



Field Geology Club of South Australia (Incorporated) Bulletin

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MARCH 2025

MEETING THURSDAY 6TH MARCH 2025 AT 7.00 PM
Mawson Lecture Theatre, Department of Earth Sciences,
University of Adelaide

THE ANTHROPOCENE IN THE CONTEXT OF GEOLOGICAL TIME
Professor Kathryn Amos, Earth Sciences, University of Adelaide



The Anthropocene is a proposed human-dominated geological time interval, which has been the subject of intense debate over the past 20 years. As a concept, the Anthropocene is clear – an interval of pervasive, demonstratable, human alteration of the Earth system. The debate stems from whether the Anthropocene should be formally defined as a geologic time interval. If so, should it be an Epoch, or an Age? Perhaps, it should be an informal time period, similar to terms such as the Neolithic Era, and Bronze Age. Or maybe, an Event, such as the Great Oxygenation Event.

In this talk, I will summarise these discussions, starting with the rules that apply to definitions of time intervals in the geologic time scale. This highlights key issues that the scientific community has been grappling with in the context of defining the Anthropocene – have human impacts left a measurable signature in the geologic record that is global and synchronous? If so, when did this occur – ie when did the Anthropocene begin? How can the Anthropocene be formally recognised in the geological timescale, and should it be formally recognised at all? I will summarise the various potential start dates proposed for a formal Anthropocene Epoch, discuss the outcomes of the vote held in March 2024 by the International Commission on Stratigraphy's Subcommission on Quaternary Stratigraphy, and what this likely means for defining the Anthropocene moving forwards.

Professor Kathryn Amos holds the position of Chair in GeoEnergy at the University of Adelaide, in the Discipline of Earth Sciences. She was previously Head of School for the

Australian School of Petroleum and Energy Resources (2020-2022) and Associate Dean (Student Experience) for the Faculty of Engineering, Computer and Mathematical Sciences (2018-2019). In July 2020, Kathryn won the South Australian Chamber of Mines and Energy (SACOME) Exceptional Woman in Resources Award. Kathryn's technical expertise is in clastic sedimentology; she obtained her PhD from the University of East Anglia, UK, in 2004. Her first sedimentologic loves were turbidity currents (lab work) and dryland fluvial sedimentology (fieldwork which brought her to Australia for the first time). Kathryn has enjoyed working at the University of Adelaide for 17 years and has continued investigating sediment deposition in a range of environments and sharing this knowledge with students. Kathryn currently teaches into the first year 'Building a Habitable Planet', second year 'Sedimentary Geology', and third year 'Energy Resources' courses. She currently leads a \$10 Million industry-sponsored research, education and outreach program on the geological storage of hydrogen and carbon dioxide.

University policy is to close doors at 7.00 pm, so be sure to arrive punctually! If you are late you may call the number affixed to the door. However this will only be available until the main lecture starts (around 7.10 to 7.15 pm).

Refreshments will be served in the tea room following the meeting.

The meeting will be zoomed. The link will be distributed to members by email a day or two before the meeting,

TUTORIAL: VOLCANOES Part 2, by Kym Dixon

The second part of the Volcanoes tutorial series will be presented at the March meeting. Last month looked at the cause of volcanoes and some of the main forms.

Volcanoes can also be classified by the nature of their eruptions. This will be the focus of the March tutorial.

We are fortunate that in Australia, we do not suffer from the effects of volcanoes – although a high-volume ash cloud like the eruption of Mount Pinatubo in the Philippines can have global weather effects. The tutorial will show some of the more devastating effects of those who live near an active volcano.



For those who would like to attend the tutorial, try to arrive before 6:40 and sit more towards the left-hand side of the theatre (as viewed from an audience perspective).

If you have your copy of the February handout – bring it along to the tutorial.

TEN-MINUTE TALK

Mark Dale will talk on "When Slate was Great".

He will cover its derivation from mud to low grade metamorphic rock and its many uses in the past to its lingering value as a paving stone and roofing tile.

PINK GARNET SANDS ON SA BEACHES.

Those who attended a club meeting last year when students gave their presentations will remember Sharmaine Verhaert, PhD candidate, whose research was on the garnet sands we find washed up on our south coast beaches. Her research has now been taken up as an excellent YouTube presentation which you can watch by loading up the following link:

<https://www.youtube.com/watch?v=s7wwcmcbfPM>

Peter Briggs

MAKE A DATE WITH SLATE AND LINGER LONGER IN WILLUNGA
Mark Dale with Friends of the Willunga Slate Museum and Quarry staff
Sunday 23rd March

Visit to the Willunga Slate Quarry, the Slate Museum and Old Willunga Courthouse.

Slate was big business in the 19th century. It was used extensively in the building trade for roofing, walls, water tanks, drains and in the memorial stone business as gravestones. It still has a continuing reduced role for paving and landscaping.

The two main sources of slate in South Australia were, and continue to be, Mintaro in the north and Willunga in the south. The slate industry was central to the economy of the nineteenth and early twentieth-century town of Willunga. The National Trust has kept the memory alive with the Slate Museum which is in the same grounds as the Old Courthouse filled with history of the district.



The Slate Museum



Noted geology professor as felon in the Old Courthouse

We will meet at the Courthouse car park to be ready to carpool at 10 a.m. for the winding drive uphill to Willunga slate Quarry. Visit: <https://www.nationaltrust.org.au/places/willunga-courthouse-museum/> for details how to get to the Courthouse and more information.

At the Quarry we will be hosted by quarry staff and will be able to explore the quarry site and learn about the transition from mud to the hard, layered stone that is slate. We will then return to the Courthouse to be greeted by National Trust volunteer staff who will have supplied an urn to complement our packed lunch, taken al fresco.

After lunch we will be guided by the volunteers through the Court house and Slate Museum. This concludes the organised part of the excursion but you may well like to complete your day with a walk along a slate trail through Willunga's leafy suburb.

This is an easy walking day with rough terrain in the Quarry, so suitable footwear and be prepared for hot sunny conditions but March has changeable weather so check the forecast ahead of the day.

The National Trust has opened the Courthouse and Museum just for our group and will charge \$10 per person. Participants will need to bring \$10 with them in cash.



In the Willunga Quarry

A sign-up sheet for the excursion will be provided at the March meeting; or contact Secretary/Programme Coordinator Frances Williams (contact details on back page of this Bulletin) if you would like to join this excursion.

Mark Dale

ROYAL GEOGRAPHICAL SOCIETY OF SOUTH AUSTRALIA

MAR 2025 LECTURE PROGRAMME

Lectures are held in the Hetzel Room in the Institute Building, corner of North Terrace and Kintore Avenue commencing at 5.30 pm sharp. Bookings must be made through the Society's website <https://rgssa.org.au>. Note that there is a \$10 charge for non RGSSA members.

Thursday 27 March	Danielle Clode	French Exploration in South Australia
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RARE BOOKS GROUP SESSIONS

Sessions are held in the Jervois Room on the southern (North Terrace) end of the ground floor of the Mortlock wing in the State Library of South Australia, from 10.30 am to 12 noon.

Bookings are essential, through the Society's website <https://rgssa.org.au>

TO BE ADVISED		
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HOLD THEM SPELLBOUND FOR JUST TEN MINUTES

There are a few vacant slots in the FGCSA monthly meeting calendar where you could give a ten minute presentation, not just on geology but any natural science subject or in fact any particular interest of yours.

If you would like to give a Member's Ten Minute Talk, please contact me by email at markodale@proton.me and give me an idea of the topic and a title and I will contact you and allot you a monthly meeting.

Not prepared to give a talk yourself? How about dobbing someone in. Your tip treated with complete confidentiality .

Mark Dale

MINING HISTORY

Garry Trethewey spotted this one from:

<https://www.newscientist.com/article/mg26435212-200-the-scientists-on-a-mission-to-catch-farts-for-the-good-of-our-health/>

with acknowledgment to:

Shutterstock/Thomas Trompeter

The article is incomplete without your subscription.

(Some cage signs warn against riding on the outside of the cage. Maybe this one explains everything!)



FLINDERS RANGES EXCURSION 23rd-30th Sept 23 – 30, 2024

Day 6 – Blinman Mine Tour and Enorama Diapir

Precision timing saw a smooth departure from Willow Springs at 08.30 with the bus door finally and firmly closed.

Travelling northwards on the Flinders Ranges Way towards Blinman under an overcast sky we were soon travelling around the western extent of the Oraparinna diapir with the peaks of the Bunkers Range as the Eastern horizon to the East

Passing over the Enorama Diapir with the Trezona range westerly and the Great Wall of China resistant sandstones of the Bunkers Range to the East

Site 1: Blinman - The Blinman Diapir

Contained within the diapir are numerous rafts of country rock which are of dolomitic limestone, basaltic and granitic origin. One of these dolomite rafts originating from Callana Group deposits presents as a lode 150 m by 35 m and 200m deep that was subjected to infiltration along faults and joints of hot saline from the diapir carrying sulphide and other soluble minerals dissolved from the underlying rock.

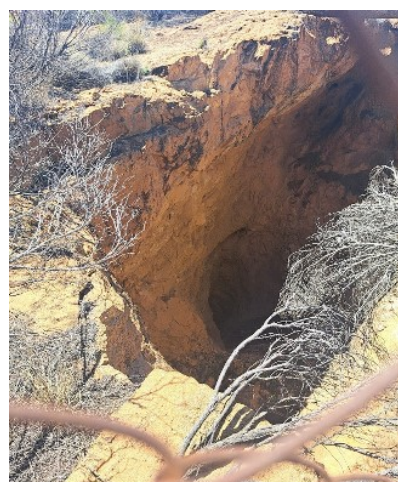
The discovery of copper bearing minerals in 1860 by “Peg Leg Blinman” showed a promise of wealth. Mining operations commenced in 1861 and continued until 1918 with over 200,000 tonnes of copper ore producing copper worth \$30 million in current money .

Miners and families were transported here from Cornwall to Adelaide and then by all manner of transport to Blinman and further north to what became the site of North Blinman which at an altitude of 650m is the States highest settlement. A bare landscape with no existing dwellings, scant water supply and temperatures ranging between 0 and 50 degrees was an immediate challenge

A tour of the mine gave an overview and provoking insight into the daily activities and the miners young and old working in a hazardous and unforgiving environment to extract and process the mineral bearing ore. The stories of the blood, sweat and tears in the adits and over the drives and shafts in a dimly lit and dusty environment stimulated the realism.

Within the walls of the adits and drives were seen remnants of the copper ore chalcopyrite and enriched as malachite, cuprite and azurite.





Remains after primary extraction of ore



Foundations of Machinery House and Boilers

Bob Dalgarno led us up Blinman Creek behind the Hotel to locate a granite raft extracted from the basement layers during the upward movement of the diapir.



Granite xenoclast



Diapiric breccia exposed in the creek bank

The Blinman Progress Society and locals have been at work to restore and bring back to travellers a range of public and private buildings to their former glory



Old houses



Bakery

Coffee was sourced from the Miners Crib bakery and some savouring of bakery goodies and authentic Miner's Pasties was a recommendation.

Site 2: Dedmans Bore - A changing of the diapers

Travelling south to the northern boundary of the Enorama Diapir exposed in Bulls Creek at Dedmans Bore



*Dead man's
dunny - loo with
no running water*



*Dead bore at
Dedman's Bore*



Corralled up for lunch at the yards – built to last

The view upstream shows the sediments of the Etina Formation seen prior as the “Great Wall of China”

Turn around 180 degrees and see the chaotic contact zone with the Enorama Diapir leaving a range of breccias as it intruded through the Etina Formation and in the younger Enorama shales.





Bulls Creek has eroded through the limestones and shales and exposed cobbles from the flow-laminated breccia along with cherts, basalts and diorites

Further down the creek within the shales of the Etina formation are indicators of diamictite layers suggesting marine alteration around the diapir margins.



After this site we travelled back to Willow Springs to recover with a delicious snack and a sumptuous evening meal.

The evening was further highlighted with a presentation by Dr Harald Ehmann on the Evidence for a Drying Environment. This was followed by a presentation by Dr Sanaz Orandi on Iranian Geology and the Use of Biofilms in Environmental Remediation

And then merry making and chatter and blissful sleep.

Stan Flavel

WILD SOUTH COAST WAY GEOLOGICAL EXCURSION

Saturday 26th October 2022, Leader: Professor Pat James

Twenty-four intrepid members met at 10:00 at the Talisker Mine turnoff on the Fleurieu Peninsula, near Cape Jervis.

The day was windy and dusty at times with increasing heat and flies - but that did not stop us! We briefly examined the peneplain surface (at the telecom towers before descending to Cape Jervis) - bedded Cambrian silts and shales, shot through with quartz veins and clay-filled fractures. This surface has been highly weathered over many millions of years due to it being regularly uplifted, so no further sediments could be laid down and preserved.

We then drove (in pooled cars) to the Cape Jervis lighthouse where Pat and Fraser (local tour operator and Backyard Universe “touristing” astronomer) discussed the Permian sedimentation in the area.

Figure 1 shows the Second-Valley-to-Waitpinga portion of the SADME geological map. The blue is the Permian, and we looked at Permian erratic boulders on the Cambrian Carrickalinga Head submarine fan silts and shales at the lighthouse.

Note that you can get a wealth of geological maps, field guides etc for free from:

<https://products.sarig.sa.gov.au/Products/Index/381>

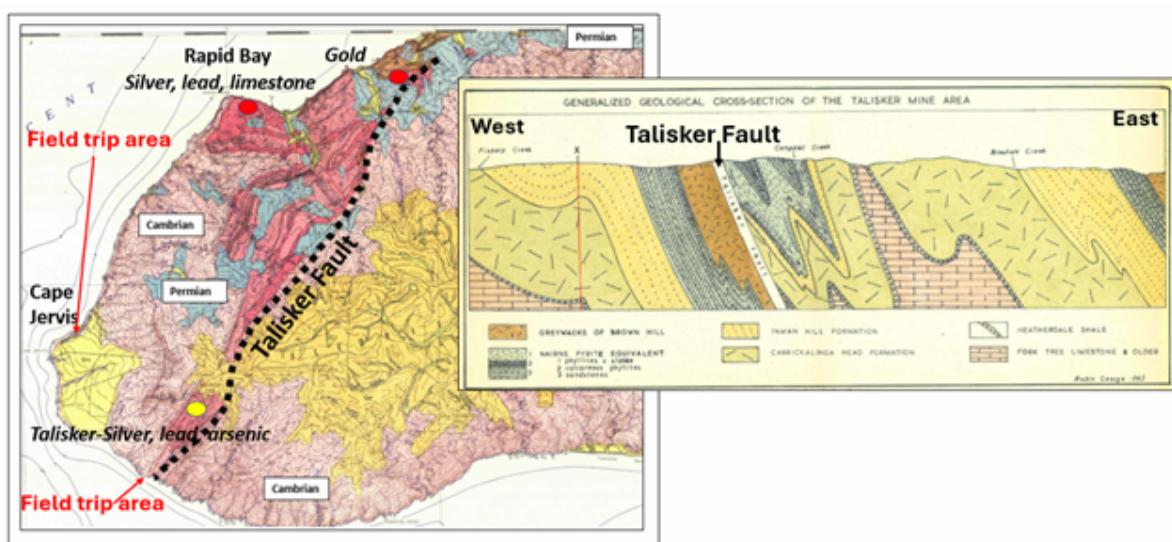


Figure 1 - SADME geological map of Cape Jervis area with inset 1963 cross section by Robin George through the Talisker mine area - see below.

Figure 2 shows the extent of Permian ice. Note how close to the South Pole this area of the supercontinent was.

Figure 3 shows Permian erratics (arrowed) sitting on the Cambrian submarine fan sediments. Members noted at least two different types of granite (from Antarctica?) and a quartzite boulder (likely to be Adelaidean in age).



Figure 2 - area of regional Permian glaciation - Wikimedia Commons



Figure 3 - Cape Jervis beach near the lighthouse with members amongst the Permian (arrowed) erratics sitting on the Cambrian turbidites (submarine fan sands and silts) of the Carrickalinga Head Formation

Figure 4 shows a simplified stratigraphic section through the Cambrian rocks from Cape Jervis, through to Fisheries Beach and on to the Talisker Fault. This shows a very common geological cycle which starts and finishes with unconformities (often due to climate change). The oldest sediments are the Carrickalinga Head Formation submarine fans, seen at Carrickalinga, Cape Jervis lighthouse and which finish at Fisheries Beach. Here we divided into two groups, and one examined the end of the fans (thin beds, few sedimentary structures and rare load casts) and then there were no rocks seen for 100 metres, due to erosion of the soft shales and silts of the Blowhole Creek Formation. The second group of members examined the beginning of the Backstairs Passage Formation which are distal deltas that become more proximal as we walk towards the Talisker Fault to the south. This group noted more sedimentary structures such as cross bedding.

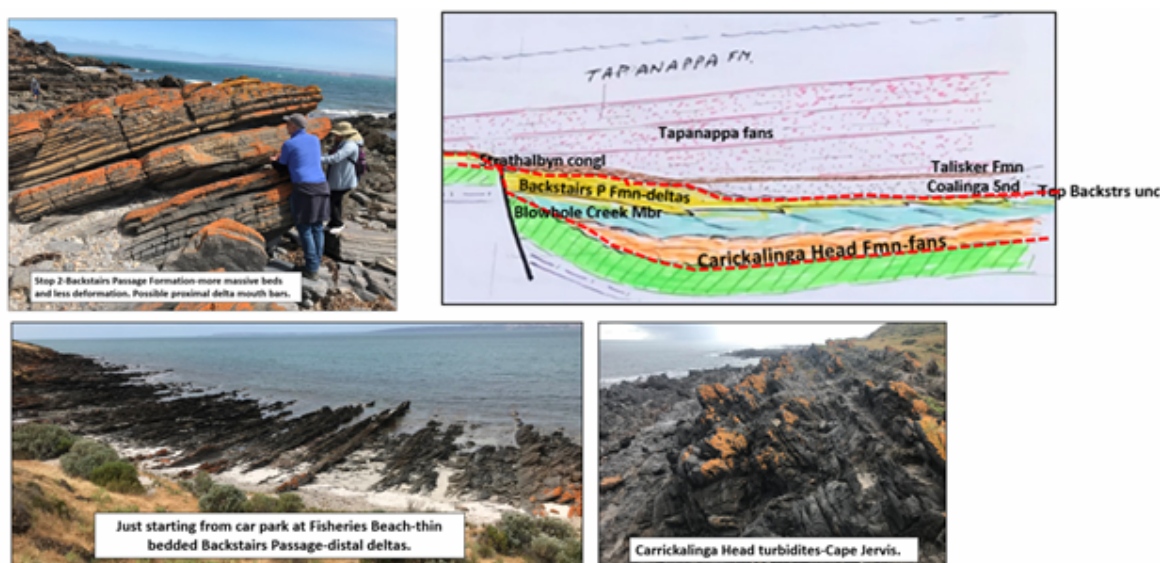


Figure 4 - simplified stratigraphic cross section of the Cambrian section studied in the Cape Jervis area - author and Rhodri Johns.

After looking at the rocks at Fisheries Beach (where there was an early whaling station and then buildings associated with moving ore from the mine on to ships) we drove back inland, past where Silverton was (300 people lived here during the mining), past the mine entrance and down a STEEP track to the cliffs above the beach.



Figure 5 - members learning about the Cambrian sediments we will be examining (left) and the somewhat precipitous track down to the beach from Talisker Mine.

Once on the cliffs we walked north and went past the Talisker Fault where it reaches the sea, and a little way south from it - Figure 6.

Here we saw relatively unstructured Backstairs Passage Formation distal deltaic sands. However, as we returned south and approached the fault lots of faulting and tight folding were seen in these sediments - Figure 7.



Figure 6 - on the Cambrian deltaic outcrops south of the Talisker Fault



Figure 7 - tight parasitic folding (small folds on the sides of a large fold) of Cambrian deltaic sands near the Talisker Fault

Pat James then took out his fruit and vegetables and, in his classic manner, described some of the incredible tectonic forces at play here and related deformation - Figure 8. During the Delamerian Orogeny, a major plate tectonic compressional episode, the rocks were folded and, depending on their type and strength, deformed in different ways. They can have a sudden breakage (the ruler), can deform quite a bit before failing (the celery) or can have intricate and complex fold and breakage patterns (the banana).



Figure 8 - Pat James demonstrating faulting and folding associated with different competence of "rocks" - a ruler, a piece celery and a banana

Pat terms this area the Naiko/Talisker continental collision zone and this area offers a unique window in to both upper and lower sections of this ancient crustal margin.

Figure 9 shows Pat's before and after reconstruction of what the faulting is doing in this region. There is so much overthrust faulting mapped by his students in this area that sections

are repeated, and these stacked repetitive packages produce what is called a “duplex” - very rare to see in outcrop.

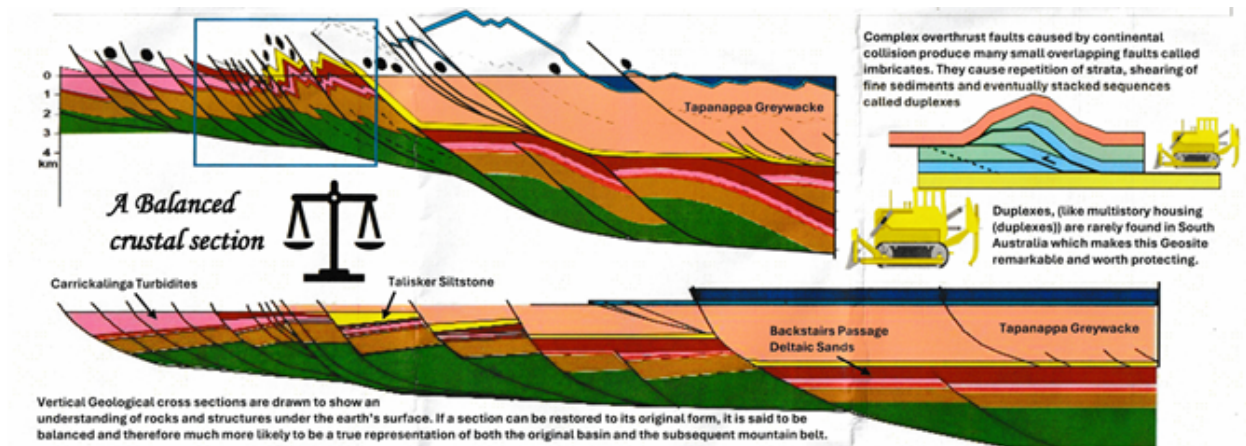


Figure 9 - cross section through highly faulted Cape Jervis area (upper) and balanced cross section showing the basin prior to the Delamerian compression - Pat James.

Figure 1 shows the Talisker Fault cutting across the Fleurieu Peninsula and also a schematic cross section through the Talisker Mine site.

When this tectonism was taking place, mineral-rich hot fluids came up this (and other) fault and left behind minerals in fractures around the fault zone. Such minerals in the area include silver, lead, arsenic, titanium gold and even uranium near Myponga.

We returned to the Talisker Mine site where Fraser entertained us with how blasting holes were drilled and showed us galena samples - the mine had silver, lead and arsenic.

The mine started in 1862 and basically went to 1872, but there were some early 20th C attempts at bringing it back to production. The ore value in the 1862-72 period was 46,000 pounds.



Figure 10 - Fraser discussing the Cornish mining operations, with ore samples, at Talisker Mine

Figure 11 - Talisker Mine tour by Fraser. Many remains are still standing - such as the crushing house shown here

This site is well worth a visit but do not pick up apple-green covered minerals as they may be arsenic rich.

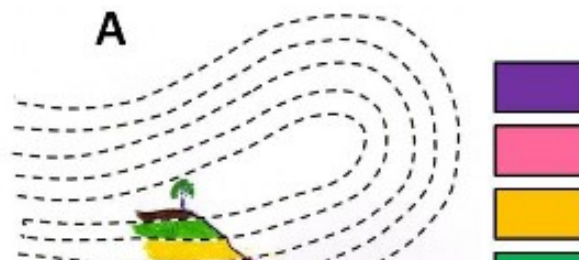
Many thanks to Pat for the work put in to running this trip, and to Fraser for his local knowledge and enthusiasm.



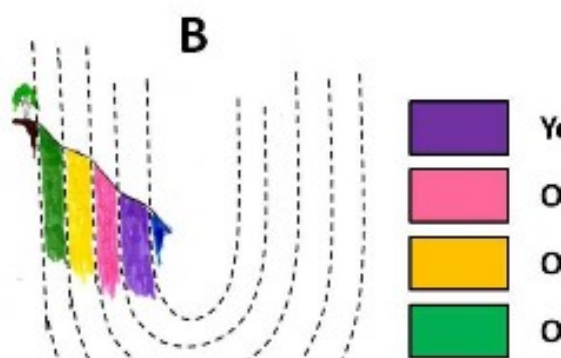
OPTIONS FOR A REVERSAL OF YOUNGING IN THE FIELD

The morning session of the August excursion led by Peter Briggs and Kym Dixon led us in a walk across Cambrian and Precambrian strata of the Delamerian fold belt. Our leaders obligingly had us drive to the top of Sellicks Hill and then it was a downhill walk all the way on the closed-to-traffic Old Sellicks Hill Road with many good outcrops in roadside cuttings.

The major point of interest was that the oldest strata were at the top of the hill and were progressively younger as we made our way downhill. Peter explained we were walking over the eroded surface of an overturned fold and his notes showed a cross section of the geology that led me to believe it was something like my diagram 'A'.



However Kym would sing out the dip direction from time to time as we passed outcrops and all were steeply dipping. On reflection I think the underlying structure was probably more like diagram 'B'. In fact, providing the hill slope is such that the oldest sediments are exposed high on the slope, any dip angle between close to perpendicular through to a truly overturned by 180° will give a reversed younging exposure. This is irrespective whether (like 'B'), it is a syncline or (like 'A'), an anticline. When I taxed Peter with this, his response was that the definition of "Overturning" was "more than 90° ". I think this overstates the case and is misleading. There were one or two furrowed brows on the day. I hope if they read this they find it enlightening.



My inspiration

Mark Dale

[For the youngest rocks to be at the foot of the escarpment, the strata only need to dip more steeply than the hill slope. East of McLaren Vale they dip at about 60° . By the time you get to Main South Road the dip is more than 90° by direct observation in the cutting. Further south-west it gets close to 180° as seen on our boat trips. Both folds are needed. Please pass the cake! Ed.]

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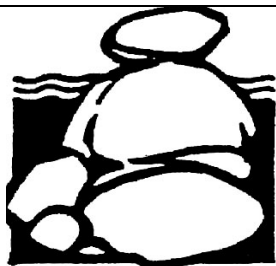
Annual subscriptions are \$40 (adult/family) and \$35 (student/pensioner) for a full year, but are half price after 31 March. Renewal is due in October.

Bulletin Contributions: Bob Whatmough Tel 8362 8786, 4/11 Wakefield St, Kent Town, 5067 bobwhatmough@bigpond.com (April issue cut-off date: 23 March)

Excursion enquiries: contact@fieldgeologyclubsa.org.au

Club publications: Kym Dixon: kymdixon1@bigpond.com

If undeliverable return to: FIELD GEOLOGY CLUB OF SOUTH AUSTRALIA INC 17 Chicklade St Elizabeth Vale 5112
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