

SOUTHAUSTRALIAN STUDY TOUR

FLINDERS RANGES

WEDNESDAY, 21ND MARCH-
TUESDAY, 27TH MARCH



NAME.....

Preparation for the Field trip Study

Task 1: During the trip, each group has to respond to one question and write a field trip report for that. Please form a group of 5 students. Finally, write a field trip report based to the question assigned.

Question 1: How would the South Australian make use of the geological features for economic activities?

Question 2: What do you know about school life in Australia? What do you think about it?

Question 3: How do you evaluate the wildlife conservation of South Australia?

Question 4: How do you compare and contrast the traditional Chinese culture of Hong Kong and the aboriginal culture of Australia?

Question 5: How do you compare and contrast the climate and natural environment between Hong Kong and South Australia?

Task 2: To analyze the question, you can discuss with your group-mates and prepare the information you need.

1. What do you need to learn about for the question?

2. What concepts and idea need to be clarified or defined?

3. What data do you need to collect?

4. Where is the source for the data?

5. What is your personal feeling and comment for the question?

Task 3: You will be meeting the South Australian Students in Leigh Creek. They would like to know more about your living in Hong Kong. Each group has to present a topic about Hong Kong. Please prepare with your group-mate for the presentation.

Group 1: Geography of Hong Kong

Group 2: Popular culture of Hong Kong

Group 3: School life in Hong Kong

Group 4: Family and Traditional lifestyle of Hong Kong

Group 5: Food Culture of Hong Kong

Task 4: Each student would be suggested to prepare a small gift (Food is not recommended) for the South Australian students. The small gift should be something interesting, meaningful and with elements of Hong Kong culture.

After you have prepared your small gift, please write down why you present this gift and the meaning behind.

PROFILES OF TOUR PERSONNEL



JAYNE VAUGHTON: Tour Operator and tour guide.

Having worked in the travel industry twenty years as well as running Words On Wheels for 17 years - my main focus has always been to impart my knowledge of the state and it's environment. My passion is in hosting groups and showing them the best that South Australia has to offer.

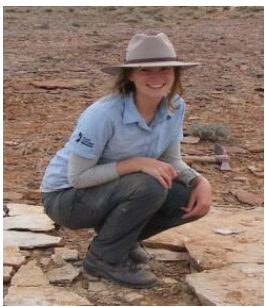
RICK HAMILTON: Tour guide.

After having resided in The People's Republic of China from 1998-2008, I returned to South Australia and began a career in Tourism. This has taken me from Kangaroo Island to The Kimberley via outback highways, desert tracks and remote four wheel drive routes in a wide range of vehicles playing host to an equally varied collection of nationalities.



STEFAN WILTON: Aboriginal Elder

Stefan Wilton is an Adnyamathanha Aboriginal Elder who grew up in, and remains deeply connected to his country, the Flinders Ranges. Stefan warmly welcomes visitors to discover what lies at the heart of the Adnyamathanha Dreamtime, Wilpena Pound. Be captivated as he graciously shares the creation story of Wilpena Pound on a guided interpretive walk into Arkaroo Rock.



FELICITY COUTTS: Tour guide-Ediacaran Fossil site.

Felicity is a PhD researcher with the University of Adelaide and the South Australian Museum. Her research is focussed on the ancient marine Ediacaran fossils of outback South Australia. Felicity is part of the research team studying these ancient fossils, and her PhD is particularly focussed on the palaeoecology of these strange but unique creatures. Felicity also makes Ediacaran fossil replica jewellery out of silver and resin.

ROBYN HUNT: Tour guide

After teaching in secondary schools for 33 years, I moved into the tourist industry in 2014. I conducted wines tours, hosted dinners for international tourists and worked with Jayne at Words on Wheels taking international students on tour. Recently I have been busy getting to know my 3 new grandchildren.



ROSS FARGHER:

Ross, a 4th generation pastoralist, has continued the Fargher family tradition running cattle on remote Nilpena Station, a 200,000 acre property. Ross has also spent much of his time within the film industry providing location and production services, as Nilpena boasts an amazing diversity of desert landscapes and historic stone station buildings.

In the early 1980's, while mustering on the property, Ross observed evidence of rippled stone which he shared with research scientists. Nilpena is now home to a National Heritage listed Fossil Site. Ross Fargher's commitment to the protection of fossils and the significance of the Nilpena site has been recognised in stone, with the naming of a new fossil, Nilpenia Rossi.

STEVEN CHEUNG: Educational Facilitator



22/3 Visiting Adelaide

Task Reminder: During the trip, each group has to respond to one question and write a field trip report for that. Please form a group of 5 students. Finally, write a field trip report based on the question assigned.

Task 1: Your group would be visiting Adelaide. **Please set at least 8 questions and interview at least 5 residents from Adelaide.** The information you gathered and answer could help you write the field trip report.

You could follow the 5W principle to set your questions: When, Where, Who, What and How etc.

Each group would be provided an example. It is not necessary to use this question and **you could design your own which fit your study.**

Question 1: How would the South Australian make use of the geological features for economic activities?

E.g. *What kind of mineral with a high economic value could be found in South Australia?*

Question 2: What do you know about school life in Australia? What do you think about it?

E.g. *How many academic subjects do you need to study in secondary school?*

Question 3: How do you evaluate the wildlife conservation of South Australia?

E.g. *Who would be responsible for the wildlife conservation in South Australia?*

Question 4: How do you compare and contrast the traditional Chinese culture of Hong Kong and the aboriginal culture of Australia?

E.g. *Where we can learn more about the aboriginal culture of Australia?*

Question 5: How do you compare and contrast the climate and natural environment between Hong Kong and South Australia?

E.g. *When would be the wet and drought season in South Australia?*

Note:

[illegible]

TOUR ROUTE



LEIGH CREEK

Leigh Creek is a former coal-mining town situated to the west of the northern Flinders Ranges. The area was named Leigh's Creek after its first settler, Harry Leigh, in 1856. Coal was discovered and, from 1888, small quantities were mined from an underground mine. However coal was not mined in a significant commercial manner until 1943 in an effort to make South Australia more self-sufficient for its energy needs.

The current town is 13 km further south than the original town—it was moved in 1982 to allow the expansion of the mine. As a result, most facilities and buildings in the town are only a little over thirty years old, and with relatively modern designs.

The open cut mine operation produced over 2.5 million tonnes of brown coal a year. It was transported 250 km by rail to power stations outside Port Augusta on the east side of Spencer Gulf. The coal-fired generators in these power stations were the only remaining coal-fired generators in South Australia and the only users of coal from Leigh Creek. The mechanisation of mining operations from the early 1990s and the closing of both the mine the power stations since 2015 has had a drastic effect on Leigh Creek. The population fell from 2,500 in 1987 to 250 in 2016, resulting in the loss of many services. For example, a simple medical procedure may require a trip to Adelaide, which means a round trip of about 1200 km.

Leigh Creek occupies an important role in the regional economy and offers extensive services to surrounding tourism businesses, pastoral properties and nearby communities. The State Government is supporting Leigh Creek to remain open for business, providing strategic support and essential services for about 700 people both in the town and the surrounding area. Ideas submitted for the 2016 Leigh Creek Futures report included proposals for use of the mine site, for use of the area's natural mineral & renewable energy resources, as well as for using the town's existing facilities for developments in education, training, tourism & the arts.

In 2015 it was announced that another coal project at Leigh Creek was in the planning process. Gas would be extracted from Leigh Creek's coal and would then be exported to Australia's eastern states via existing pipeline networks. This project is still in the planning, exploration & approval stage.

By 1985, the lands around Leigh Creek showed serious sign of desertification. Massive numbers of rabbits and feral goats had depleted the native vegetation leading to extensive soil erosion. Overgrazing and the unrestricted use of 4-wheel vehicles, motorbikes and horses had also added to land degradation.

In 1995, the Government of South Australia declared the area around Aroona Dam a flora and fauna sanctuary. Within 10 years, an extremely badly degraded area had recovered to a situation where it could again support a diverse range of native plants and wildlife. The project proved that degraded lands could be rehabilitated and it has become one of Australia's most successful and most awarded environmental rehabilitation projects.

23/3 Leigh Creek School Sharing

Agenda of the day

Ice-breaking (45 mins)

Presentation - 5 groups from Hong Kong (Each group 5mins)

Presentation - groups from Leigh Creek (Each group 5mins)

Issue Discussion - 5 Joint groups of Hong Kong & Leigh Creek Students. (60 mins)

Joint Activity and Lunch

Activity 1 - Bingo

Step 1: Write down your own answer for the questions. (Both Australian and Hong Kong Students have to do so)

Step 2: Find a buddy who shares the same answer with you, then write down his/her name in the box with No. e.g. Trump shares the same Luck No. with you, write down "Trump" in the box.

Step 3: The first student who fills all the boxes with buddies' names, wins the game.

1. The food you hate most <u>Your Ans.:</u>	2. Your Lucky no. (Only 0-9 please!) <u>Your Ans.:</u>	3. The social media/ networking app you mostly use. <u>Your Ans.:</u>
1. Buddy's Name:	2. Buddy's Name:	3. Buddy's Name:
4. The country you want to visit <u>Your Ans.:</u>	5. Your favorite Subject <u>Your Ans.:</u>	6. Your favorite Color
4. Buddy's Name:	5. Buddy's Name:	6. Buddy's Name:
7. Your favorite drink (Non-Alcoholic!) <u>Your Ans.:</u>	8. Your favorite singer <u>Your Ans.:</u>	9. Your Zodiac Sign <u>Your Ans.:</u>
7. Buddy's Name:	8. Buddy's Name:	9. Buddy's Name:

Activity 2 - “What’s your life?” Presentation from Hong Kong and Leigh Creek

Presentation Topics

Group 1: Geography of Hong Kong

Group 2: Popular culture of Hong Kong

Group 3: School life in Hong Kong

Group 4: Family and Traditional lifestyle of Hong Kong

Group 5: Food Culture of Hong Kong

Activity 3 - Issue discussion

The question/ topic your group would have to study about:

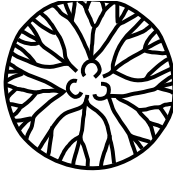
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Task 1: Please form a group with your Australian friends from Leigh Creek. Based on the above question/ topic, raise your questions or discuss with your group mates.

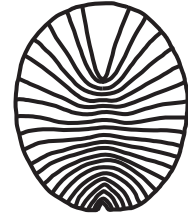
To guide your thinking:

1. What do you need to learn about for your study?
2. What Concepts need to be clarified or defined?
3. What kind of data do you need to collect?
4. Where is the source for the data?
5. Do they study need the comment / feeling from your Australian friends?

Hint: You are suggested to ask the questions you designed for the interviews on 22/3 in Adelaide.



EDIACARAN FOSSILS



A workbook on
the oldest animal life on Earth



Photos provided by Felicity Coutts

**An informative workbook on the Ediacaran fossils from
the National Heritage Listed fossil site, Nilpena
of the Flinders Ranges, South Australia.**

Descriptions for words that are highlighted in bold font can be found in the Glossary
at the end of the workbook.

Copyright Felicity Coutts

All about Ediacaran fossils

Ediacaran fossils can be found all around the world, including Canada, South Africa, Russia, the United Kingdom and right here in South Australia. Ediacaran fossils are the oldest evidence of **multicellular** life on Earth. Right here in the **Flinders Ranges** of South Australia, Ediacaran fossils are dated to about 555 million years old and demonstrate the first evidence of large and complex animal life on Earth.

We are here!

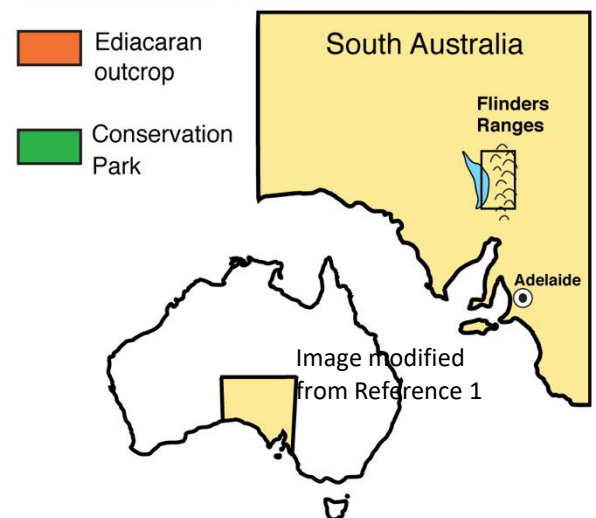
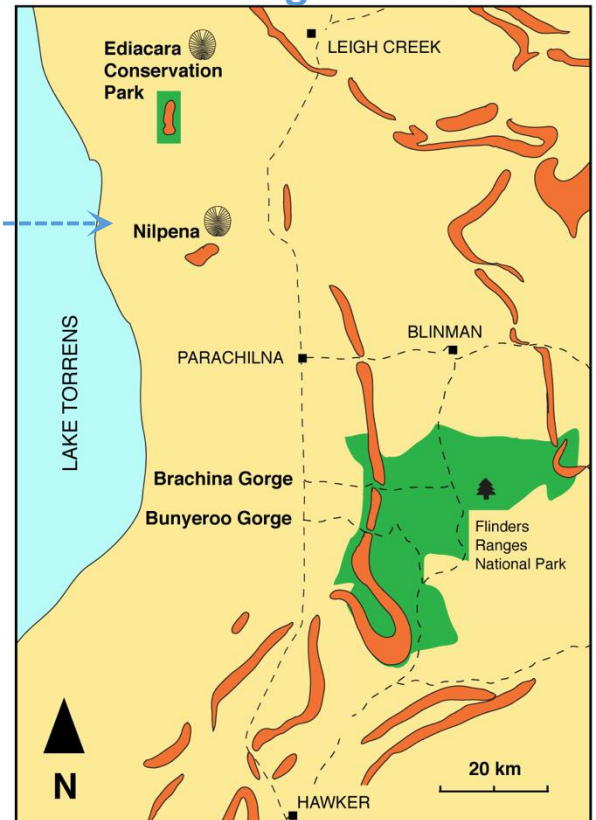
The National Heritage Listed fossil site **Nilpena** is one of the most iconic Ediacaran fossil sites in the Flinders Ranges. Nilpena is essentially a field-laboratory, where hundreds or square metres of fossilized Ediacaran seafloor has been **excavated** and can be studied on site.

Ediacara Conservation Park (CP) is also an iconic Ediacaran fossil site (upper left corner of map). The first Ediacaran fossils in Australia were discovered in Ediacara CP by hobby Geologist Reg Sprig in 1946. Palaeontologists have discovered that **Ediacara CP** preserves some of the smallest Ediacaran fossils, which allows these unusual creatures to be studied more closely.

Note: All the orange-highlighted areas in the map show where Ediacaran fossils can potentially be found. They're everywhere!

It is extremely important that we protect and conserve Ediacaran fossils so that we can continue to learn about how early animal life evolved on Earth. Fossil collecting without a scientific permit is not allowed anywhere in the Flinders Ranges. (Illustration from Reference 1)

Flinders Ranges



How were Ediacaran fossils created?

About half a billion years ago (555 million years old), a large shallow sea lay where the Flinders Ranges is today. Ediacaran organisms were abundant, and lived on the seafloor. Destructive **submarine sand flows** buried these living communities, and this happened over and over again. After a sand flow buried a community, a new group of organisms would then occupy this fresh patch of seafloor. However, once again, sand flows would then bury this new community. Over millions of years these sand layers hardened into sandstone. This cycle of burial and occupation happened over and over again, and we can see this in the layers (**strata**) of sandstone we find today in the Flinders Ranges.

The outlines and shapes of the organisms were moulded into the overlying sand and became **fossilized**. Palaeontologists think that an **organic mat** of algal or bacterial origin (look for the textures!) covered the seafloor at this time which helped to **preserve** the creatures in this way. The way in which the organic mat preserved Ediacaran communities is called the 'Death Mask' model (2). More recently, there has been a suggestion that at the time there was abundant **dissolved silica** in the oceans, and that this contributed to the preservation of the Ediacaran communities (3).

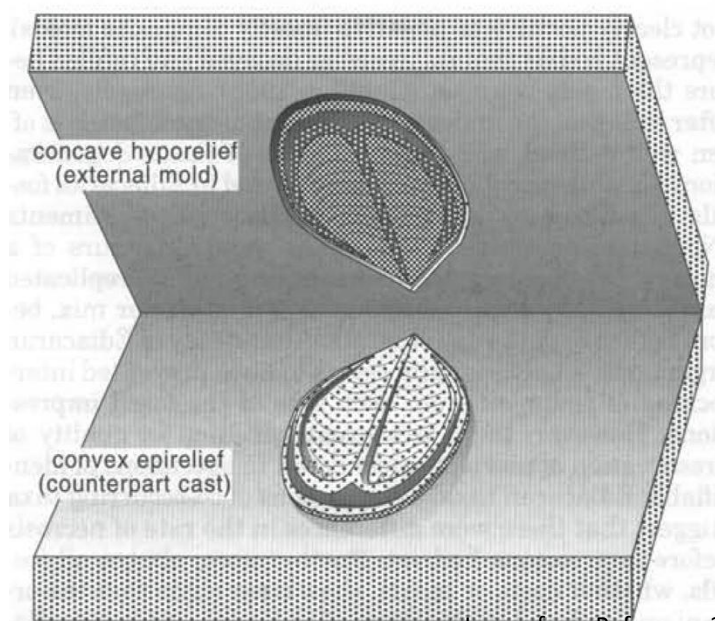


Image from Reference 2

How were Ediacaran fossils created? Contd.

The illustration on the previous page shows the two different ways in which we find Ediacaran fossils. The underside of the top layer of sandstone (bed) preserves a negative impression, while the topside of the bottom layer of sandstone (bed) preserves a positive impression. Usually, we find only the top sandstone layer with a negative impression of the organisms. Because we often find only negative impressions of the organisms, we use Silly Putty to press into the fossils to make a positive mould. This enables us to get a clearer picture of what the original organism would have looked like.

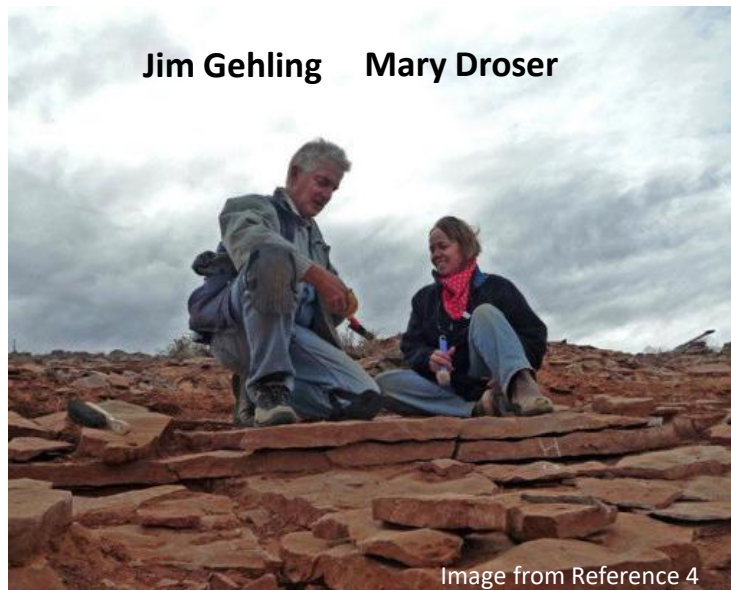


Image provided by Felicity Coutts

The photo above shows a negative impression of the small round Ediacaran fossil *Rugoconites* preserved in the bottom of the bed (left), and a cast made of the fossil to reveal a positive impression. Doesn't *Rugoconites* look cute!?

Research

Palaeontologists from both the South Australian Museum and University of California Riverside (California, USA) travel to Nilpena every year to **excavate** new fossilized seafloors and study Ediacaran communities. Dr. Jim Gehling leads a group from South Australia and Prof. Mary Droser leads a group from California and both teams collaborate together to learn new things about Ediacaran fossils.

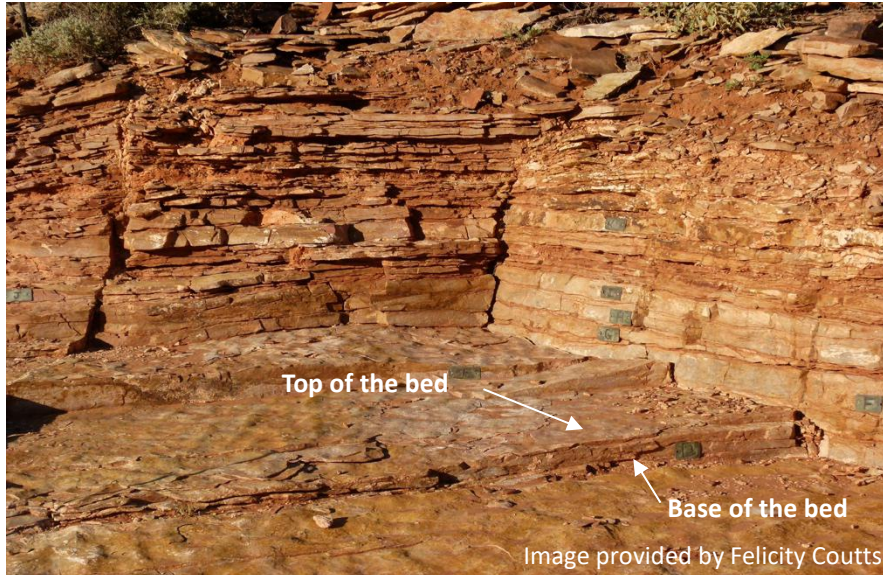


Over the past 15-20 years Palaeontologists have excavated hundreds of square metres of seafloor from different **submarine environments**, and new discoveries are being made all the time. Jim and Mary (above) are sitting on layers of fossil seafloor!



How do we find Ediacaran fossils?

Step 1. First, we look for a clear **horizon** of fossil seafloor in the ground. This may either be already exposed, or we dig to look for it. Can you see all the layers of sandstone in the excavation **quarry** below? Each one of these is a fossil bed which preserves an Ediacaran community on its base.



Step 2. Next, we carefully dig around this key bed, being careful not to damage the fossil. We want to expose as much seafloor as we can, so that it can be easily excavated.



Step 3. We then excavate the fossil seafloor. This must be done with care! The seafloor is broken up into smaller fragments, a bit like a jig-saw or a puzzle, and we need to ensure that when we remove it from the ground that we can put it back together again. To help with this, we often mark the edges of each individual piece of sandstone, so that we know how they fit together.

Step 4. Next, we flip the bed! When we put the bed back together after removing it from the ground we have to flip it over, so that we can study the Ediacaran community on the bed base.



Step 5. Once the area of fossil seafloor is excavated and put back together, we are ready to study the Ediacaran fossil community preserved on the bed. In the photo below Prof. Mary Droser and Ediacaran researcher Scott Evans are mapping out a fossil surface.

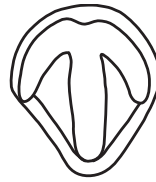


Now you are ready to be an Ediacaran Palaeontologist!

Look carefully at the fossil surfaces
in front of you... Can you identify and name these fossils?



A possible **segmented** flatworm



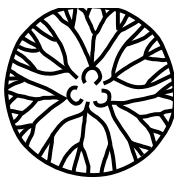
Aligns its body with the current



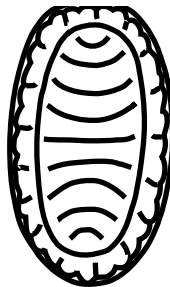
A possible **suspension-feeder**



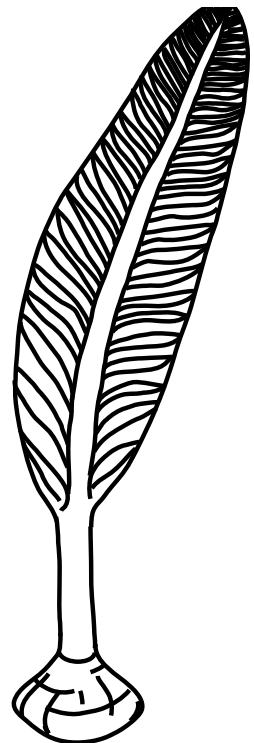
First animal with a head!



Distinct three-fold **symmetry**



Looks like a sea-slug!



Looks like living **sea pens**

DRAW A FOSSIL

What other fossils can you identify?

If you don't know what a fossil is called, draw it and try to describe it yourself – what does it look like?

(refer to the Fossil Identification Key after the Find-a-Word)

Name: 	Name:
Name: 	Name:
Name: 	Name:
Name: 	Name:

Spriggina



Ediacara Find-a-word

Can you find these words in the grid below?



Dickinsonia

NILPENA

MOULD

DICKINSONIA

SEAFLOOR

FLINDERS RANGES

FOSSILIZE

PARVANCORINA

BURIAL CURRENT

SANDSTONE

FOSSILS

SPRIGGINA

SUBMARINE

EXCAVATE

SILLY PUTTY

ASPIDELLA

REG SPRIGG

PRECAMBRIAN

IMPRESSION

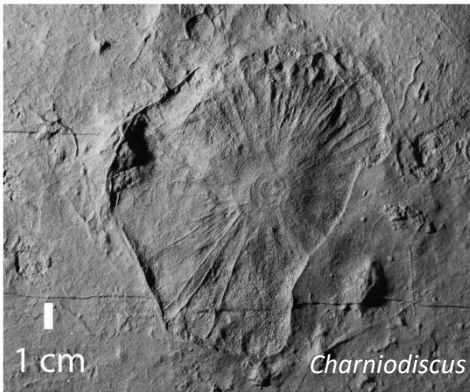
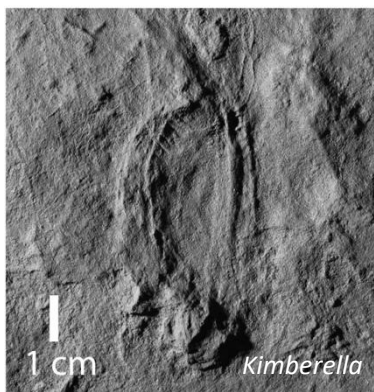
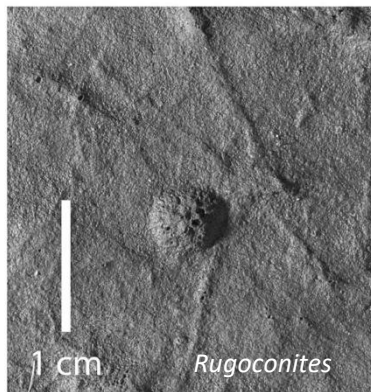
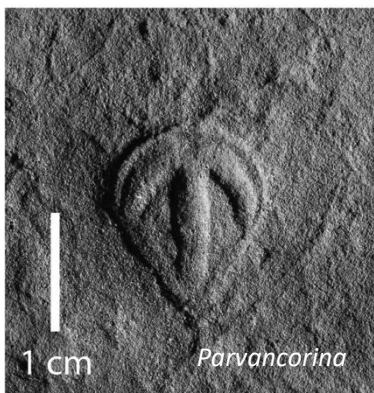
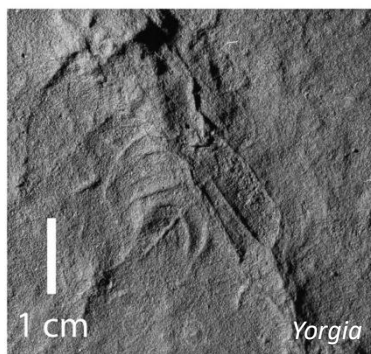
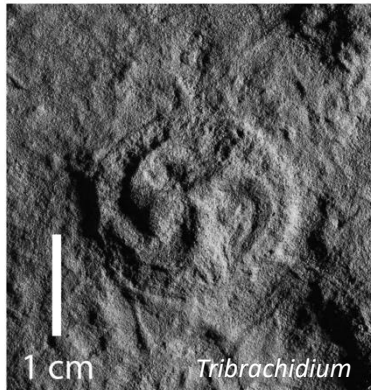
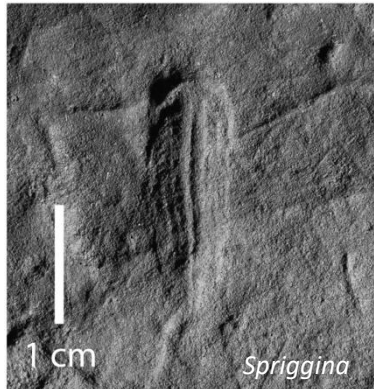
FUNISIA

EDIACARA CP

F	K	A	X	H	W	Y	S	U	B	M	A	R	I	N	E
C	L	N	S	F	N	I	L	P	E	N	A	Q	U	W	D
D	M	I	P	G	V	T	I	K	F	J	X	G	L	P	I
I	E	G	N	W	X	N	S	M	O	U	L	D	I	A	A
C	X	G	L	D	R	E	S	C	J	E	F	Y	M	R	C
K	C	I	F	K	E	R	O	E	V	N	U	H	P	V	A
I	A	R	O	A	G	R	F	P	T	O	N	K	R	A	R
N	V	P	S	S	S	U	S	X	C	T	I	J	E	N	A
S	A	S	S	P	P	C	E	R	M	S	S	M	S	C	C
O	T	N	I	I	R	L	A	T	A	D	I	B	S	O	P
N	E	T	L	D	I	A	F	O	U	N	A	Z	I	R	R
I	Q	Y	I	E	G	I	L	T	C	A	G	O	O	I	U
A	H	C	Z	L	G	R	O	P	H	S	F	E	N	N	T
K	U	H	E	L	R	U	O	K	F	S	W	D	S	A	B
P	R	E	C	A	M	B	R	I	A	N	L	U	Q	I	A
T	G	D	S	I	L	L	Y	P	U	T	T	Y	R	P	E

Fossil Identification Key

These are some of the most common Ediacaran fossils we find.



Photos provided by Felicity Coutts

Glossary

Ediacaran / Ediacaran Period: The Ediacaran or the Ediacaran Period is the title used to describe the period of time when the first Ediacaran organisms first appeared in the fossil record, to when they disappeared. This period of time was given the title 'Ediacara' after the oldest complex, animal-like fossils were found in Ediacaran Conservation Park.

Multicellular: Complex life forms tend to be multicellular. This means they are comprised of more than one cell. Very simple life forms, such as bacteria tend to only be comprised of a single cell. The evolution of life on Earth has shown that single celled simple organisms gradually evolved into more complex organisms of multiple cells (multicellular).

Flinders Ranges: The Flinders Ranges is a mountain range in south-central South Australia. It is one of the biggest Geosynclines in the World. About half a billion years ago, the Flinders Ranges used to be a submarine basin with a shallow sea in which Ediacaran fossils, the oldest animal communities, thrived in the diverse marine environments. Over millions of years the submarine basin gradually became filled up by sediments, uplifted and the forces of continental movement gradually formed the Geosyncline we see today.

Animals: Animals belong to the Animalia, one of the five Kingdoms of life found on Earth. Animals show bilateral symmetry (where the left side and the right side are mirror images of each other). Animals are capable of movement, and have a complex digestive arrangement such that their internal body compartments are comprised of three generalized layers.

Organism: An organism is defined as any living thing. This includes animals, plants, bacteria and fungi.

Trace fossil: In Ediacaran palaeontology, a trace fossil is an impression left behind as evidence of movement. We see trace fossils created by *Dickinsonia*, where it was sitting for periods of time on the seafloor possibly consuming organic matter beneath it body. We also see trace fossils produced by *Kimberella*, where it was actively excavating the seafloor.

Preserved / preserve / preservation: To preserve something is to maintain its original state. Fossil remains of dead organisms are all preserved to a degree.

Excavated / excavate: To excavate is to dig up something.

Submarine: Below the surface of the ocean.

Sand flows: When a large amount of sand is deposited in a layer.

Strata: Strata are defined layers of rock.

Fossilized / fossil: Fossils are the preserved remains of dead organisms. Fossils can include the organic tissue of an organism or an internal cast or external cast of an organism where there is no organic matter left. Usually, to be a fossil the original organism has to have been dead for a very long time.

Organic mat: An organic mat is an algal or bacterial film that coats a surface.

Dissolved silica: Dissolved silica is everywhere in the oceans, and it is used by many animals to make skeletons. It is thought that before marine animal life became prominent, dissolved silica was more abundant in the oceans. Then as marine life exploded, more organisms were taking up this silica and there was less dissolved in the oceans.

Palaeontologist: A palaeontologist is someone who studies the remains of dead animals and plants (fossils).

Beds: In Ediacaran Palaeontology, a bed refers to a single layer of seafloor.

Submarine environments: Submarine environments are areas or surroundings that organisms dwell or live in under the sea.

Quarry: A hole or deep pit in the ground created by the removal of fossil material.

Horizon: A distinctive layer of rock or bedding surface.

Segmented: When the body of an organism is comprised of self-similar compartments or divisions.

Sea pens: Sea pens are a type of soft coral that have a soft body instead of a hardened skeletal body. The Ediacaran fossil *Charniodiscus* looks very similar to and is compared with living soft coral sea pens (*Pennatulacea*).

Suspension-feeder: A suspension-feeder is an organism that gets its food from nutrients suspended in the water.

Symmetry: Symmetry refers to body symmetry. In the Animal Kingdom, animals tend to show bilateral symmetry – where the two halves of their body (the left and right) are mirror images of each other. Body symmetry is very important when looking at Ediacaran fossils, because it gives us clues into the mode of life of organisms. For example: A fossil organism with bilateral symmetry was most likely capable of active movement, whereas a fossil organism with round or radial symmetry was less likely to have moved quickly, if at all!

References

1. Jim Gehling and Mary Droser (2012) Ediacaran stratigraphy and the biota of the Adelaide Geosyncline, South Australia. *Episodes*, 35: 236-246.
2. James Gehling (1999) Microbial mats in terminal Proterozoic Siliciclastics: Ediacaran Death Masks. *PALAIOS*, 14: 40-57.
3. Lidya Tarhan, Ashleigh Hood, Mary Droser, James Gehling and Derek Briggs (2016) Exceptional preservation of soft-bodied Ediacara Biota promoted by silica rich oceans. *Geology*, 44: 951- 954.
4. Article by Kurt Snibbe [online] Image published 20 March 2012. The Press Enterprise. <https://www.pe.com/2012/03/20/riverside-ucr-researchers-find-early-animal-with-skeleton/>
5. Image sourced from the Australian Broadcasting Company [online] Image posted 2 Aug 2013. <http://www.abc.net.au/news/2013-08-02/mary-droser-studies-edicara-fossils/4862498>

24/3 Brachina Gorge

BRACHINA GORGE

Considered a corridor through time, The Brachina Gorge Geological Trail passes through rock formations that represent 150 million years of geological and palaeontological history. Among the local fossils, there are imprints of stromatolites, some of the earliest forms of life ever to appear on Earth. Other imprints reveal the outlines of soft bodied animals similar to jellyfish, and more advanced creatures like trilobites, extinct relatives of the modern crab. Other features of the trail are The Golden Spike, which marks the global base of the Ediacaran period, and vertical burrows that mark the boundary between the Ediacaran & Cambrian periods.

But Brachina's rock formations are more than a glimpse into the past; they are home to one of Australia's most beautiful marsupials-the yellow footed rock wallaby. Like all wallabies they use their long tails for balance. Their fur is thick especially on the feet where it provides cushioning and grip in the precipitous terrain they prefer. Yellow footed rock wallabies grow to around 60 cms in height and weigh 7-13 Kgs. They are mainly active during the late afternoon and early morning.

The Ikara-Flinders Ranges National Park has been a saviour for this once-threatened population. The Bounceback program that started in the early 90s is all about restoring the natural ecology of the park and as well as the Yellow-footed rock-wallaby recovery. It has also included the reintroduction of locally-extinct species like western quolls and brushtail possums.



Task 1: According to your field work observation, records, data and experiences, please analyze the geological landscape in the photo with the aid of the following form.

Name of the landscape or location				
Type of the rock	Igneous		Sedimentary	Metamorphic
Features of the rock	<u>Colour</u>		<u>Grain Size</u>	
	<u>Texture</u>		<u>Structure</u>	
	<u>Minerals found</u>			
	<u>Any other special observations</u>			
Causes of the landform	Endogenic force (internal force):			
	Folding		Faulting	Vulcanicity
	<u>Any other special observations:</u>			
	Exogenic force (external force):			
	<u>Weathering</u>	<u>Erosion</u>	<u>Mass movement</u>	<u>Transportation</u>
<ul style="list-style-type: none"> ● Is the geological landscape being used for human activities like economic activities or cultural activities? 				
<ul style="list-style-type: none"> ● Besides human activities, is any flora or fauna living by the landscape? Does the landscape support any wildlife habitat? 				

25/3 Flinders Ranges National Park

IKARA FLINDERS RANGES NATIONAL PARK

The park comprises approximately 95,000 hectares. It includes the Heysen Range, Parachilna, Brachina and Bunyerroo Gorges and the vast amphitheatre of mountains that is Wilpena Pound.

Ikara-Flinders Ranges National Park has a rich and complex cultural heritage combining Aboriginal and pastoral history. The park is co-managed by a board consisting of Adnyamathanha and Department of Environment, Water and Natural Resources representatives. The Adnyamathanha people are the traditional custodians of the Ikara-Flinders Ranges National Park. Their connection with the land stretches back many thousands of years.

In 2016 the Flinders Ranges National Park was renamed the Ikara-Flinders Ranges National Park in recognition of the Adnyamathanha, as 'ikara' is an Adnyamathanha word meaning 'meeting place', which Wilpena Pound was and is for the Adnyamathanha people.

Words from the Adnyamathanha people

As the traditional owners of this amazing part of the country, we have a cultural responsibility to ensure your physical and spiritual wellbeing is well-looked-after during your stay. There are many cultural treasures to be found whilst you visit our Yarta. We invite you to learn about our culture and social history; however, we ask that you exercise your role as a respectful and responsible traveller to assist us in protecting them for future generations. Take your time, walk in our footprints, and share our story. Familiarise yourself with the richness of our Yarta and appreciate the wildlife, landscape, cultural richness and more. We will do our best to highlight areas of strong cultural importance and we ask that you treat them with the respect and reverence they deserve.

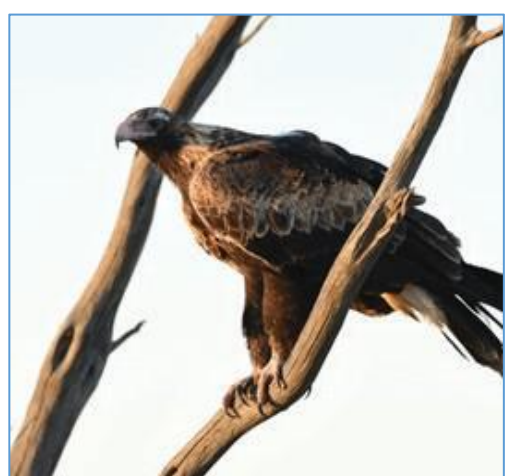
Around 580 million years ago a giant asteroid slammed into the Gawler Ranges. It hit with such force that debris from the impact spread to a regions some 300 kilometres to the east. At that time the Flinders Ranges had yet to be formed and the area was a vast inland sea. The debris from the asteroid settled into the water above earlier deposits and, over the millions of years that followed, many more layers of sediment piled on top. Much later, movements in the earth's crust compressed, folded and uplifted these sedimentary layers, forming towering mountains much higher than the Flinders we see today. Wind and water then slowly eroded these mountains, exposing the warped and tilted strata and creating the Flinders Ranges of today which stretch 430km from north to south.

The region has a semi-arid climate with hot dry summers and cool winters. Summer temperatures usually exceed 38 °C (100 °F), while winters have highs around 13–16 °C (55–61 °F). Although rainfall is erratic, most of the precipitation falls in winter. The area gets around 250 mm (9.8 in) of rain annually. Frost is common on winter mornings and temperatures have dropped as low as –8 °C (18 °F). Snow has even been recorded in Wilpena Pound region.

IKARA FLINDERS RANGES NATIONAL PARK contd.

The flora of the Flinders Ranges consists of plants adapted to a semi-arid environment. Trees like cypress pine and black oak are very common in this area. In moister areas near Wilpena Pound, plants like grevilleas, lilies and ferns can be found. Water-loving reeds and sedges grow near springs and waterholes.

The Flinders Ranges supports a diverse fauna. Since the removal of dingos and the establishment of permanent waterholes for stock, the number of red kangaroos, western grey kangaroos and wallaroos has increased. The yellow-footed rock-wallaby, which neared extinction after the arrival of Europeans due to hunting and predation by foxes, has now stabilised. Insectivorous bats make up significant proportion of the mammals. There are a large number of bird species including parrots, galahs, emus, the wedge-tailed eagle and small numbers of water birds. Reptiles include goannas, snakes, dragon lizards, skinks and geckos.



WILPENA POUND



Wilpena Pound, a natural amphitheatre of mountains, is approximately 15kms long, 8kms wide and covers an area of approximately 8000 hectares. The floor of the Pound is about 180 metres higher than the surrounding area. The area is part of the Adelaide Geosyncline. Despite early amateur theories that it was some kind of ancient volcano, the actual Pound is sedimentary rock in the form of a large syncline.

Although from the outside the Pound appears as a single range of mountains, it is actually two, one on the western edge and one on the eastern, joined by the long Rawnsley Bluff at the south. A gorge called Wilpena Gap has been cut in the eastern range, and most of the inside of the Pound drains into Wilpena Creek which exits through the Gap. The wall of mountains almost completely encircles the gently-sloping interior of the Pound. The highest peak in the Pound, also the highest of the Flinders Ranges, is St Mary Peak (1171m).

The first Europeans to explore the Ranges, discovered the Pound and its prospects for pastoralism. In 1901, when the Hill family obtained the Wilpena lease, they decided to try farming, something never before attempted so far north. After the immense labour of constructing a road through the torturous Wilpena Gap, they built a small homestead inside the Pound, which still stands today, and cleared some open patches in the thick scrub of the interior. For several years the Hill family had moderate success growing crops inside the Pound, but in 1914 there was a major flood and the road through the gorge was destroyed. They could not bear to start all over and sold their homestead to the government. The Pound then became a forest reserve leased for grazing. In 1945 the tourist potential of the area was recognised when a “National Pleasure Resort” was proclaimed. The Pound also later became part of the Flinders Ranges National Park.

WILPENA POUND contd.

Wilpena Pound is one of the most popular sites in the Flinders Ranges. Tourists can go on scenic flights and bushwalking and rock climbing are also popular. However, the peaks are very rugged, and thick scrub and timber inside the pound can make navigation difficult; in 1959, a 12-year-old boy became lost while walking inside the Pound, and despite search efforts, his skeletal remains were not located until 18 months later.



View of Wilpena Pound from space

HILLS HOMESTEAD

Task: When the Hill family settled and built their homestead at the edge of Wilpena Pound in 1901, they faced many hardships. Read the information boards at the homestead carefully and then **list at least 5 of the challenges they had to face and overcome.**

1.
2.
3.
4.
5.

RAWNSLEY PARK

Rawnsley Park Station, on the southern face of Wilpena Pound, was settled as part of Arkaba Station in 1851. In 1953 Clem Smith purchased 6253 acres and renamed the land Rawnsley Park Station, after Rawnsley Bluff, the southern tip of Wilpena Pound. The property is now 29,000 acres.

Rawnsley Park Station is now owned and managed by fourth generation Flinders Ranges' residents, Tony and Julieanne Smith. Initially devoted to sheep, the station ventured into tourism in 1968, when the first cabins were opened and sheep shearing demonstrations began. It has since been transformed into an award-winning tourism facility that attracts 20,000 visitors each year. Though tourism is the main industry on the property, the station still runs 2000 sheep.

Committed to environmentally responsible and sustainable tourism, Tony and Julieanne have entered into a Heritage Agreement with the South Australian Department of Environment, Water and Natural Resources to protect the diverse vegetation of Rawnsley Bluff.



Rawnsley Bluff

26/3 Activity - Akaroo Rock & Mt. Remarkable National Park

ARKAROO ROCK

Akaroo Rock, located at the base of Wilpena Pound in the southern part of the Flinders Ranges National Park, is a significant cultural site for the Adnyamathanha (pronounced Ad-nya-mut-ta-na) people.

The Adnyamathanha are an indigenous Australian people from the Flinders Ranges. The name Adnyamathanha means “hills or rock people” in the Adnyamathanha language. The origins of the Adnyamathanha are told through creation stories, passed down from generation to generation.

The art at Akaroo Rock (Akurra Adnya) tells the story of the creation of Wilpena Pound. It's a story from the Adnyamathanha Dreamtime and is believed to be 5,000 years old. It is believed that two Akurras (mythological serpents) entered into a long & vicious battle with a group of hunters. The hunters killed both the snakes and it is their petrified bodies that form the outer walls of Wilpena Pound (Ikara).

An alternative story is that two Akurras ate a large sum of people gathered for a ceremony, which caused the serpents to be unable to move from their eating grounds.

In the cave you will see many charcoal and red, yellow and white ochre paintings of birds, people, snakes and waterholes. These were made by mixing the colours with blood, water or animal fats & then brushed on with fingers and hands.

In 1851 the first Europeans settled some of the Adnyamathanha land. This led to many conflicts because the Adnyamathanha people were pushed off their land by the Europeans.

On 30 March 2009, the Adnyamathanha people were recognised by the Federal Court of Australia as having native title rights over about 41,000 square kilometres (16,000 sq mi) running east from the edge of Lake Torrens, through the northern Flinders Ranges, approaching the South Australian border with New South Wales



Task 1: Copy and draw **the most impressive pattern or piece of drawing** from the ancient aboriginal paintings from the Arkaroo Rock.

Task 2: Please discuss with our cultural guide, Mr. Stefan about the meaning of the above drawing from the aboriginal culture.

Could you explain why did the aboriginal people create this drawing?

MOUNT REMARKABLE NATIONAL PARK

Land associated with the Park at Mambray Creek and Alligator Gorge first obtained protected area status in 1952 as 'national pleasure resorts'. The Mount Remarkable National Park was proclaimed in 1972. The Park now has a total area of 18,271 ha (45,150 acres).

The park is a popular destination for bushwalking, offering dramatic gorges, colourful rock formations, water courses lined with river red gums, picture-perfect ranges and scenic cliff-top views – the 960m high Mount Remarkable Summit presides over the Willochra Plain and looks out to the Spencer Gulf.

There is a wide range of wildlife that call Mount Remarkable National Park home. You can see yellow-footed rock wallabies, emus, euros and lace monitors. Mornings and evenings are the best time to spot them – especially in the Mambray Creek valley.



Emus in Mount Remarkable National Park

Task 3: Rock and mineral research

Mr. Rick would show you 2 kinds of mineral on the trial, please describe the 2 minerals. You can use a handy microscope for observation.

Name of the mineral		
Color		
Grain Size		
Texture		
Structure		
Density		
Hardness		
Mineral Luster		
Magneticty		
Found in type of rock		
How people make use of the mineral		


27/3 Round up activity

Task 1: You have already experienced the stunning landscape in South Australia.

- Each group has to choose one natural landscape or destination, think about and write down as many keywords related to natural landscape or destination as you can. You may write down the keywords according to these categories:

Descriptive words (e.g. wide, beautiful)	Facts and objects (e.g. Town, buildings)
Feeling words (e.g. fun, exciting)	ALL other words you can think of...

Task 2: Organise the keywords into paragraph. Tell your friends about the place and your feelings.

<i>HONG KONG</i>	