon Ranges Await Exploration’, *The Scout Leader*, 4th December, 1947, 126. It’s unsigned, but the accompanying sketch map is by Dick Wayte, and is dated October 1947. There’s a photo with the article captioned ‘In the Gorge of Ferns’. However, Wayte was with Bonython on his August 1947 hike, and may have got the name from him. *The Scout Leader* was published by the then Boy Scouts Association of South Australia, and can be found in the State Library of South Australia, and in the South Australian Scout Archive.

<sup>4</sup> The three of the four photos reproduced here are courtesy the Greenwood Family. The four black-&-white photos are 3 × 2 inches (8 × 5.3 cm). The black card is 21 × 16.5 cm, and the three captions are in cursive and in white ink.

<sup>5</sup> Modris Ozolins of Quorn checked at the National Motor Museum at Birdwood, and has searched the Internet extensively. The closest he’s found is a Packard of that time. The solid wheels were a common feature in the mid-1920s too. One problem may be that US cars back then may have been assembled in Australia from imported components, and their bodywork redesigned for Australian conditions.

<sup>6</sup> This photo is reproduced and captioned in Kristin Weidenbach, *Rock Star: The Story of Reg Sprigg—an Outback Legend* (Adelaide: East Street Publications, 2008), 34. But we don’t know where she got its caption from, and how accurate it is.

<sup>7</sup> *The Advertiser*, Adelaide, 2nd August, 1899, 6, ‘The Northern Goldfields: Worturpa: Promising Specimens’.

<sup>8</sup> The map is in a booklet, Robt. S[ands] Frearson, *Robt. S. Frearson’s Guide and Handbook to the Worturpa Goldfields. S.A.* (Adelaide:

Frearson’s Printing house, 1899), 44. Copy in the State Library Victoria, and available online from the SLV website.

<sup>9</sup> The homestead was moved in recent times to what was back then the Owieandana Outstation on the west side of the Gammons, just south of the Arcoona Creek. The old homestead is now in ruins.

<sup>10</sup> Gordon Lillecrapp says that he and his sister Barbara discovered Yackie Waterhole after hearing it talked about by Aboriginal station hands, and at Nepabunna. This would have been before 1948, since *The Scout Leader* article, op cit, mentions it. The Adnyamathanha people never visited it because it was the home of the Arkuru serpent that they feared. Bonython told Peter Wyld and me in September 1970 that it was pronounced ‘Yack-eye’, but Gordon says it was definitely ‘Yack-ee’. He also says that he and his brother and sisters cleared that bridal path across the Yankaninna Range into Mainwater Pound so that they could take visitors into the Pound—the Lillecrapps never ran stock in the Pound.

<sup>11</sup> He doesn’t use this name in his 1949 ‘Story of a Gammon Range Walk’, but does in a later article, ‘Springs and Waterholes of the Gammon Ranges’, *Tarndanya*, September 1953. He also shows its location clearly at Rover Rock Hole on his sketch map accompanying yet another article, ‘Italowie Creek—North and South Branches’, *Tarndanya*, April 1954.

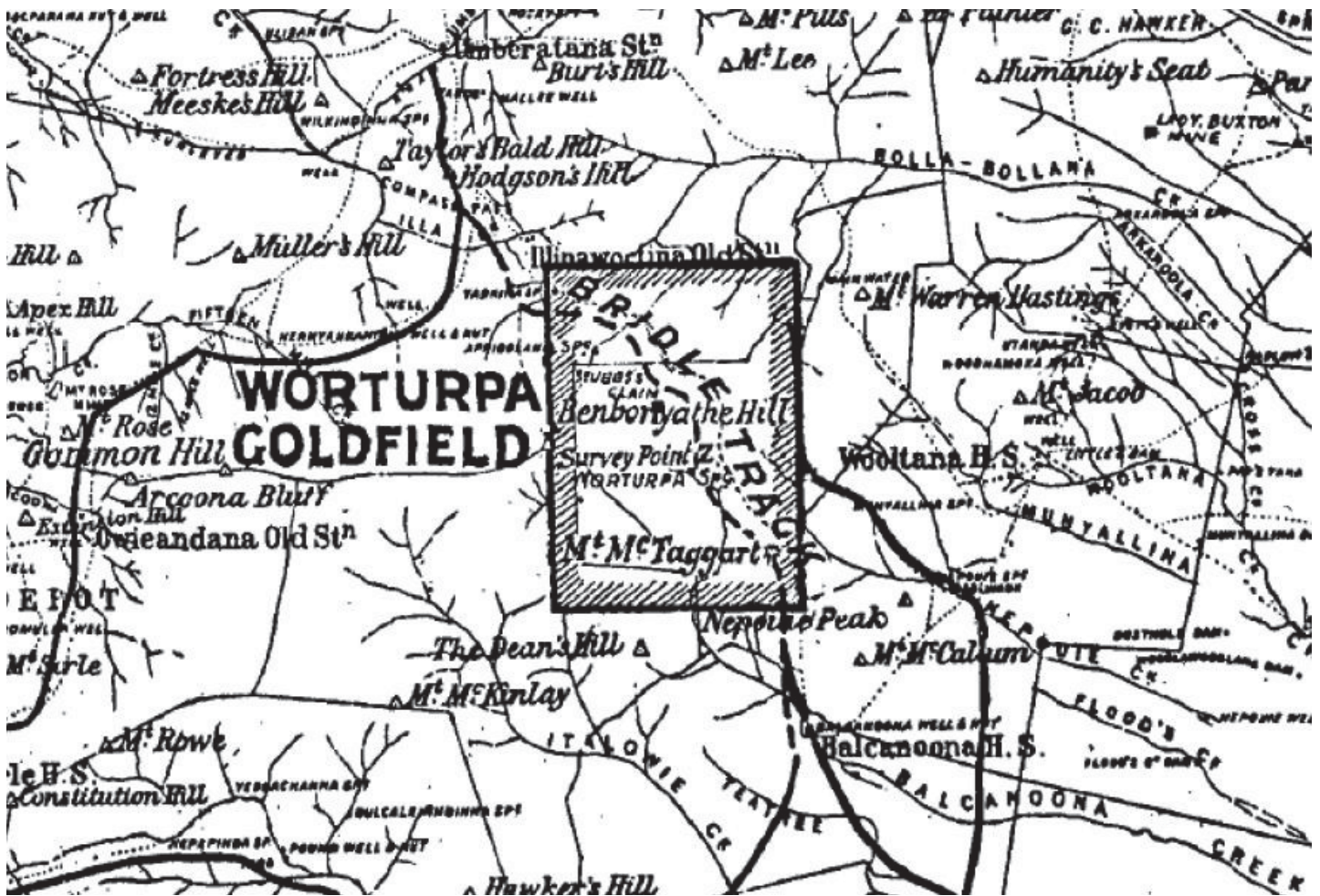
<sup>12</sup> Grindell Hut is sometimes described as being situated against the Balcanoona Range. In fact it’s against a small range separate from the Balcanoona Range, that was in earlier times known as the White Range when the present Blue Range was known as the Black Range.

<sup>13</sup> Information on the founding of the ABW, and their *Tarndanya* newsletter, is from David Evans et al (eds), *Adelaide Bushwalkers 50 Years: 1946–1996* (Unley: Adelaide Bushwalkers, 1996).

<sup>14</sup> I have copies of fifteen sketch maps that I know of. I’m trying to make a complete collection of all Gammons sketch maps for archiving. If anyone reading this has any, my address is PO Box 188, Quorn, SA 5433. I don’t as yet have copies of Lin Richardson’s sketch maps,







## SEG LOGO COMPETITION

The winner of the logo competition is Graeme Oats. I thank those who submitted entries. All entries had some merit but in the end we decided to go with an entry which combined the features of the original SEG logo with a bit more information.

The new logo will have a formal form for letterheads and the like, an informal form for use on posters and informal documents, and an abbreviated form for placement within documents. I can supply copies of these in PDF or other forms for inclusion in documents etc.

Alun Thomas



Formal Form



Informal Form



Abbreviated Form

## MINNAWARRA AUTUMN BIODIVERSITY SURVEY

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## WHY WOULD ANYONE TAKE ON THIS TASK?

### Chris Wright

The Vulkathunha-Gammon Ranges Scientific Project (V-GRASP) is recording rainfall, water flow, vegetation, and animals, in a remote part of the Northern Flinders. The instruments that have been carried up and installed there measure rainfall continuously, and water level in the creek, whenever there is any flow, which is not often. There have been many challenges in setting up those instruments, keeping them running, and making sure that the information stream is unbroken and accurate. For those of us working on them, it has been a matter of pride to make sure that there is a continuous record, and a sense of failure whenever an instrument stopped working. Every effort was made to fix the problem with minimum delay. In earlier years, we would not know about a failure until the next visit, 3 months later, and we learned at an early stage that by duplicating the data loggers at each site, the chances of losing data were minimised, if one failed, hopefully the other one would keep going. A more recent innovation was the ability to "talk" to the loggers in remote sites, using the Telstra Mobile net. Even though the sites are up to 70km from the nearest repeater at Leigh Creek, by using Yagi directional antennas, they will reliably connect and send in the latest data each day.

With this in mind, over the last 18 months or so, we have completed an upgrade of all the 10 sites, and celebrated 26 years of operation in a ceremony on the Gammon Plateau on 5<sup>th</sup> October 2014. Subsequent to that, we successfully recovered data from all sites and were sitting back comfortably in Adelaide, keeping an eye on the Bureau of Meteorology web-page which displays the rainfall, when we noticed that although the other stations had reported rain, The Plateau site showed nothing. It could have been a random effect because showers in that area in spring are scattered and can give very variable amounts of rainfall. When it had happened a couple of times, we decided that something was wrong. The problem was that The Plateau is the most remote site, at least 5 hours walk from the nearest vehicle access. It takes about 9 hours to drive up there, via Leigh Creek and Mt Serle. We didn't know what was wrong, and had to decide what would be needed to fix it. We thought that on balance, lightning strike was the most likely, but if that was the case, what had been damaged? The logger and telemetry equipment are protected by Lightning Arrestors, which are designed to divert any voltage surges down the Earth Stake, but the fuses can be blown in the process. Graham Blair had also noticed that the double loggers at the Plateau had been recording slightly different data, which was an indicator that there might have been a problem with the raingauge switches.

At this stage in the year, Graham and I were both flat out at work, and Graham had no more leave to take. I had enough knowledge of the system to carry out repairs, and was able to get away for a few days. So we made a plan, and decided that we needed to replace the whole raingauge unit, a delicate instrument that has to be carried in a padded box, about the size of two 10-litre Water Cartons, strapped to a backpack. That didn't leave much room for camping gear, rain jackets, food and water. Secondly I found that most of the regular

bushwalkers who come up to the Gammons with us were not available, at short notice. Frank Tomas however was prepared to come, and Christopher Kemp was interested, but in the end had to pull out because of commitments to give a couple of lectures. So Frank and I did the trip. I carried the raingauge and as much camping gear and food as I could manage. He carried the water and the Trangia (camp cooker), and most of the food. Our risk management strategy was to take Telstra mobile phones with us because we had always been able to make contact with the Mt Scott Telstra repeater at Leigh Creek, from the top of North Tusk Hill and from the Plateau, so we knew if we got into trouble we could call for assistance.



*Heading up Arcoona Creek - fully loaded- including a "John Love" heat shield*

Usually a Gammons trip takes 4 to 5 days. We planned to do this one in 3, just a rapid walk in, overnight stay at Vandenberg Camp and quick climb up to North Tusk and the Plateau and back home.

In the event it all went more or less to plan. We left Adelaide at 6am on Friday 21<sup>st</sup> November. The Meteye (Bureau of Met) weather forecast indicated that Saturday might get up to 42C, so we planned to try to do any scientific work early, and then rest in whatever shade we could find for the later hours of the day. The drive up to Henzells Camp was uneventful, late breakfast at the Jamestown Bakery, top up with bacon and egg sandwich at Copley and at Henzells by 3pm. That left enough time for the 3-hour walk up to Vandenberg camp at the foot of North Tusk Hill. I was carrying 23kg of stuff, including the raingauge, laptop computer and calibration cylinder. Frank had a slightly lighter load. The familiar walk, following the alignment of Arcoona Creek was fine, we passed Woodcutter's Well, and at The Seeps there was an enormous stink, and the remains of a dozen or so goats, killed by the Sporting Shooters a week or so before.

A big Murder of Crows had congregated there, and made a noisy exit as we passed. We made good progress after that and were up at camp by about 6:30, very pleased to have achieved that much. There was absolutely no surface water





*The dead goats stank, but the crows seemed to be happy.*

available, all water holes were dry, but we had drunk plenty before leaving the vehicle, and we made use of the Grandfield cache of water drums, when we got to camp. We could not have carried the +/- 6 litres per person per day, needed in that weather, and absolutely relied on the store of water in the cache.

That night was the first time I have used the Back County dried meals that are sold by camping shops, found them to be really good quality, an excellent meal and no washing up afterwards.

On Saturday morning, we set off at 7am up the shoulder of North Tusk, complete with raingauge, and enough food and water for the day. Once we got to the summit, we set up the Telstra mobile phone and long antenna, expecting to report back home and tell them all was well. A disappointment was in store, no network coverage! This had never been a problem in the past, and was a bit of a shock, we couldn't work out what was wrong. We thought perhaps the Telstra repeater was down for maintenance. On we went for another hour to the Plateau pluviometer and started going through the regula checks to try to find out what was wrong. By disconnecting the raingauge connections at the Rittal Box (containing the loggers, modem and transmitter), we could check whether the signals from the raingauge were coming through, with me working at the Box, with the test gear, and Frank, 50 metres away, responding to yelled instructions to tip the raingauge bucket. There were no signals coming through, and a quick check of the loggers indicated that they seemed to be fine. So we went ahead with disconnecting the old instrument and installing the new one. Once that was done, we were able to run some more tests, and thankfully everything was back in working order. We had fixed the problem. We still had to calibrate the instrument, to confirm that it was recording correctly, that was done by using the calibration cylinder to deliver water at a steady rate, and checking that the instrument was counting the bucket tips correctly. Three runs

were carried out. They should each have delivered 101 tips, we recorded 100 tips on each, which is pretty good. I had hoped to talk to Graham Blair in Adelaide, while we carried out the work, as he could then check whether the data was coming through. Disappointment again, because the Mobile phones indicated No Network Coverage. We put all the equipment back together again, packed the old raingauge back in its box, and had lunch under a Native Pine tree.

We left the raingauge site at about 11:30, by which time the wind had backed round to the North and was starting to blow hard. By the time we got back to North Tusk, it was blowing hard enough to make us wary about standing anywhere close to the edges. The temperature was rising fast and we were both pretty tired, hot and thirsty. The track back to camp is a steady negotiation of boulders and rocks, uneven stones, Triodia (Spinifex) and Mallee bush. The heat was becoming intense. Frank was struggling to keep going, not a good situation in the heat, and without the ability to call for help if we needed it. We reached camp safely at about 3pm. I have never stuck my head into a fan-forced oven, and hope that I never have to, but that was what it felt like- very hot, very strong wind gusts, and no relief at all. We will never know what the temperature got up to, it must have been greater than the forecast 42C; Karen Ferguson at the Mobile Servo at Leigh Creek thought it was around 46C. (The Weather Bureau station at the airport did not report.) Water bottles lying in the shade were almost too hot to pick up. We lay in whatever shade we could find, and awaited events! At some stage we trudged off to the Grandfield water cache and replenished our water bottles. A couple of Willy Wagtails watched our operations with great interest.



*Job done. Leaving the shade of the Calitris tree, close to the raingauge.*

The heat continued unabated until about 6pm, when we noticed a build-up of cloud in the west, thunder and lightning, far away, rapidly approaching, and then a few spots of rain. The temperature dropped rapidly by at least 10C, and then we had a shower of huge raindrops, but not many of them. I didn't have much in the way of rainproof gear, and was worried that the cardboard box that housed the (broken) raingauge, would dissolve, making it pretty hard to bring home. We had another Back Country meal at dusk, with one or two gaps in the cloud, and an orange overcast sunset. The rain was just enough to turn sand into sloppy mud which got into everything, coffee, Back Country, sleeping gear etc. However it was a welcome relief after the heat. Frank's tent gave him good cover, although the numerous bugs managed to find their way into it. I just spread the groundsheet under Calitris trees, in the middle of an ant Superway, for about 5 species of different sized ants. So I spent most of the night wriggling to find somewhere the ants weren't. Eventually at 5 am there was a rumble of thunder, and I decided that the best option would be to pack up the sleeping gear, put on a raincoat and await events, picking burrs out of my socks in the meantime, at least I was out of the ants. The rain soon stopped, Frank woke up, and on a clear cool morning it was possible to clean up the gear a bit, pack up all the gear, thankful that the raingauge box was still intact, eat the last boiled egg and muesli bar, and head back to the vehicle. We were worried that people at home, not having heard from us, and realising the hot conditions, would have pressed the panic button, so it was with considerable relief that we arrived back at Henzells, to find the Subaru, and no SES vehicle with someone looking for us. We decided it would be best to call in at Operation Flinders at Owieandana, to tell them we were ok. Owie is a couple of km west of Henzells. We jumped into the car and drove out. However there was nobody at Operation Flinders, and no possibility of making a relieving phone call! So we drove back to Copley, and thankfully Telstra was back on line and we could tell everyone we were ok. Somewhat to my surprise, nobody seemed particularly concerned, so we could relax on the long journey home, arriving back in Adelaide by about 7:30 in the evening.

Lessons that came out of the trip:

1. We should not have relied on our mobile phones and the Telstra network, we were unable to make contact with the outside world and could not call for help. We should have taken the Epirb. Although we didn't actually need it, those at home would have realised that we had it with us, and had not called for help. In future we will carry one with us in such situations.
2. The failure of the raingauge turned out to be that lightning strike had fused together the two micro-switches. The Lightning arrestors had protected the logger equipment but not the raingauge. We think at the next visit we can provide earthing for the raingauge and reduce the risk of anything like this happening again.
3. A quick trip up to the Gammons can be successfully completed despite severe heat conditions. The water caches provide invaluable risk management for hot, dry trips. This is a great credit particularly to Garry and Michelle Trethewey who did most of the work in setting them up.

It was interesting to note that Graham Blair had checked signal strength for the link with the Plateau Pluviometer, and found that the signal was extremely weak. He said that our Mobile phones would have had no chance of working. Also that the Bureau of Meteorology daily download of rainfall data failed at all 5 of the rainfall sites on that Saturday morning.



*Frank, carrying his new light weight pack*

Frank Tomas – a man for all seasons

Frank has been up to the Gammons with us previously, and is an experienced bushwalker. He agreed to come at short notice, and put up with exhausting and difficult conditions without a word of complaint. The trip would not have been possible without him. He was excellent company at all times and carried all the water that we needed on the climb up to the Plateau (about 8 litres). Up at the Pluviometer site he spent much time in the direct sun waiting for me to tell him to tip the raingauge bucket, or touch the contacts, or fill up and start the calibrator. He is a scientist with many achievements, now retired after a valuable career with CSIRO in Nutrition, and is most interesting to talk to. We share the same sense of humour. He grew up on a farm in Western Australia, lived a varied (wild) youth in the bush, and later a boarder with the CWA next to his Secondary School. He and his wife, Loreen, live a quiet life at their home in Coromandel Valley, and I think Frank does a lot of volunteer work with the orienteers.





# SCIENTIFIC EXPEDITION GROUP INC.

The Scientific Expedition Group (SEG) came into being at a public meeting on 21<sup>st</sup> August 1984. Members receive regular information on SEG activities and expeditions.

Membership is open to any persons, family or organisation interested in the following aims:

- \* The promotion and running of expeditions of a scientific, cultural and adventurous nature.
- \* The furthering of knowledge, understanding and appreciation of the natural environment.
- \* Promotion of the values and philosophy of wilderness.
- \* Enabling people to learn the skills required for planning and running expeditions, and to develop sound field techniques.

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Scientific Expedition Group Inc.  
P.O. Box 501  
Unley S.A. 5061

# EXPEDITION WITCHELINA

*You can see  
me on the  
Expedition*



You are invited to join SEG's next Expedition, in conjunction with Nature Foundation SA, to conduct a biodiversity survey on Nature Foundation's property at Witchelina near Lyndhurst in the north of the State. This property is widely varied in its landscape with areas of gibber plain, sand hills, rocky outcrops and salt lake shoreline.

In this survey, it is proposed that SEG will work mainly in the dune areas and will conduct a comprehensive study of vegetation, reptiles, mammals, birds and invertebrates. This a great opportunity for people of all ages and expertise to observe and participate in professionally conducted field survey work with experienced biologists and natural historians.

You won't need any special scientific skills, just a love of exploring the bush and learning about it's many inhabitants in an area not usually open to the public.

**DATES:-** The Expedition departs early on the morning of Sunday 20<sup>th</sup> September 2015 and returns on Saturday 3<sup>rd</sup> October 2015.

**ACCOMMODATION:-** On this survey we will be quite a long way from the homestead and will therefore need to camp near an old building known as Pug Hut toward the southern end of Witchelina.

**COST:** At present, the total cost, including food, transport and all activities is estimated at \$500.

To register your interest, please phone Trent Porter on 82789078 A/H or Email [trentasaurus@bigpond.com](mailto:trentasaurus@bigpond.com). Student concessions will be available – please enquire ASAP as they will be limited.