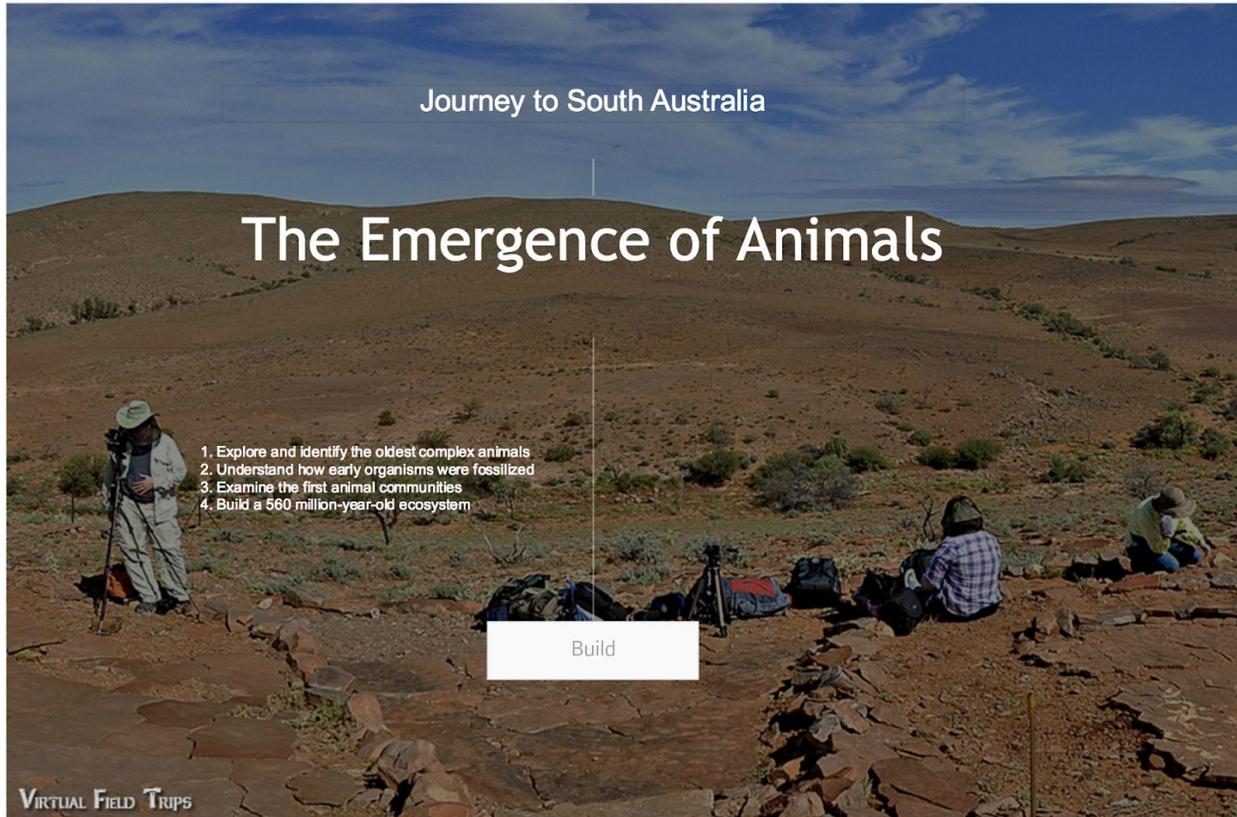


Nilpena Lesson Illustrated Summary

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Introduction



This document accompanies the immersive, interactive virtual field trip (iVFT), “Nilpena”. This iVFT is a computer-based lesson that teaches high school or college audiences about the Ediacaran time period, life in that period, and the fossils that exist today in Nilpena, Australia. The lesson includes automatic, adaptive feedback, which supports students as they work. Thus, the lesson is appropriate for use in-class, as homework, or as an extension activity.

Unlike a conventional lesson or classroom activity, the Nilpena iVFT cannot be fully summarized in a static document. However, the document does serve two purposes. It can be skimmed, providing educators with a much quicker overview of the activity than they would find from navigating it themselves in “student mode”. It also includes explanatory notes below selected screenshots. These notes explain the purpose of certain screens, describe how the adaptive feedback functions, and/or indicate areas where students may get stuck.

Most “screens” (meaning any page) in the lesson ask the student to perform some action and then click the blue **NEXT** button to move forward. Incorrect actions will trigger feedback in **RED** that guides the student to the correct answer. This is also used to enforce a minimum time on some screens to encourage the student to read instructions or watch videos. Correct actions sometimes trigger additional explanations in **GREEN**.

Lesson Start

The lesson begins by introducing the basic navigation of the iVFT and then asks the student to make some basic observations.

WELCOME

Hello and welcome.

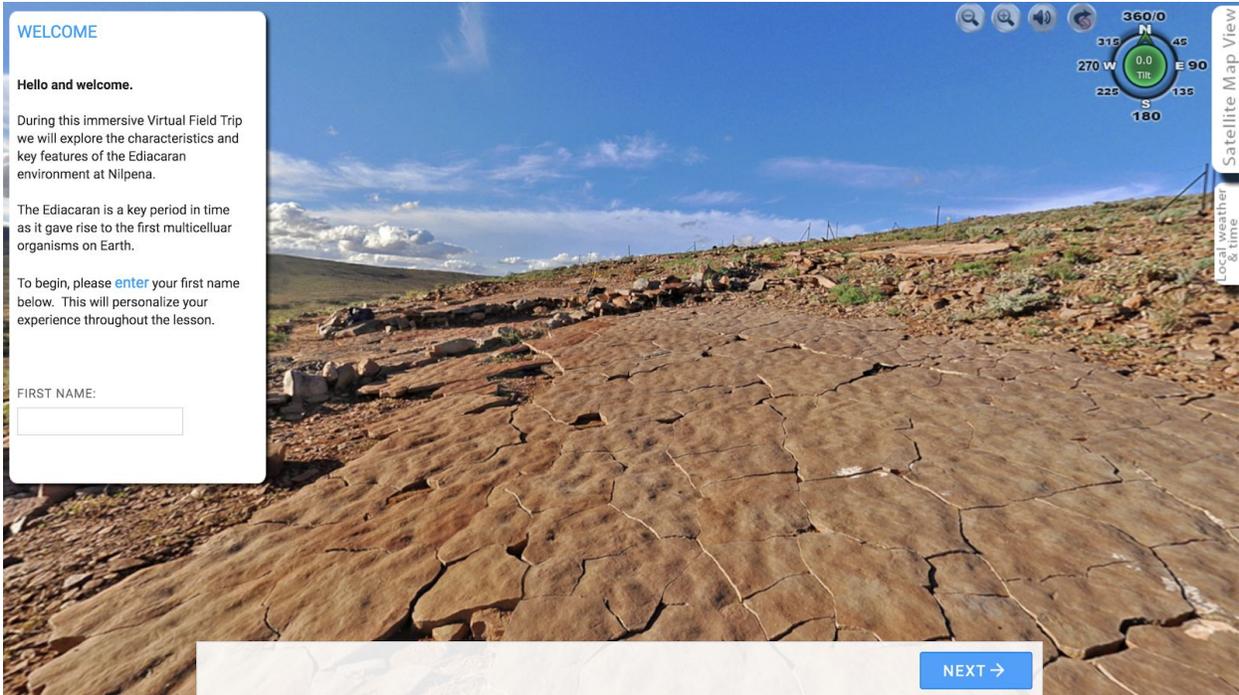
During this immersive Virtual Field Trip we will explore the characteristics and key features of the Ediacaran environment at Nilpena.

The Ediacaran is a key period in time as it gave rise to the first multicellular organisms on Earth.

To begin, please **enter** your first name below. This will personalize your experience throughout the lesson.

FIRST NAME:

NEXT →



THE ENVIRONMENT

Hi Student Name,

Welcome to **Nilpena**, a harsh landscape located in the Flinders Ranges of South Australia.

Throughout this immersive Virtual Field Trip you will interact with digital elements in a variety of ways.

For example, you can explore the location by **clicking and dragging** on the main image to the right with your 'mouse'.

Go ahead and try it now.

NEXT →



THE ENVIRONMENT

What to look for.

During your exploration you will have access to a variety images and videos from experts in the field.

Make sure to [look at each image and watch every video!](#) They will provide you with clues to successfully answer the questions in this lab.

[Pay attention](#) to each question. Questions are worth points and every incorrect response **reduces** the question's point value.



360°
315°
270° W
225°
S
180°

45°
E 90°
135°

360°
0.1
TR

NEXT →

THE ENVIRONMENT

Observations

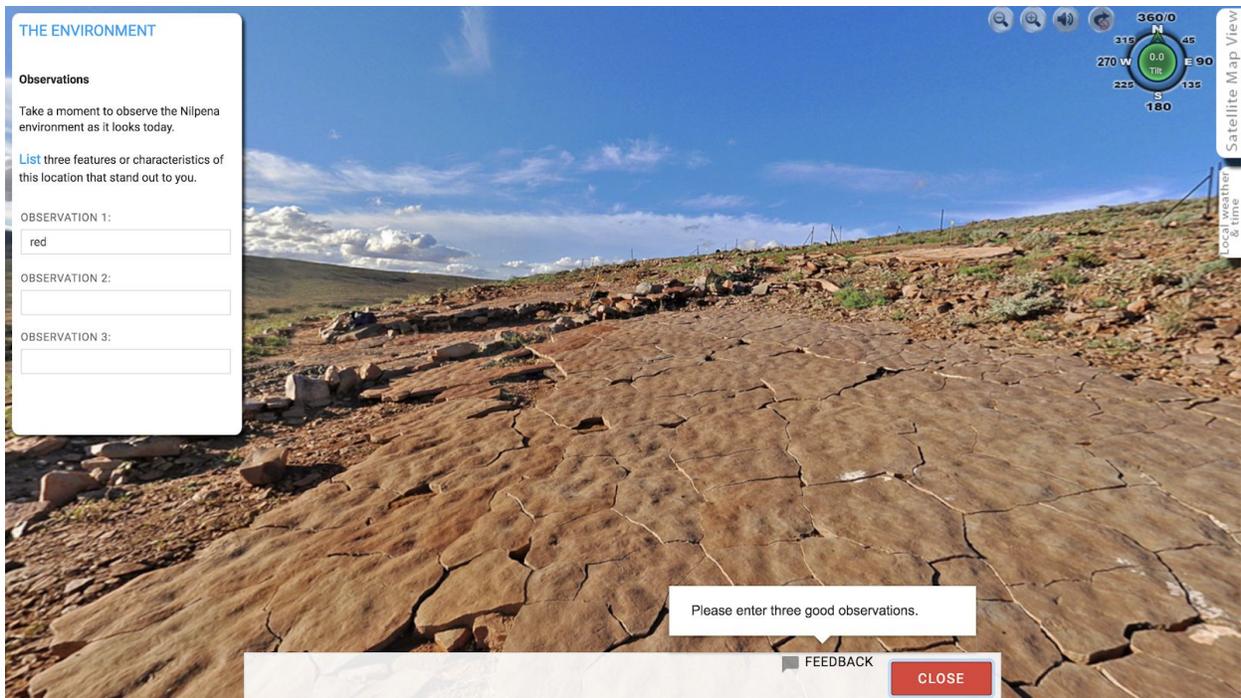
Take a moment to observe the Nilpena environment as it looks today.

[List](#) three features or characteristics of this location that stand out to you.

OBSERVATION 1:

OBSERVATION 2:

OBSERVATION 3:



360°
315°
270° W
225°
S
180°

45°
E 90°
135°

360°
0.0
TR

Please enter three good observations.

FEEDBACK
CLOSE

Any non-blank answer with at least three characters is accepted here.

THE ENVIRONMENT

Observations

Here is a description of what the environment at Nilpena is like today. Take a moment to see how it compares to the observations you made.

Nilpena Today:
 Semi-arid (mostly dry) climate
 Soft rolling hills with rocky surface
 Sparse vegetation and a few trees with mostly low bushes

's observations:

1. red
2. rocks
3. bushes

360° 0

315 N 45

270 W 0.0 TR 90

225 S 135

180

Local weather & time

Satellite Map View

NEXT →

Students can compare their observations to the lesson designer's observations.

THE ENVIRONMENT

Watch it!

Would you believe that the area you see here today was underwater and on the ocean floor? The video below explores a bit about Nilpena, where it is, and a brief overview of its importance.

360° 0

315 N 45

270 W 0.0 TR 90

225 S 135

180

Local weather & time

Satellite Map View

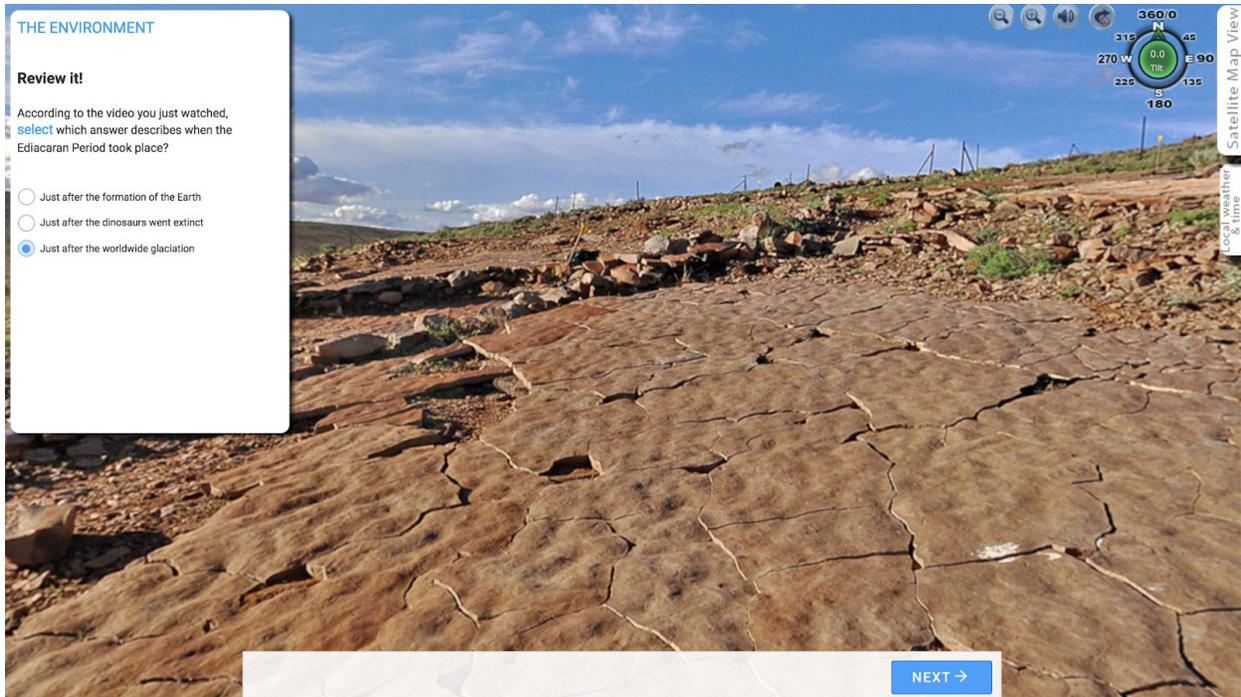
NEXT →

THE ENVIRONMENT

Review it!

According to the video you just watched, **select** which answer describes when the Ediacaran Period took place?

- Just after the formation of the Earth
- Just after the dinosaurs went extinct
- Just after the worldwide glaciation



3600
515 N 45
270 W 0.0 E 90
225 S 135
180

Local weather & time
Satellite Map View

NEXT →

Video introducing Nilpena and its importance. This is followed by a simple recall question.

Pre-Lesson Quiz

THE ENVIRONMENT

Make a guess.

As you look around the landscape, imagine what it might have looked like millions of years ago when it was still underwater. If you had to **GUESS** what the environment here at Nilpena might have looked like during the Ediacaran Period, which features do you think could have been present?

Select a choice from each area.

Water Depth

- Shallow water less than 30m - abundant sunlight
- Deep water more than 200m - little to no sunlight

Water Type

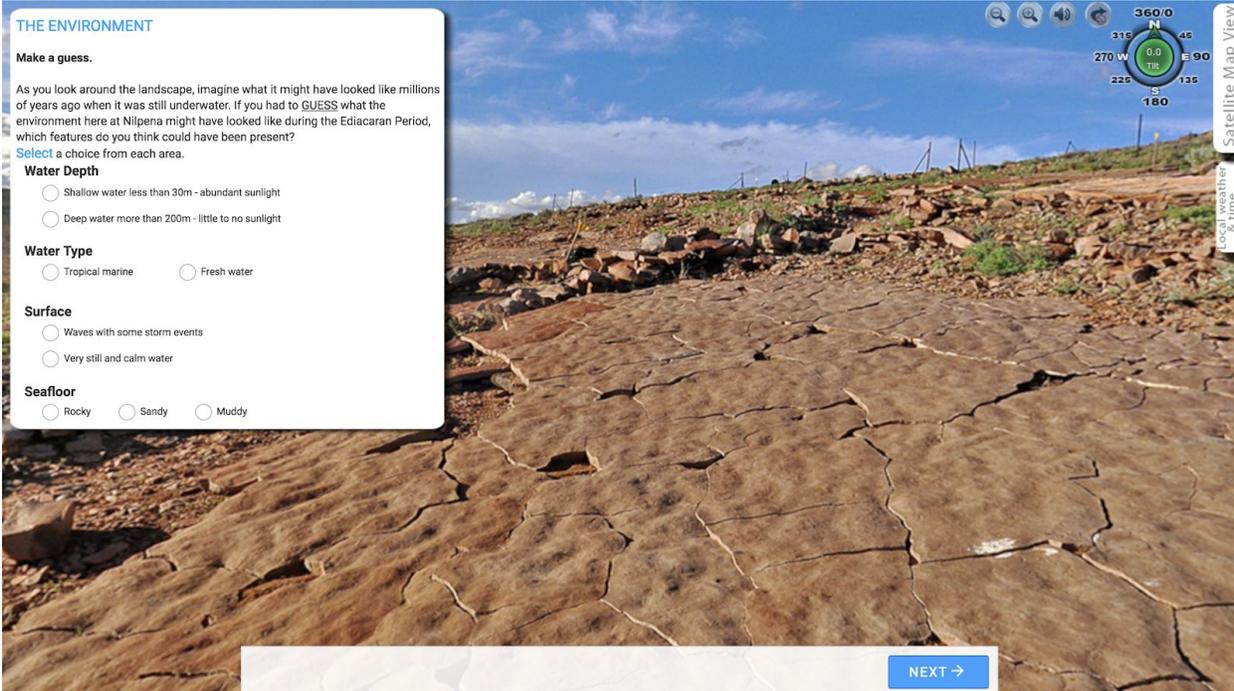
- Tropical marine
- Fresh water

Surface

- Waves with some storm events
- Very still and calm water

Seafloor

- Rocky
- Sandy
- Muddy



Navigation: Satellite Map View, local weather & time, 360.0, 315, 270 W, 0.0 TR, 180, 45, E 90, 135, S

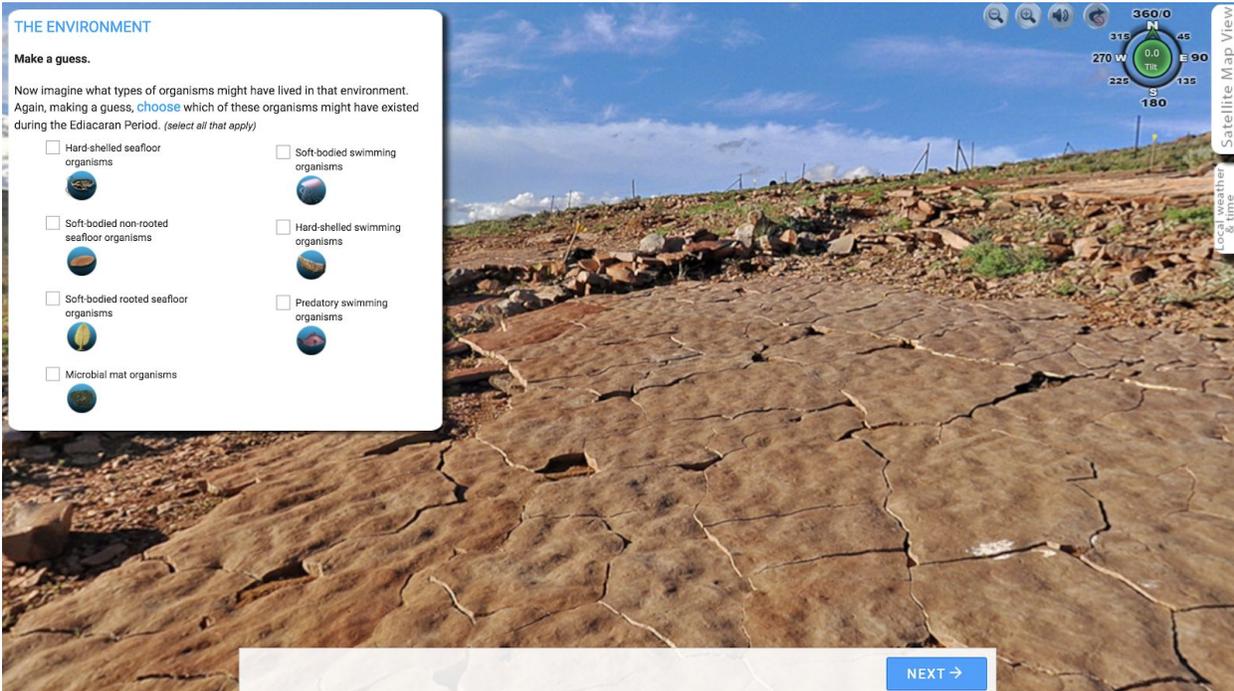
Next: NEXT →

THE ENVIRONMENT

Make a guess.

Now imagine what types of organisms might have lived in that environment. Again, making a guess, **choose** which of these organisms might have existed during the Ediacaran Period. (select all that apply)

- Hard-shelled seafloor organisms
- Soft-bodied swimming organisms
- Soft-bodied non-rooted seafloor organisms
- Hard-shelled swimming organisms
- Soft-bodied rooted seafloor organisms
- Predatory swimming organisms
- Microbial mat organisms



Navigation: Satellite Map View, local weather & time, 360.0, 315, 270 W, 0.0 TR, 180, 45, E 90, 135, S

Next: NEXT →

These two screens ask the student to make a guess about what the ancient Nilpena ecosystem might have been like. Any complete answer is accepted here, because it is only a guess. The student will return to these questions near the end of the lesson.

THE ENVIRONMENT

Watch it!

The Ediacaran time period continues to fascinate scientists for a number of reasons. Listen to Dr. Cohen explain why teams of scientists travel all the way to Australia just to look at these rocks.

360.0
N
315 W 45 E
270 W 0.0 TRK 90
225 S 135
180

Satellite Map View

Local weather & time

NEXT →

THE ENVIRONMENT

Review it!

According to the video you just watched, Dr. Cohen makes a comment regarding why the fossils of the Ediacaran Period are important. **Select** which statement she makes about the fossils from the choices below.

- The fossils represent the direct link to land mammals today.
- The fossils represent the first example of large organisms in the fossil record.
- The fossils represent the first time fossils are seen interacting with each other.

360.0
N
315 W 45 E
270 W 0.0 TRK 90
225 S 135
180

Satellite Map View

Local weather & time

Correct.
Dr. Cohen states that the fossils represent the first example of large organisms in the fossil record.

FEEDBACK

NEXT

Video introducing the Ediacara. This is followed by a simple recall question.



Here the student is introduced to the major geologic feature of this field site: the exposed fossil beds.

DEEP TIME

When did these fossils exist?

Before we explore the fossil beds in detail, we need to know when Ediacaran organisms existed and try to understand how long ago in time these events took place.

In order to do that we need to grasp the idea of what geologists refer to as 'deep time'.

Deep time - refers to the passage of geologic time on vast scales that can be difficult to comprehend.

You could almost say geologists are a form of time travelers. They study events that have occurred over thousands, millions, even billions of years!

360.0 N
315
270 W -11.4 E 90
180
135
180

Satellite Map View
Local weather & time

NEXT →

DEEP TIME

How large is the concept of time?

Think about this: Humans today are closer in time to the *Tyrannosaurus rex* (*T-rex*) dinosaur that lived 66 million years ago from the present day...
...than the *T-rex* is to its older ancestor the *Stegosaurus* dinosaur, that lived approximately 150 million years ago from the present day. (About 90 million years before the *T-Rex* existed!)

150mya 66mya present

The first evidence of life on Earth was approximately 23 times earlier than when the *Stegosaurus* lived. If you use the same logic from above, approximately how far back in time do you think the first evidence of life on Earth would have been?

350,000 years ago
 3.5 million years ago
 3.5 billion years ago

360.0 N
315
270 W -11.4 E 90
180
135
180

Satellite Map View
Local weather & time

That is incorrect.
If the *Stegosaurus* lived 150 million years ago, then you would multiply 150 million years x 23.
Give it a try.

FEEDBACK CLOSE

To better imagine how long ago life first emerged on Earth, the student performs a simple multiplication activity. 3.5 billion years ago is the correct answer.

DEEP TIME

How large is the concept of time?

Think about this: Humans today are closer in time to the *Tyrannosaurus rex* (*T-rex*) dinosaur that lived 66 million years ago from the present day...
...than the *T-rex* is to its older ancestor the *Stegosaurus* dinosaur, that lived approximately 150 million years ago from the present day. (About 90 million years before the *T-Rex* existed!)



The first evidence of life on Earth was approximately 23 times earlier than when the *Stegosaurus* lived. If you use the same logic from above, approximately how far back in time do you think the first evidence of life on Earth would have been?

- 350,000 years ago
- 3.5 million years ago
- 3.5 billion years ago

Correct.
If the *Stegosaurus* lived 150 million years ago, then $150 \text{ million years} \times 23$ is 3,450 million years, or approx 3.5 billion years ago.

FEEDBACK

NEXT

Deep Time

This “hub” activity asks the student to read about seven different events in Earth history. Each node uses the same timeline diagram to illustrate the relative position in history of the event. Having read all of them, the student is asked to complete a timeline activity to show that they understand the timing of each event.

DEEP TIME

To illustrate this concept of **deep time**, we will look at seven key events that have happened throughout geologic time.

Click on the top most icon above, representing the "Earth's Formation". Then click each of the other circular icons to view what event they represent.

Pay close attention to the order of events and when they occurred in geologic time. You will need to demonstrate that you understand this information later in the lesson.

After you have examined all of the events, click "next" to move on.

360° N
270° W
11.4° TR
225° S
180°

Local weather & time
Satellite Map View

DEEP TIME

Earth's Formation
The Earth is thought to have been formed about **4.6 billion years ago** by collisions in the giant disc-shaped cloud of material that also formed the Sun and planets in our solar system.

That is roughly 4.5 billion years from when humans first roamed the Earth.

Earth forms
4.6
3.6
2.6
1.6
0.6
0
Humans

360° N
270° W
11.4° TR
225° S
180°

Local weather & time
Satellite Map View

NEXT →

DEEP TIME

First forms of life
Stromatolites are a major constituent of the fossil record of the first forms of life on Earth. The earliest of these fossils date to **3.5 billion years ago**.

That is about 1 billion years after the formation of the Earth and approximately 1.2 billion years before the rise of oxygen.

Earth Forms, First life, Rise of O₂, Snowball Earth

360.0 N, 270.0 W, -11.4 TR, 180 S

Local weather & time

Satellite Map View

NEXT →

DEEP TIME

The Rise of Oxygen
This event was the biologically induced appearance of oxygen in Earth's atmosphere. Geological and chemical evidence suggest that this major environmental change happened around **2.3 billion years ago**.

That is about 1.2 billion years after the evidence of the first stromatolites on Earth and 1.65 billion years before the Snowball Earth period.

Earth Forms, Rise of O₂, Snowball Earth

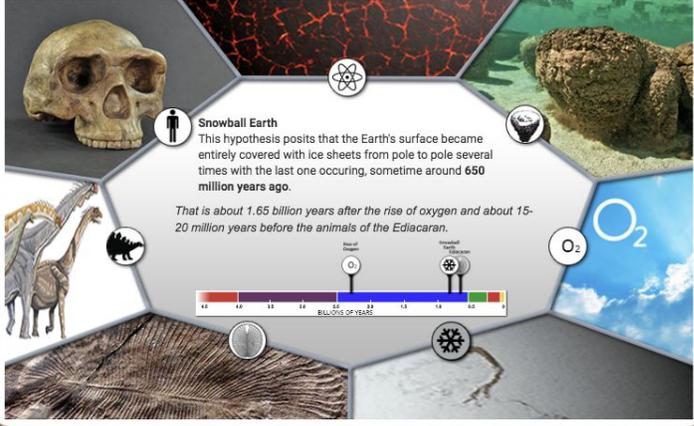
360.0 N, 270.0 W, -11.4 TR, 180 S

Local weather & time

Satellite Map View

NEXT →

DEEP TIME



Snowball Earth
 This hypothesis posits that the Earth's surface became entirely covered with ice sheets from pole to pole several times with the last one occurring, sometime around **650 million years ago**.

That is about 1.65 billion years after the rise of oxygen and about 15-20 million years before the animals of the Ediacaran.

O₂

4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0

BILLIONS OF YEARS

Local weather & time

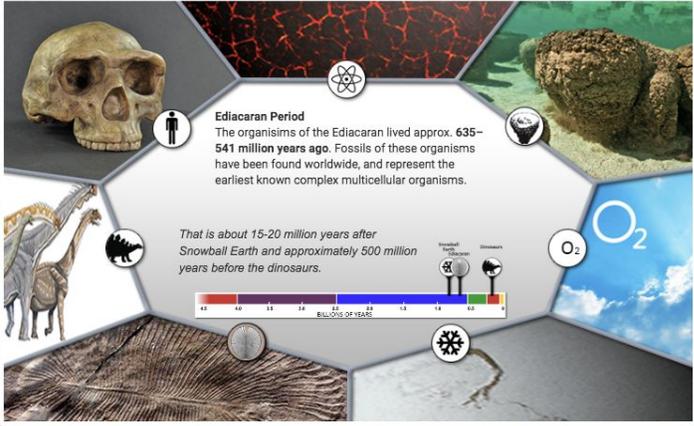
Satellite Map View

360.0 N
 315 E
 270 W
 225 S
 180

11.4 TR
 136

NEXT →

DEEP TIME



Ediacaran Period
 The organisms of the Ediacaran lived approx. **635-541 million years ago**. Fossils of these organisms have been found worldwide, and represent the earliest known complex multicellular organisms.

That is about 15-20 million years after Snowball Earth and approximately 500 million years before the dinosaurs.

O₂

4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0

BILLIONS OF YEARS

Local weather & time

Satellite Map View

360.0 N
 315 E
 270 W
 225 S
 180

11.4 TR
 136

NEXT →

DEEP TIME

Dinosaurs

The dinosaurs diverged from their ancestors roughly 20 million years after the Permian-Triassic extinction event (250 mya) that wiped out an estimated 95% of all life on Earth. They lived approx 160 million years, from **230-66 million years ago** until the end of the Cretaceous Period when the Cretaceous-Paleogene or K-Pg extinction event led to their extinction.

That is roughly 500 million years after the first animals of the Ediacaran and 65 million years before humans.

4.6 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0

BILLIONS OF YEARS

O₂

NEXT →

360.0 N
315
270 W -11.4 E 90
225 S 135
180

Satellite Map View
Local weather & time

DEEP TIME

Humans

The earliest documented representative of the genus *Homo* is *Homo habilis*, which evolved around **2.8 million years ago**, and is arguably the earliest species for which there is positive evidence of the use of stone tools.

That is 65 million years after the dinosaurs and 4.6 billion years after the Earth was formed.

4.6 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0

BILLIONS OF YEARS

O₂

NEXT →

360.0 N
315
270 W -11.4 E 90
225 S 135
180

Satellite Map View
Local weather & time

DEEP TIME

The Rise of Oxygen
 This event was the biologically induced appearance of oxygen in Earth's atmosphere. Geological and chemical evidence suggest that this major environmental change happened around 2.3 billion years ago.

That is about 1.2 billion years after the evidence of the first stromatolites on Earth and 1.65 billion years before the Snowball Earth period.

4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0
 BILLIONS OF YEARS

FEEDBACK **CLOSE**

Make sure to view all seven events before continuing.

The lesson requires the student to view all seven events.

DEEP TIME

Based on the seven historical events you just examined, Drag the markers below to where they occur on the timeline.
 (NOTE: Not every box will have a marker. The first one has been done for you.)

Use the boxes as guides

Earth Forms

4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0
 BILLIONS OF YEARS

Dinosaurs Ediacaran Humans First life Rise of Oxygen Snowball Earth

SUBMIT →

The timeline assessment. Each event in the bottom must be dragged to its appropriate place along the timeline.

DEEP TIME
 Based on the seven historical events you just examined,
 Drag the markers below to where they occur on the timeline.
 (NOTE: Not every box will have a marker. The first one has been done for you.)

Use the boxes as guides

Earth Forms Rise of Oxygen First life Snowball Earth Ediacaran Dinosaurs Humans

4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0
 Earth Forms BILLIONS OF YEARS Now

That is Incorrect.

The events below are in the wrong location on the timeline. Please change them and try again.

The Great Oxygenation Event
The first forms of life on Earth.

FEEDBACK CLOSE

Incorrect feedback will indicate which specific events are misplaced.

DEEP TIME
 Based on the seven historical events you just examined,
 Drag the markers below to where they occur on the timeline.
 (NOTE: Not every box will have a marker. The first one has been done for you.)

Use the boxes as guides

Earth Forms First life Rise of Oxygen Snowball Earth Ediacaran Dinosaurs Humans

4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0
 Earth Forms BILLIONS OF YEARS Now

Correct!

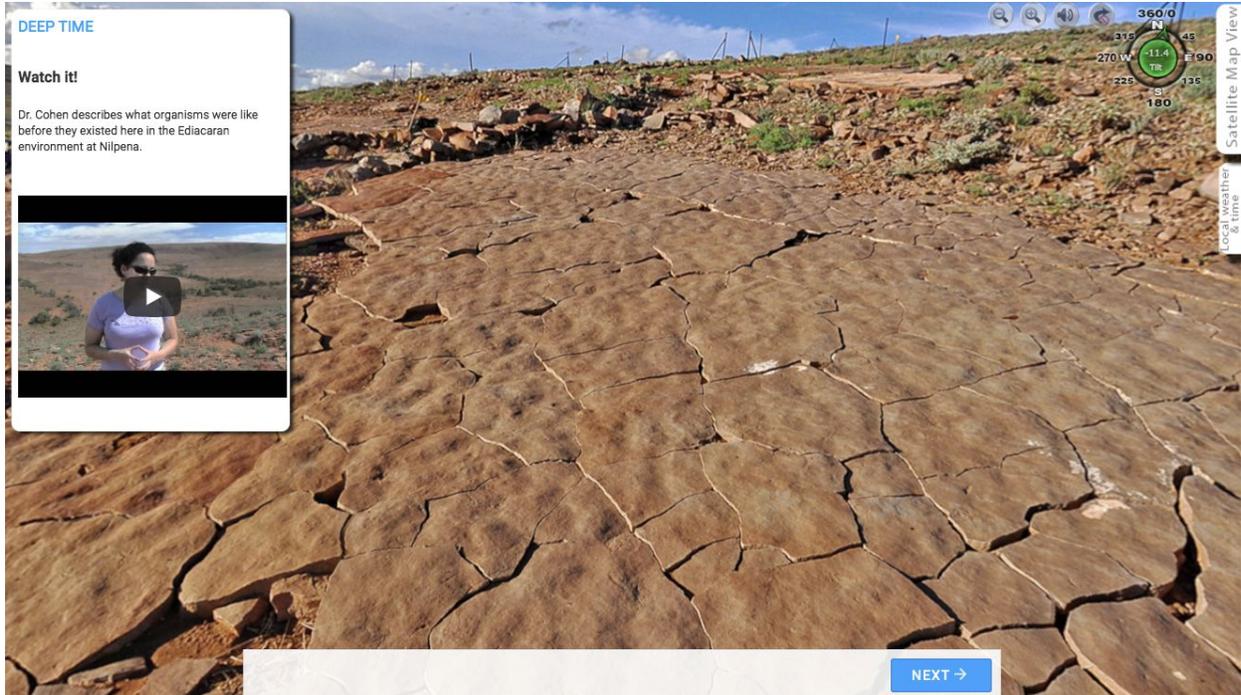
You have successfully placed all seven of the historical events where they occurred on the geologic timeline.

FEEDBACK NEXT

DEEP TIME

Watch it!

Dr. Cohen describes what organisms were like before they existed here in the Ediacaran environment at Nilpena.



360° N
315° 45'
270° W -11.4° E 90'
225° S 135'
180°

Local weather & time

Satellite Map View

NEXT →

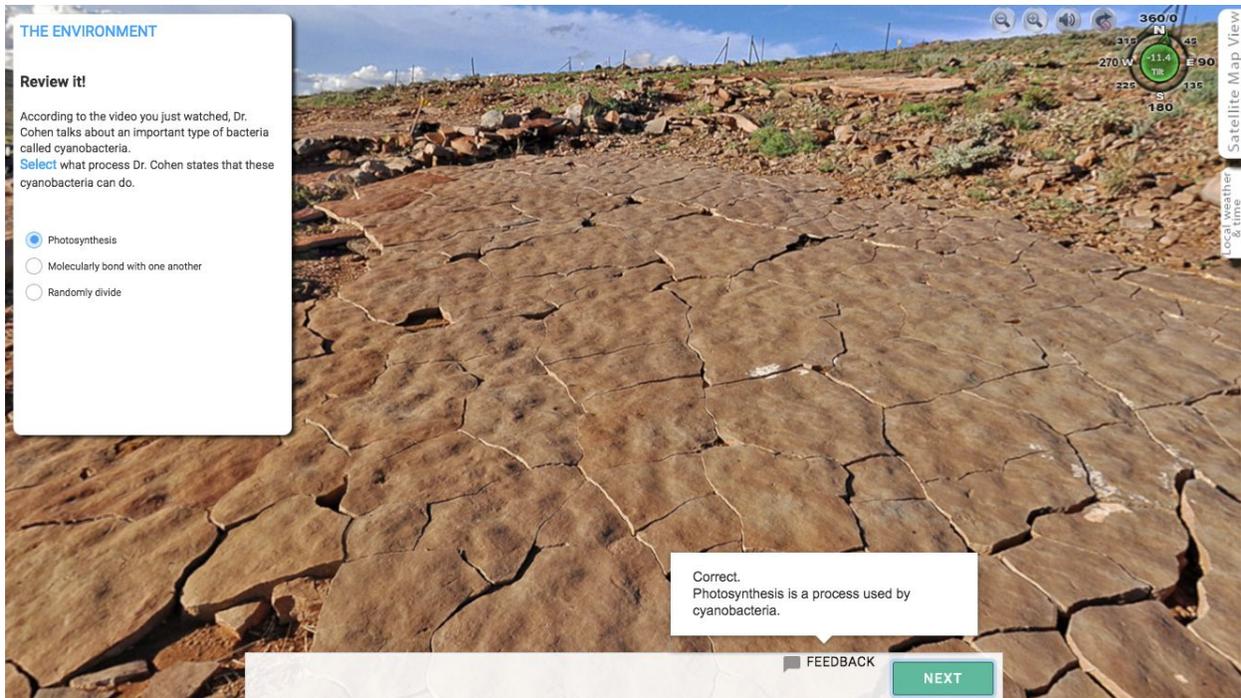
THE ENVIRONMENT

Review it!

According to the video you just watched, Dr. Cohen talks about an important type of bacteria called cyanobacteria.

Select what process Dr. Cohen states that these cyanobacteria can do.

- Photosynthesis
- Molecularly bond with one another
- Randomly divide



360° N
315° 45'
270° W -11.4° E 90'
225° S 135'
180°

Local weather & time

Satellite Map View

Correct.
Photosynthesis is a process used by cyanobacteria.

FEEDBACK

NEXT

Video explaining the importance of cyanobacteria and the accompanying recall question.



The lesson now offers a new navigation link to visit the Parv Bed Fossil Site.

THE ROCKS

Where to look.

In this section we are going to briefly examine the type of rock that has formed here in Nilpena which fossilized and preserved these organisms.

In the Virtual Field Trip environment you will notice that there is a "new link" available that will now allow you to move to an additional location - it looks like the image below.



Look around and find that new link, then [click](#) on it to explore the new location. The location is up on the ridge on the next hill. This new location is called the **Parv Bed Locality**. Take a moment to look at the rocks in that area before continuing.



THE ROCKS

How are the rocks layered here?

Look around in Virtual Field Trip until you notice a section of the **Parv Bed Locality** outcrop with rocks that look like they are stacked or layered.

Click on the button below to make sure you are looking at the correct area.

[LOOK HERE](#)



The student is now introduced to the second fossil bed.

Rock Types

THE ROCKS

How are the rocks layered here?

Which way do these rocks appear to be orientated?

- Horizontal like stacked pancakes
- Vertical like arranged columns



Correct!
The rock layers here are stacked horizontally.

FEEDBACK NEXT

It should be clear that these rocks are layered horizontally.

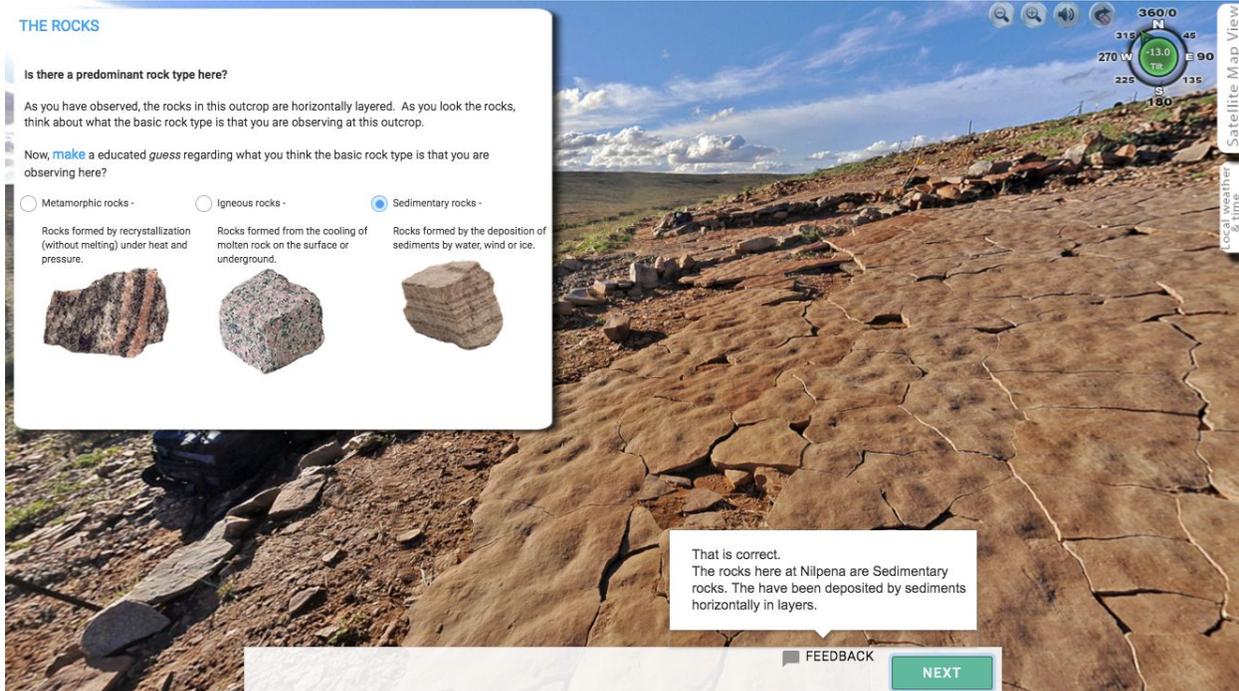
THE ROCKS

Is there a predominant rock type here?

As you have observed, the rocks in this outcrop are horizontally layered. As you look the rocks, think about what the basic rock type is that you are observing at this outcrop.

Now, **make** an educated **guess** regarding what you think the basic rock type is that you are observing here?

- Metamorphic rocks -
Rocks formed by recrystallization (without melting) under heat and pressure.
- Igneous rocks -
Rocks formed from the cooling of molten rock on the surface or underground.
- Sedimentary rocks -
Rocks formed by the deposition of sediments by water, wind or ice.



That is correct.
The rocks here at Nilpena are Sedimentary rocks. They have been deposited by sediments horizontally in layers.

FEEDBACK NEXT

This prominent layering makes it most likely that the exposed rocks are sedimentary.

THE ROCKS

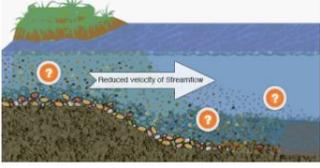
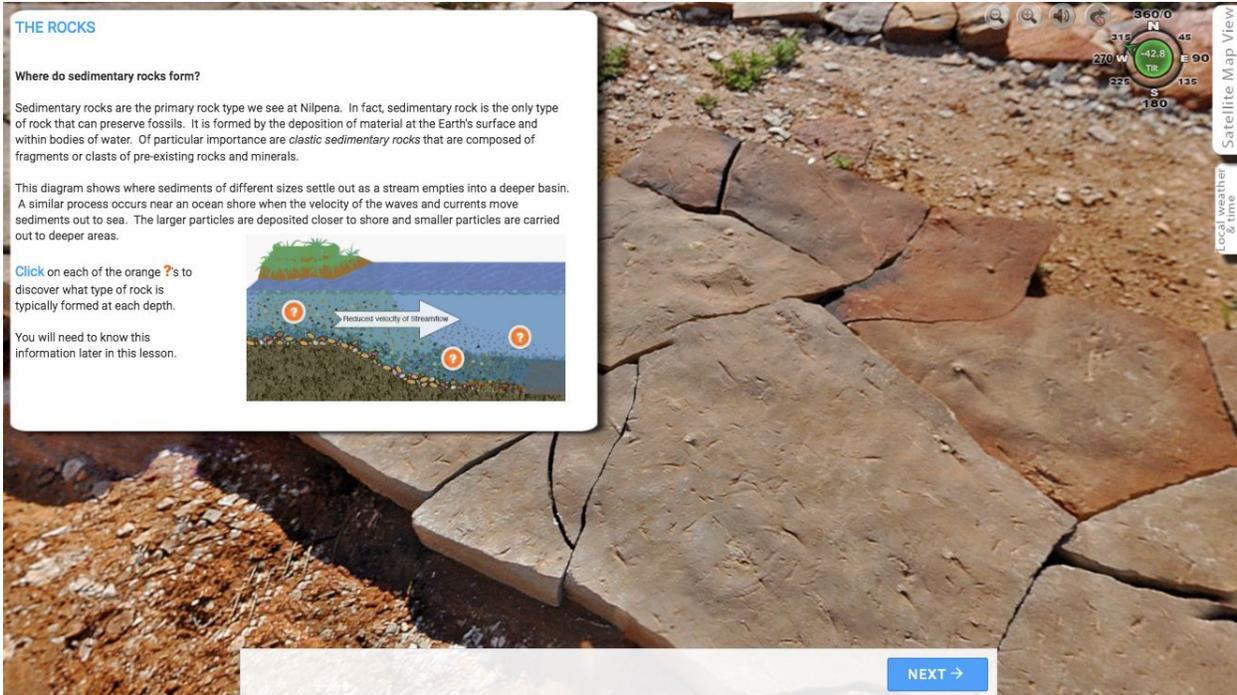
Where do sedimentary rocks form?

Sedimentary rocks are the primary rock type we see at Nilpena. In fact, sedimentary rock is the only type of rock that can preserve fossils. It is formed by the deposition of material at the Earth's surface and within bodies of water. Of particular importance are *clastic sedimentary rocks* that are composed of fragments or clasts of pre-existing rocks and minerals.

This diagram shows where sediments of different sizes settle out as a stream empties into a deeper basin. A similar process occurs near an ocean shore when the velocity of the waves and currents move sediments out to sea. The larger particles are deposited closer to shore and smaller particles are carried out to deeper areas.

Click on each of the orange ?'s to discover what type of rock is typically formed at each depth.

You will need to know this information later in this lesson.

Satellite Map View
Local weather & time

NEXT →

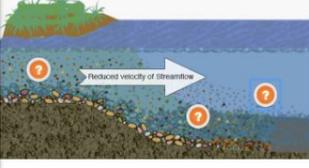
THE ROCKS



we see at Nilpena. In fact, sedimentary rock is the only type by the deposition of material at the Earth's surface and be are *clastic sedimentary rocks* that are composed of minerals.

ent sizes settle out as a stream empties into a deeper basin. when the velocity of the waves and currents move deposited closer to shore and smaller particles are carried

Shale is a clastic sedimentary rock composed of clay minerals and a small amount of silt - a mixture otherwise known as "mud". It is easily identified by its fine-grained texture (particles can't be seen without magnification) and characteristic of breaking into thin sheets.




Satellite Map View
Local weather & time

NEXT →

These two screens explains the basics of how sedimentary rocks form. The orange ? display popups of the different types of sedimentary rocks which form at different water depths. This concept is used in the assessment that follows.

THE ROCKS
 Drag each of the six items below to one of the three picture environments above them.
 Place each item in the location that you would most likely encounter where that item would be located or mostly likely would have formed.

Areas with the highest current or wave energy		Areas with moderate to high current or wave energy		Areas away from shore in deep or quiet water areas	
			Particles too small to be seen with the human eye	Very large rounded particles or clasts	Smaller particles that can be seen with the human eye
Sandstone	Shale	Conglomerate			

SUBMIT →

This drag and drop assessment asks the student to match each depositional environment with a description of the particle size in that environment and the resulting sedimentary rock.

THE ROCKS
 Drag each of the six items below to one of the three picture environments above them.
 Place each item in the location that you would most likely encounter where that item would be located or mostly likely would have formed.

Areas with the highest current or wave energy		Areas with moderate to high current or wave energy		Areas away from shore in deep or quiet water areas	
Very large rounded particles or clasts 		Smaller particles that can be seen with the human eye 		Particles too small to be seen with the human eye 	
Conglomerate	Shale	Shale	Sandstone	Sandstone	Conglomerate

That is incorrect.

Please try again by dragging each item to the image where it would most likely be encountered.

Here are some hints:

Typically sandstone would not be found in areas with high wave activity or in very deep water.

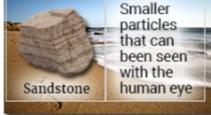
Typically shale would be more likely to form in water with little or no wave energy.

FEEDBACK **CLOSE**

Incorrect feedback is provided in response to the student's choices.

THE ROCKS

Drag each of the six items below to one of the three picture environments above them. Place each item in the location that you would most likely encounter where that item would be located or mostly likely would have formed.

Areas with the highest current or wave energy	Areas with moderate to high current or wave energy	Areas away from shore in deep or quiet water areas
<p>Very large rounded particles or clasts</p>  <p>Conglomerate</p>	<p>Smaller particles that can be seen with the human eye</p>  <p>Sandstone</p>	<p>Particles too small to be seen with the human eye</p>  <p>Shale</p>

Correct!
You have successfully matched each item with the environment it would most likely be located.

FEEDBACK NEXT

Nilpena Rock Formation and Preservation

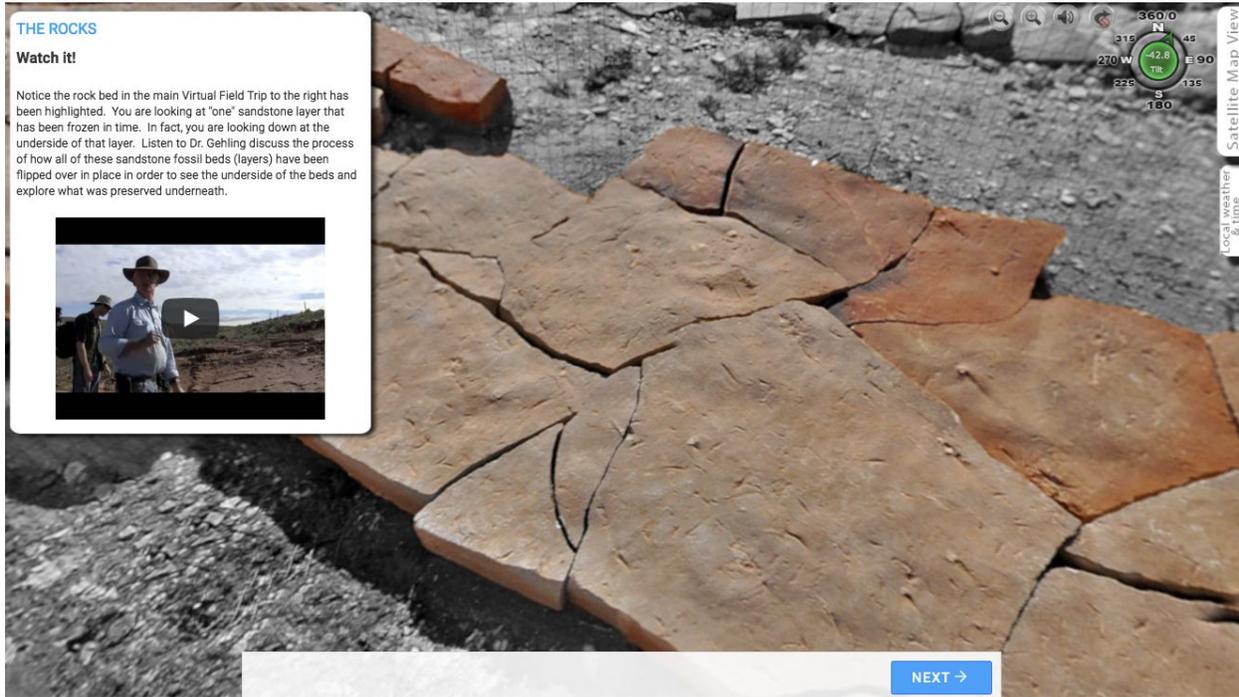
THE ROCKS

Watch it!

Notice the rock bed in the main Virtual Field Trip to the right has been highlighted. You are looking at 'one' sandstone layer that has been frozen in time. In fact, you are looking down at the underside of that layer. Listen to Dr. Gehling discuss the process of how all of these sandstone fossil beds (layers) have been flipped over in place in order to see the underside of the beds and explore what was preserved underneath.



NEXT →



THE ENVIRONMENT

Review it!

According to the video you just watched on the fossil beds, Dr. Gehling talks about the process of what they do to examine the underside of the fossil beds.

Select what process he states was the best solution.

- Leave the beds as they are, then lift and look underneath
- Trace the top on transparent paper then flip them
- Simply flip the beds in place because it produces the least amount of damage

Correct.
Dr. Gehling found that by tracing on top of the bed, then flipping it and re-erecting it was the best solution.

FEEDBACK

NEXT



THE ROCKS

What are ripple marks?

One of the first noticeable characteristics of these beds are wavy ripples in the sandstone.

Ripples are sedimentary structures that form from the motion of particles (grains) in water or wind.

Under the right conditions, ripples can become preserved in the rock record and are called *ripple marks*.

General ripple formation for wind or water:



Watch it!

Dr. Gehling describes how and why ripple marks are formed.



NEXT →

THE ENVIRONMENT

Review it!

According to the video you just watched on ripple marks, Dr. Gehling states that when ripple marks are very tight and close together, that tends to suggest what type of water?

Select from the choices below.

- Fresh water
- Shallow water
- Deep water

Correct.
Ripple marks that are tight and close together suggest shallow water.

FEEDBACK

NEXT

THE ROCKS

Watch it!

Dr. Gehling describes how the sandstone beds here at Nilpena were formed by tropical storm events that stirred up sediment and then covered the seafloor burying the organisms that were living on the bottom.



Credit: Artwork by Peter Trusler

NEXT →

THE ENVIRONMENT

Review it!

According to the video you just watched on how sandstone beds were formed, Dr. Gehling explains the red color of the surface.

Select why the surface of the sandstone has this red layer?

- The hot Australian sun has colored the desert rocks.
- Shallow water in this region produces red sandstone.
- Due to the mineral crust of the dead organisms.

Correct.
Dr. Gehling states that due to the mineral crust of the dead organisms and the other organic material caused the red color in the rocks.

FEEDBACK

NEXT

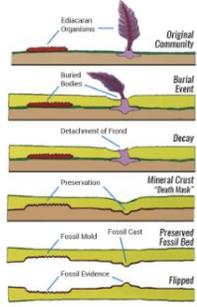
THE ROCKS

What is the process of fossilization?

After a major tropical storm event, organisms are buried under significant amounts of sand. Some parts of the organisms are detached, folded, and some are simply buried.

After the burial, a mineral crust (or death mask) formed on the decomposing bodies of the animal. This helps to preserve the imprints of their soft bodies in the sand.

Listen to Dr. Gehling describe evidence of this process.



NEXT →

THE ENVIRONMENT

Review it!

According to the video you just watched on how fossilization, Dr. Gehling points to round circular molds on the seafloor.

Select what Dr. Gehling suggests they round objects were?

- An organism that had other organisms living under it.
- Evidence of trace fossils.
- A rooted part of a larger organism.

Correct.
Dr. Gehling states that the circular rooted fossil is part of a larger organism that became separated.

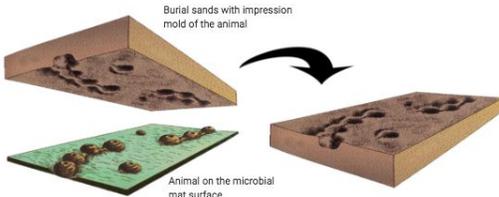
FEEDBACK

NEXT

THE ROCKS

How does the bottom become the top?

The illustration below shows the concept of how imprints of organisms are made in sandstone. After the sandstone beds are turned over, they reveal molds of what the organisms looked like at the time of the tropical storm event. Ediacaran fossils are mainly found on the bases of rippled sandstone beds. After a significant amount of time and erosion, beds of sandstone become more accessible for scientists to discover and explore.



THE ROCKS

Watch it!

Dr. Gehling describes what a mold of the seafloor is and what we are looking at when we look at the fossil beds.



The screenshot displays a 3D model of a rock formation with a quiz overlay on the left. The quiz is titled "THE ENVIRONMENT" and "Review it!". It asks the user to select what Dr. Gehling suggests is evident and can be seen in the sandstone mold. The options are:

- Only the evidence of the living material on the seafloor.
- Only evidence of the sand ripples on the seafloor.
- Both the evidence of the living material and the ripples on the seafloor.

A feedback box on the right says "Correct. Both the evidence of the living material and the ripple marks can be seen in the sandstone mold." At the bottom right, there are buttons for "FEEDBACK" and "NEXT". The background image shows a close-up of a rock face with distinct ripple marks and fossilized structures.

360.0 N
315 W 42.8 TR E 90
225 S 135
Satellite Map View
Local weather & time

A series of videos explaining features of the rocks, their formation, and preservation. Each video is accompanied by a multiple choice question.

THE ROCKS

The order of fossil preservation.

Put the events at the right in the correct order based on which event took place first.

Order the elements from Bottom to Top with Bottom being the oldest and Top being the most recent.

Drag the events up or down to place them in a new location.

When all the events are in the correct position, **click** "Submit".

MOST RECENT EVENT
(THE LAST EVENT THAT OCCURED)

- Decomposition of organisms
- Original community of organisms
- Mineral Crust Death Mask
- Time and pressure harden sediments
- Burial of organisms
- Tropical storm event
- Discovery of fossils
- Erosion of sandstone

OLDEST EVENT
(THE FIRST EVENT THAT OCCURED)

SUBMIT →

THE ROCKS

The order of fossil preservation.

Put the events at the right in the correct order based on which event took place first.

Order the elements from Bottom to Top with Bottom being the oldest and Top being the most recent.

Drag the events up or down to place them in a new location.

When all the events are in the correct position, **click** "Submit".

MOST RECENT EVENT
(THE LAST EVENT THAT OCCURED)

- Discovery of fossils
- Erosion of sandstone
- Time and pressure harden sediments
- Mineral Crust Death Mask
- Decomposition of organisms
- Burial of organisms
- Tropical storm event
- Original community of organisms

OLDEST EVENT
(THE FIRST EVENT THAT OCCURED)

FEEDBACK

NEXT

Correct!
You have arranged the events in the correct. This is the order of fossil preservation that is seen here at Nilpena.

This assessment checks for understanding of the preceding videos explaining the formation and exposure of the Nilpena fossils. As always, feedback is provided adaptively in response to the student's input. The correct answer is shown here.

Fossil Identification Activity (Dichotomous Key)

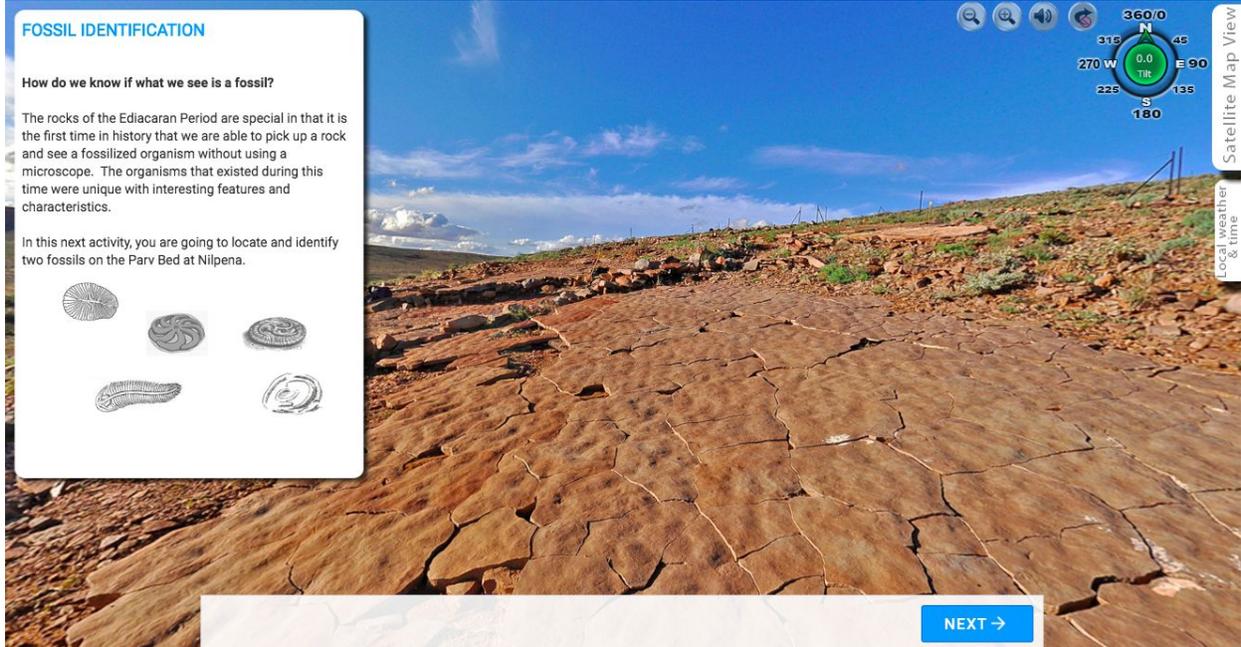
In this section of the lesson, the student discovers and identifies three types of fossils from within the Nilpena fossil beds on their own using a dichotomous key. Students can also learn the characteristics of several other fossil organisms through markers placed on the fossil beds.

FOSSIL IDENTIFICATION

How do we know if what we see is a fossil?

The rocks of the Ediacaran Period are special in that it is the first time in history that we are able to pick up a rock and see a fossilized organism without using a microscope. The organisms that existed during this time were unique with interesting features and characteristics.

In this next activity, you are going to locate and identify two fossils on the Parv Bed at Nilpena.



Navigation: NEXT →

Map: 360.0 N, 270 W, 0.0 TR, 180 S, 45 E, 90

Local weather & time

Satellite Map View

FOSSIL IDENTIFICATION KEY

How do you use a dichotomous key?

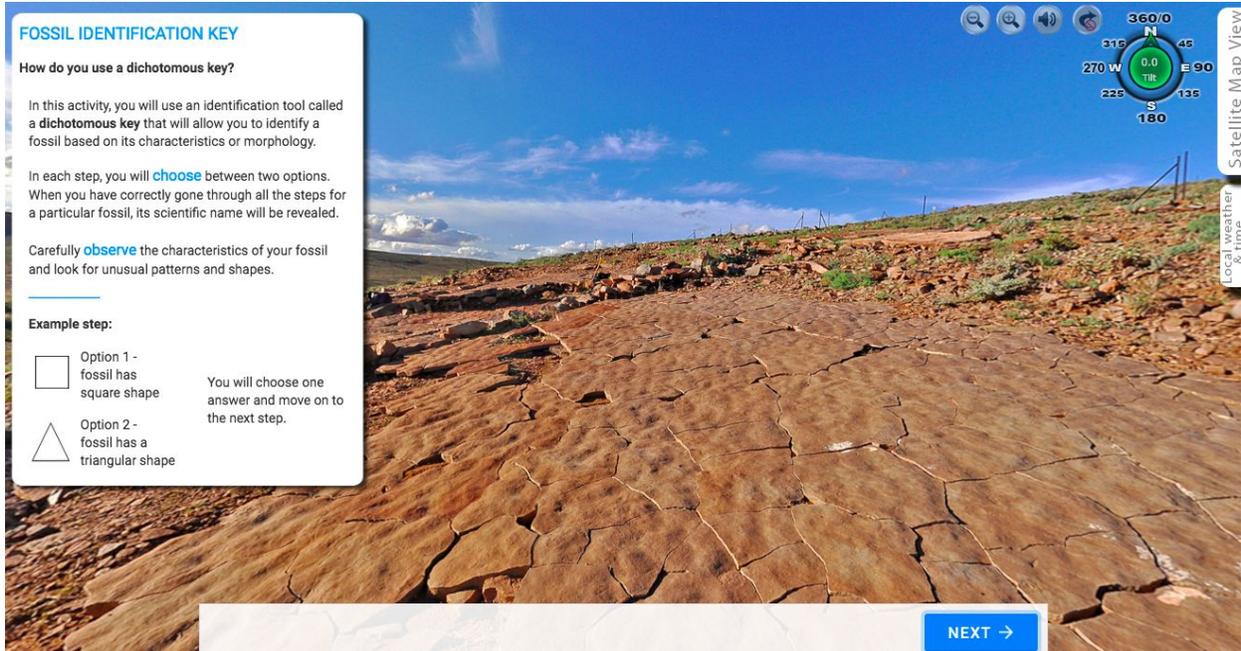
In this activity, you will use an identification tool called a **dichotomous key** that will allow you to identify a fossil based on its characteristics or morphology.

In each step, you will **choose** between two options. When you have correctly gone through all the steps for a particular fossil, its scientific name will be revealed.

Carefully **observe** the characteristics of your fossil and look for unusual patterns and shapes.

Example step:

<input type="checkbox"/>	Option 1 - fossil has square shape	You will choose one answer and move on to the next step.
<input type="checkbox"/>	Option 2 - fossil has a triangular shape	

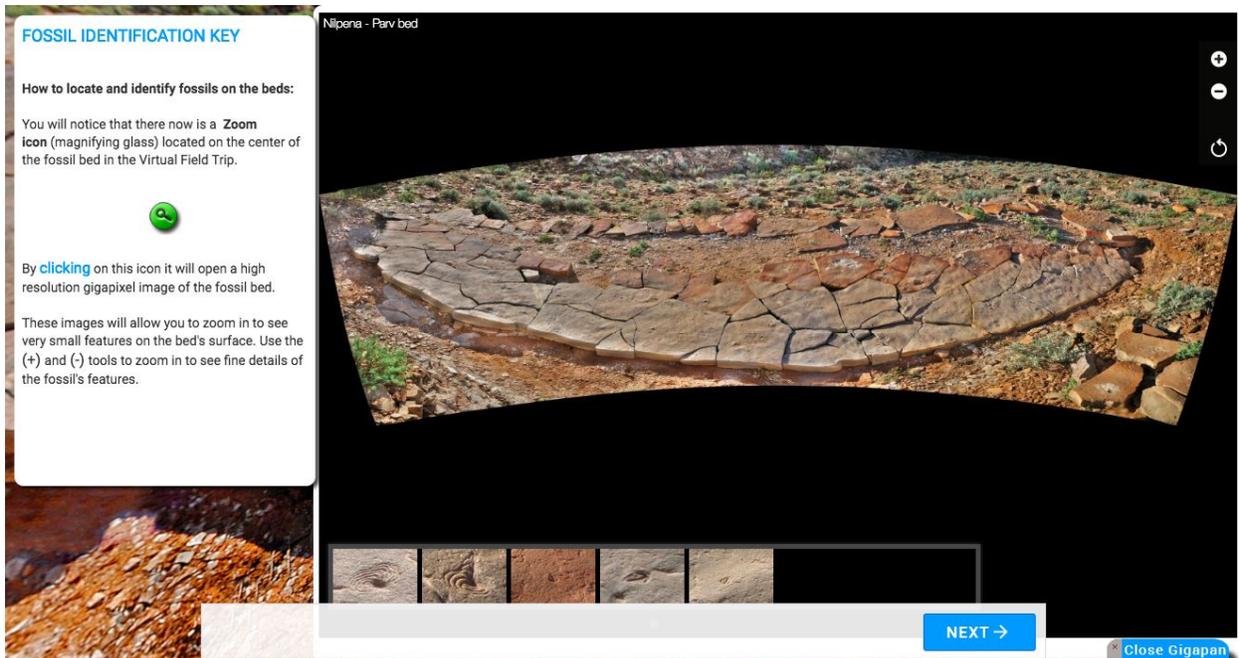


Navigation: NEXT →

Map: 360.0 N, 270 W, 0.0 TR, 180 S, 45 E, 90

Local weather & time

Satellite Map View



The first activity uses gigapixel imagery, accessed via the magnifying glass icon. Students can explore these on their own, but the locations of important fossils can also be reached directly via thumbnails at the bottom of the Gigapan.

FOSSIL IDENTIFICATION KEY

How to locate and identify fossils on the beds:

You will notice that there now is a **Zoom icon** (magnifying glass) located on the center of the fossil bed in the Virtual Field Trip.



By **clicking** on this icon it will open a high resolution gigapixel image of the fossil bed.

These images will allow you to zoom in to see very small features on the bed's surface. Use the (+) and (-) tools to zoom in to see fine details of the fossil's features.









NEXT →

[Close Gigapan](#)

FOSSIL IDENTIFICATION KEY

How to locate and identify specific fossils.

After you click on the **Zoom icon** and the high resolution gigapixel image opens, you will see a set of **interactive snapshots** along the bottom of the window.

The two unique fossils that you need to identify with the "Fossil Identification Key" can be found in these snapshots. **Click** on the snapshots to observe the fossils on the Nilpena fossil beds.

THESE ARE THE FOSSILS YOU NEED TO IDENTIFY.

Observe these fossils and identify what their scientific names are by using the Fossil ID Key.

When you are ready to begin, **locate** the snapshots and then **click** on "ID Key" to open the "Fossil Identification Key" to start the identification process.









ID KEY →

[Close Gigapan](#)

FOSSIL IDENTIFICATION KEY

General Fossil Shape:

Option 1 - Fossil is irregular and looks like patches of wrinkles, grooves or bubbles on the bed surface



Option 2 - Fossil is circular, oval, tubular or some other distinct shape on the bed surface



Parv bed



[NEXT →](#) [Close Gigapan](#)

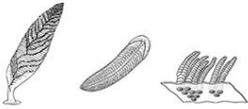
FOSSIL IDENTIFICATION KEY

Circular vs Tubular:

Option 1 - Fossil is circular, oval or anchor-shaped



Option 2 - Fossil is tubular or feather-shaped



Parv bed



[NEXT →](#) [Close Gigapan](#)

FOSSIL IDENTIFICATION KEY

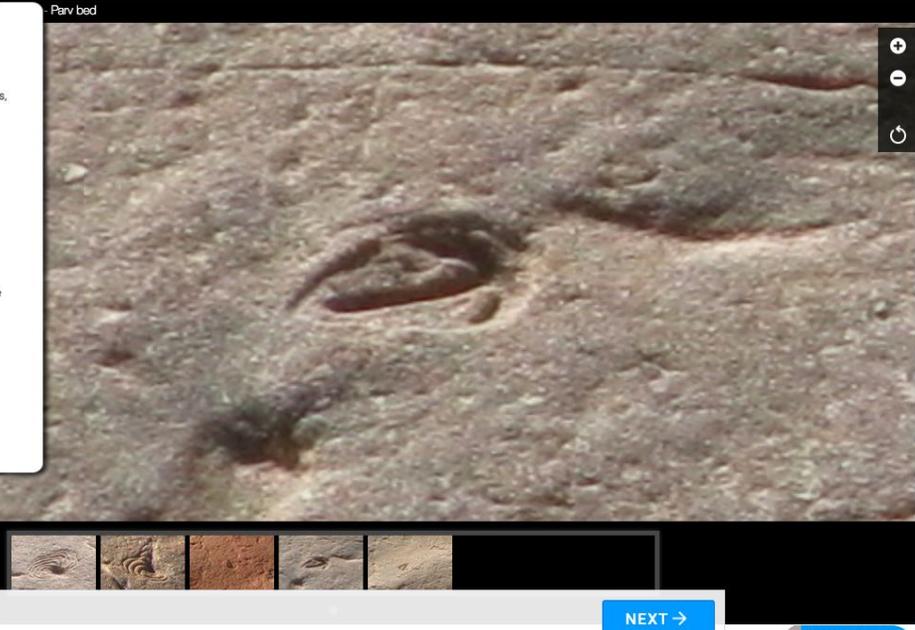
Circular to Oval vs Anchor-shaped:

Option 1 - Circular to oval in shape with circular ridges, arms or segments in the center or at the edge



Option 2 - Anchor-shaped with an arched ridge on the head connected to a ridge down the middle





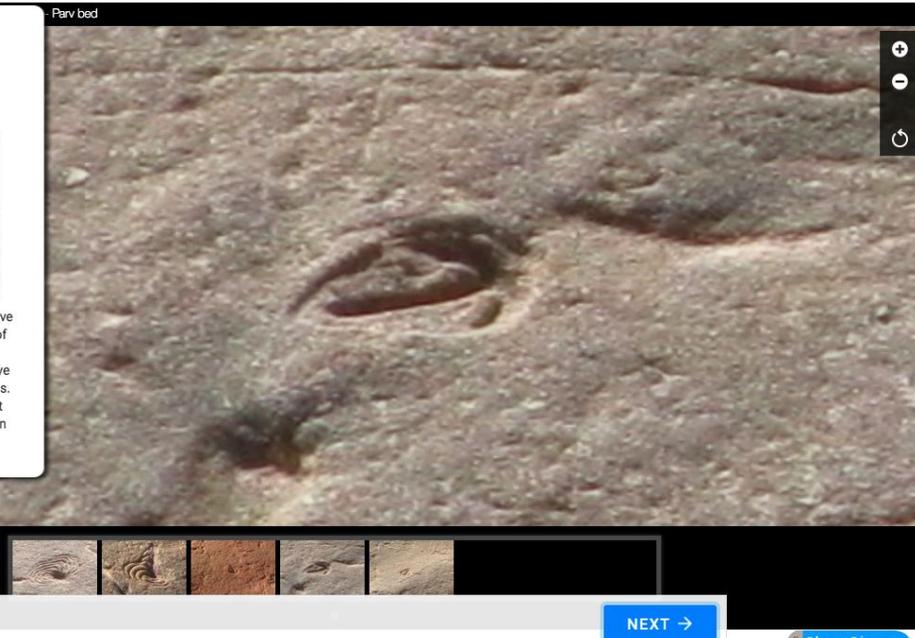
FOSSIL IDENTIFICATION KEY

Parvancorina

Its name comes from Latin *parva* *ancora* or 'small anchor'.




Parvancorina lived on the seafloor and may have been a very early arthropod – the large group of animals that includes insects, spiders and crustaceans. Impressions of this organism have a distinctive shield-like shape with raised ridges. However, its lack of limbs and antennae, make it difficult to determine its relationship to modern groups. Scale bar = 1 cm.

This pathway leads to the identification of *Parvancorina*.

FOSSIL IDENTIFICATION KEY

Have you identified the two fossils?

If you have identified **both** fossils, then select the "Check Fossils" button below in order to check to see if your identification of the organisms are correct.

If you still need to identify another fossil or would like to explore the Fossil ID Key again, select the "Reopen ID Key" button.

CHECK FOSSILS **REOPEN ID KEY**

FOSSIL IDENTIFICATION KEY

General Fossil Shape:

Option 1 - Fossil is irregular and looks like patches of wrinkles, grooves or bubbles on the bed surface



Option 2 - Fossil is circular, oval, tubular or some other distinct shape on the bed surface



NEXT →

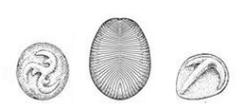
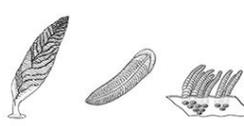
Close Gigapan

Parv bed

FOSSIL IDENTIFICATION KEY

Circular vs Tubular:

- Option 1 - Fossil is circular, oval or anchor-shaped
- Option 2 - Fossil is tubular or feather-shaped



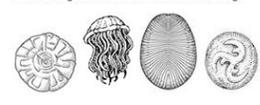
[NEXT →](#) [Close Gigapan](#)

Parv bed

FOSSIL IDENTIFICATION KEY

Circular to Oval vs Anchor-shaped:

- Option 1 - Circular to oval in shape with circular ridges, arms or segments in the center or at the edge
- Option 2 - Anchor-shaped with an arched ridge on the head connected to a ridge down the middle






[NEXT →](#) [Close Gigapan](#)

FOSSIL IDENTIFICATION KEY

Circular, oval vs Anchor-shaped:

- Option 1 - Circular to oval in shape with circular ridges or segments in the center



- Option 2 - Circular to oval in shape with arms in the center or arms around edge



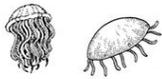
NEXT →

Close Gigapan

FOSSIL IDENTIFICATION KEY

Arms in center or at edge:

- Option 1 - Circular to oval in shape with a fringe of arms around the edge of body



- Option 2 - Circular to oval in shape with from three to eight spiral arms in the center of body



NEXT →

Close Gigapan

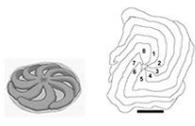
FOSSIL IDENTIFICATION KEY

Three to Eight Spiral Arms:

Option 1 - Circular to oval in shape with three spiral arms in the center of body



Option 2 - Circular to oval in shape with eight spiral arms in the center of body





Parv bed

Close Gigapan

NEXT →

FOSSIL IDENTIFICATION KEY

Eoandromeda 



Eoandromeda is a oval to circular fossil around 1 to 4 cm in diameter with eight "arms", with closed ends, that spiral either clockwise or counterclockwise. It is a puzzling fossil and scientists don't know if it is actually an animal or a type of algae.




Parv bed

Close Gigapan

NEXT →

This pathway leads to the identification of *Eoandromeda*.

FOSSIL IDENTIFICATION KEY

Have you identified the two fossils?

If you have identified **both** fossils, then select the "Check Fossils" button below in order to check to see if your identification of the organisms are correct.

If you still need to identify another fossil or would like to explore the Fossil ID Key again, select the "Reopen ID Key" button.

CHECK FOSSILS **REOPEN ID KEY**

FOSSIL IDENTIFICATION KEY

Identify the names of the two fossils?

Select the names of the two unique fossils that you identified from the snapshots located on the Parv Bed, and then click "Submit Answer". If you need to reidentify a fossil, click "Open ID Key".

Dickinsonia Aspidella
 Medusoid (Jellyfish) Tribrachidium
 Eoandromeda *Parvancorina*
 Spriggina Chamiodiscus Funisia
 "Pucker" - Textured Organic Surface
 "Elephant Skin" - Textured Organic Surface
 "Groove" - Textured Organic Surface

SUBMIT ANSWER **REOPEN ID KEY**

That is correct!
You have identified the two fossils:
Eoandromeda and *Parvancorina*.

FEEDBACK **NEXT**

If the student has used the dichotomous key correctly, they can simply check off the two types of fossils found in the Parv Bed.

FOSSIL IDENTIFICATION KEY

Fossils on the Parv Bed

Congratulations, you have identified two of the fossils on the Parv Bed.

A new set of icons have now been revealed to you on the Parv Fossil bed in the Virtual Field Trip.



These icons will give you additional information about the fossils including size comparisons, extra imagery, and some 3D object models.

Click on the icons and investigate each of the fossils. You will need to know that information in order to complete upcoming activities.



Parv bed

Close Gigapan

NEXT →

FOSSIL IDENTIFICATION KEY

Locate and identify a specific fossil on Bed T3.

In addition to the new icons that reveal fossil data, there is an additional link back to the "Main Fossil Bed" quarry.

At the Main Fossil Bed Quarry location you will notice a **Zoom icon** (magnifying glass) located on the center of that fossil bed also.

Similar to how you located fossils on the Parv Bed, you now will identify a fossil on **Bed T3**.

Open the Zoom Tool on Bed T3 and locate the new set of snapshots.

IDENTIFY THE FOSSIL IN THE SNAPSHOTS ON BED T3 IN THE SAME WAY YOU DID PREVIOUSLY.

Observe the fossil and identify its scientific name by using the Fossil ID key.

Click "ID Key" when you are ready to begin.



Parv bed

Close Gigapan

ID KEY →

FOSSIL IDENTIFICATION KEY

Locate and identify a specific fossil on Bed T3.

In addition to the new icons that reveal fossil data, there is an additional link back to the "Main Fossil Bed" quarry.

At the Main Fossil Bed Quarry location you will notice a **Zoom icon** (magnifying glass) located on the center of that fossil bed also.

Similar to how you located fossils on the Parv Bed, you now will identify a fossil on **Bed T3**.

Open the Zoom Tool on Bed T3 and locate the new set of snapshots.

IDENTIFY THE FOSSIL IN THE SNAPSHOTS ON BED T3 IN THE SAME WAY YOU DID PREVIOUSLY.

Observe the fossil and identify its scientific name by using the Fossil ID key.

[Click "ID Key"](#) when you are ready to begin.

To T3 Fossil Bed

360/0
N 45
270 W -20.0 TR E 90
225 S 135
180

Make sure you jump over to the Main Fossil Bed (T3) in order to identify the fossil.

Satellite Map View
Local weather & time

FEEDBACK CLOSE

The next step in the lesson requires the student to navigate to a new fossil bed—T3. Incorrect feedback will trigger if they are viewing a different bed.

FOSSIL IDENTIFICATION KEY

Locate and identify a specific fossil on Bed T3.

In addition to the new icons that reveal fossil data, there is an additional link back to the "Main Fossil Bed" quarry.

At the Main Fossil Bed Quarry location you will notice a **Zoom icon** (magnifying glass) located on the center of that fossil bed also.

Similar to how you located fossils on the Parv Bed, you now will identify a fossil on **Bed T3**.

Open the Zoom Tool on Bed T3 and locate the new set of snapshots.

IDENTIFY THE FOSSIL IN THE SNAPSHOTS ON BED T3 IN THE SAME WAY YOU DID PREVIOUSLY.

Observe the fossil and identify its scientific name by using the Fossil ID key.

[Click "ID Key"](#) when you are ready to begin.

Gigapan - Detailed T3 Bed View

360/0
N 45
270 W -9.0 TR E 90
225 S 135
180

Satellite Map View
Local weather & time

ID KEY →

FOSSIL IDENTIFICATION KEY

Locate and identify a specific fossil on Bed T3.

In addition to the new icons that reveal fossil data, there is an additional link back to the "Main Fossil Bed" quarry.

At the Main Fossil Bed Quarry location you will notice a **Zoom icon** (magnifying glass) located on the center of that fossil bed also.

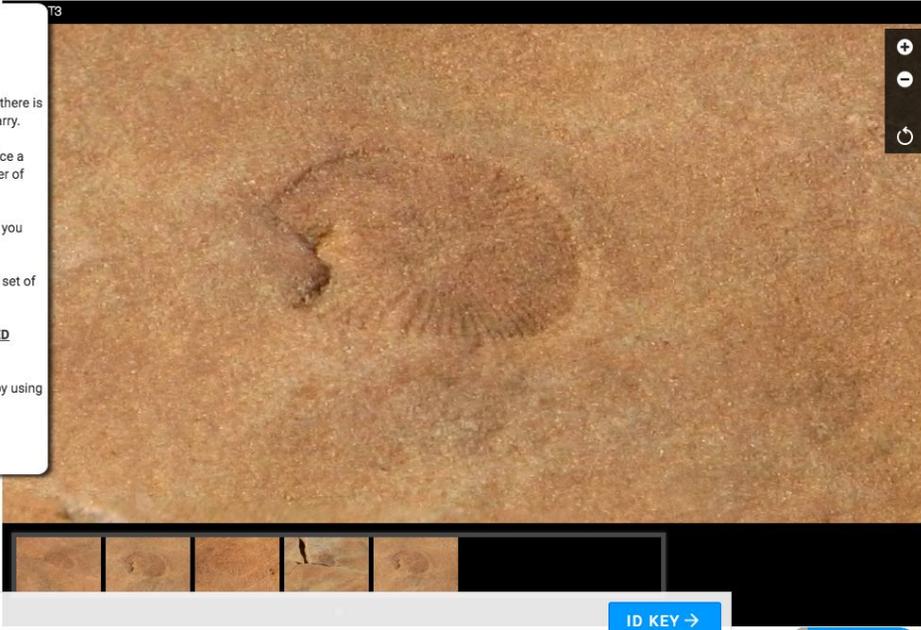
Similar to how you located fossils on the Parv Bed, you now will identify a fossil on **Bed T3**.

Open the Zoom Tool on Bed T3 and locate the new set of snapshots.

IDENTIFY THE FOSSIL IN THE SNAPSHOTS ON BED T3 IN THE SAME WAY YOU DID PREVIOUSLY.

Observe the fossil and identify its scientific name by using the Fossil ID key.

Click "ID Key" when you are ready to begin.



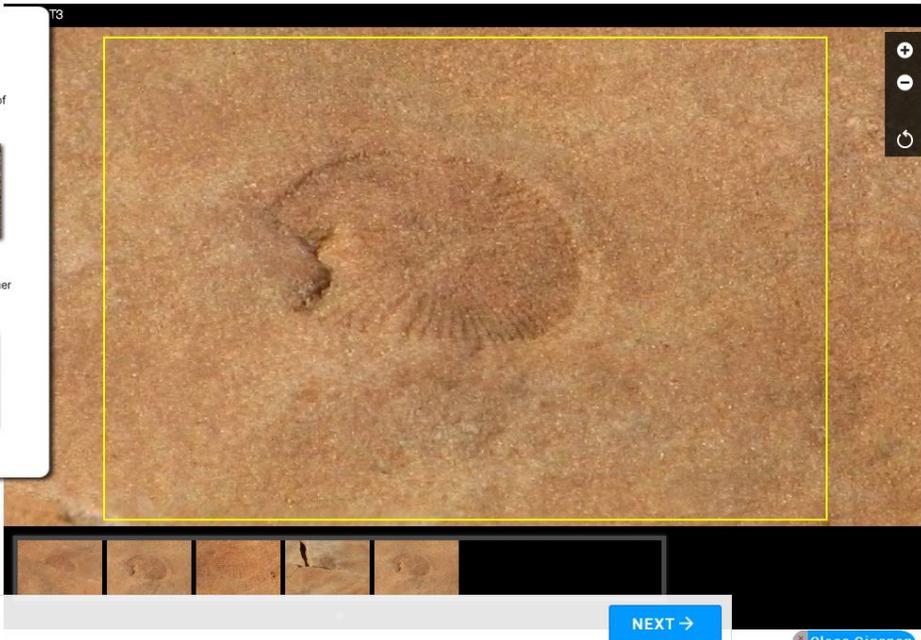
FOSSIL IDENTIFICATION KEY

General Fossil Shape:

Option 1 - Fossil is irregular and looks like patches of wrinkles, grooves or bubbles on the bed surface



Option 2 - Fossil is circular, oval, tubular or some other distinct shape on the bed surface



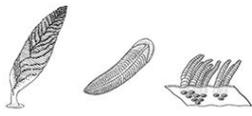
FOSSIL IDENTIFICATION KEY

Circular vs Tubular:

Option 1 - Fossil is circular, oval or anchor-shaped



Option 2 - Fossil is tubular or feather-shaped




[NEXT →](#) [Close Gigapan](#)

FOSSIL IDENTIFICATION KEY

Circular to Oval vs Anchor-shaped:

Option 1 - Circular to oval in shape with circular ridges, arms or segments in the center or at the edge



Option 2 - Anchor-shaped with an arched ridge on the head connected to a ridge down the middle




[NEXT →](#) [Close Gigapan](#)

FOSSIL IDENTIFICATION KEY

Circular, oval vs Anchor-shaped:

- Option 1 - Circular to oval in shape with circular ridges or segments in the center



- Option 2 - Circular to oval in shape with arms in the center or arms around edge

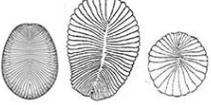



[NEXT →](#) [Close Gigapan](#)

FOSSIL IDENTIFICATION KEY

Circular, oval vs Anchor-shaped:

- Option 1 - Circular to oval in shape with segments in the center



- Option 2 - Circular to oval in shape with concentric ridges and/or radiating lobes in the center




[NEXT →](#) [Close Gigapan](#)

FOSSIL IDENTIFICATION KEY

Dickinsonia 



Dickinsonia is oval in shape and flat with segments or ribs down its body. It lacks a mouth, eyes and limbs. It ranges in size from a few centimeters to almost a meter in length. It is one of the best known Ediacaran fossils and is found at several sites around the world. Scale bar = 1 cm.



NEXT → Close Gigapan

This pathway leads to the identification of *Dickinsonia*.

FOSSIL IDENTIFICATION

Have you identified the fossil?

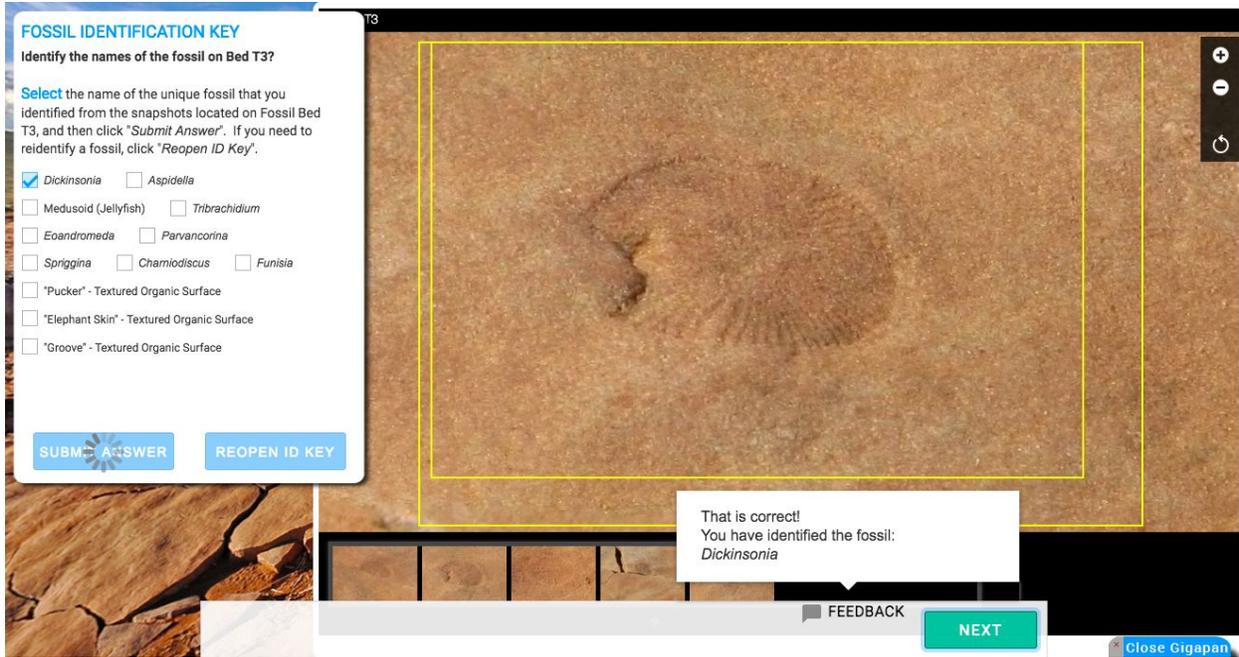
If you have identified the fossil located on Fossil Bed T3, then select the "Check Fossil" button below in order to check to see if your identification of the organism is correct.

If you still need to identify the fossil or would like to explore the Fossil ID Key again, select the "Reopen ID Key" button.

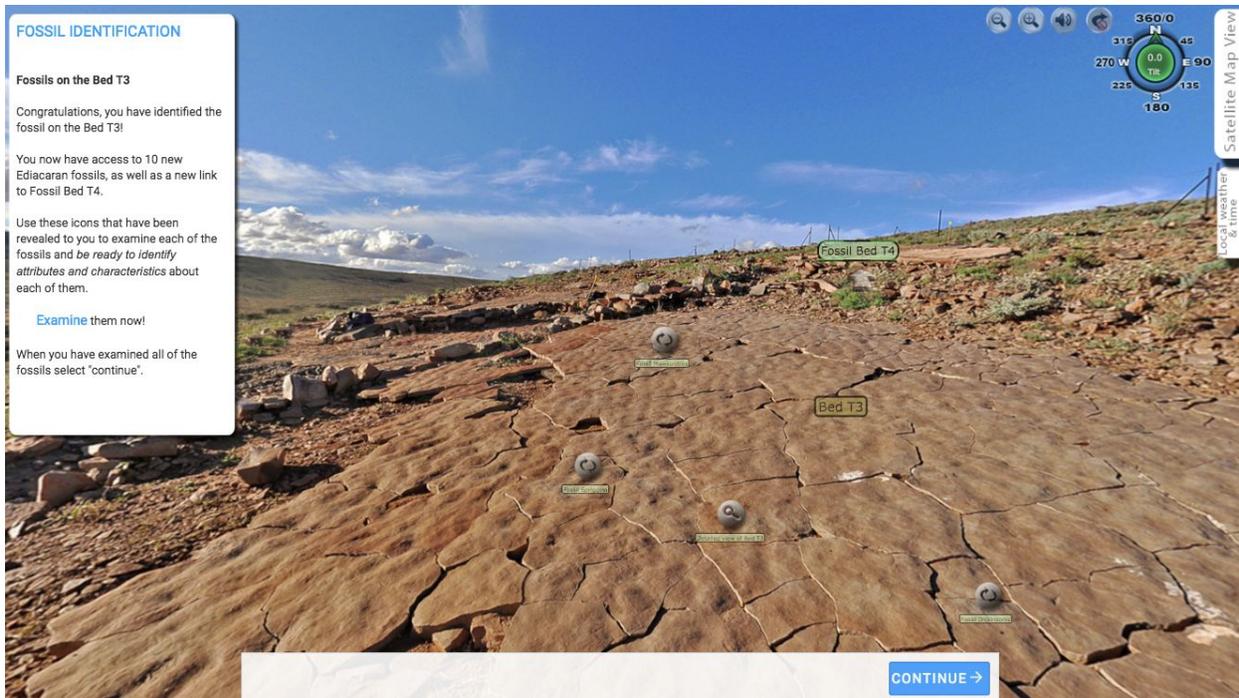
CHECK FOSSIL **REOPEN ID KEY**



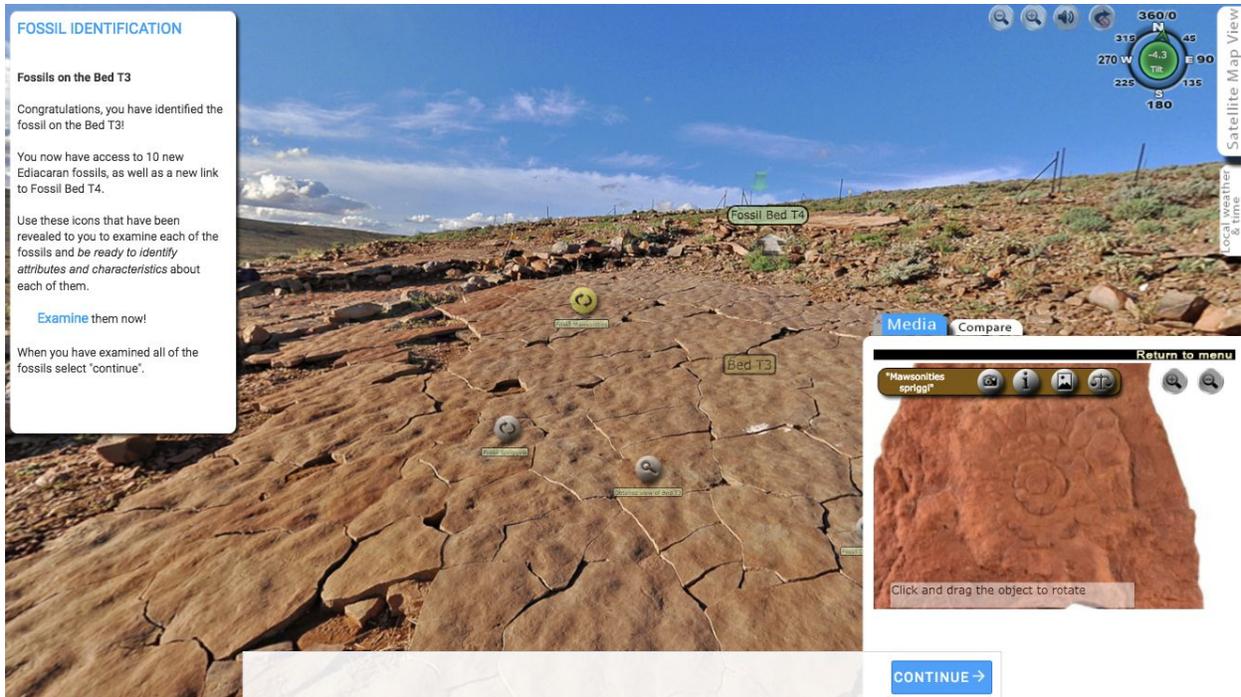
Close Gigapan



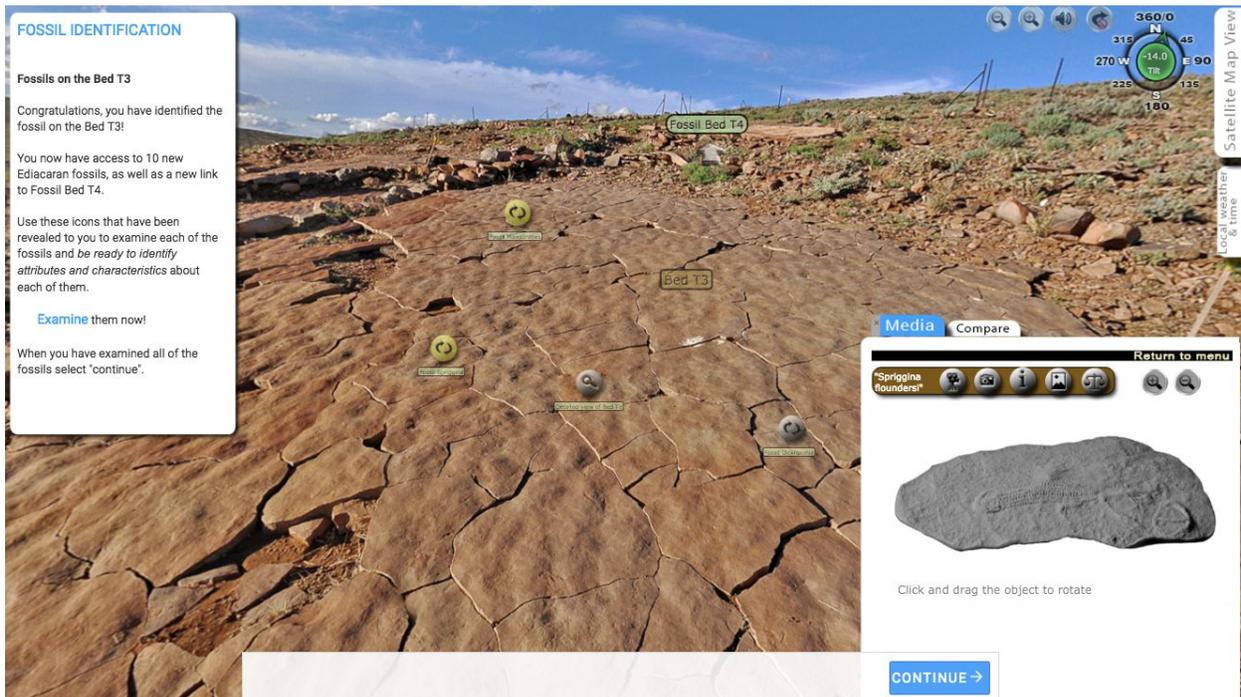
This question checks for a correct identification of *Dickinsonia* at the T3 Bed.



Finally in this section, the student is asked to familiarize themselves with the other fossil types present at Nilpena.



Each fossil can be examined with its own marker on the fossil beds. The information boxes are zoomable and include supporting information including alternative views and artistic recreations.



FOSSIL IDENTIFICATION

Fossils on the Bed T3

Congratulations, you have identified the fossil on the Bed T3!

You now have access to 10 new Ediacaran fossils, as well as a new link to Fossil Bed T4.

Use these icons that have been revealed to you to examine each of the fossils and be ready to identify attributes and characteristics about each of them.

Examine them now!

When you have examined all of the fossils select "continue".

360.0 N
315 W -16.6 TR
270 W E 90
225 S 135
180

Satellite Map View
Local weather & time

Media Compare

Return to menu

Medusoid

This object cannot rotate

CONTINUE →

Fossils are included on both the T3 and T4 Beds.

FOSSIL IDENTIFICATION

Fossils on the Bed T3

Congratulations, you have identified the fossil on the Bed T3!

You now have access to 10 new Ediacaran fossils, as well as a new link to Fossil Bed T4.

Use these icons that have been revealed to you to examine each of the fossils and be ready to identify attributes and characteristics about each of them.

Examine them now!

When you have examined all of the fossils select "continue".

360.0 N
315 W -22.1 TR
270 W E 90
225 S 135
180

Satellite Map View
Local weather & time

Media Compare

Return to menu

"Aspidella terranovica"

CONTINUE →

FOSSIL IDENTIFICATION

Fossils on the Bed T3

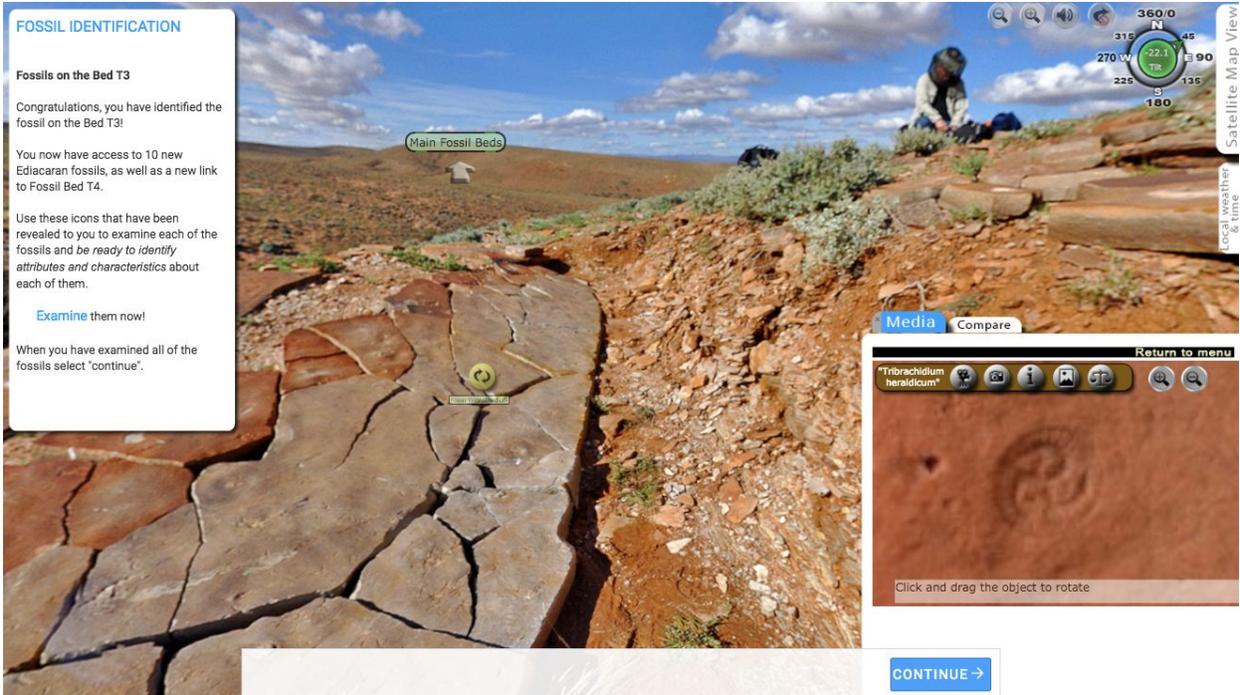
Congratulations, you have identified the fossil on the Bed T3!

You now have access to 10 new Ediacaran fossils, as well as a new link to Fossil Bed T4.

Use these icons that have been revealed to you to examine each of the fossils and *be ready to identify attributes and characteristics* about each of them.

[Examine](#) them now!

When you have examined all of the fossils select 'continue'.



Main Fossil Beds

360° N
315 45
270 W -22.1 E 90
225 135
180 S

Local weather & time

Satellite Map View

Media Compare

Return to menu

"Tribrachidium heraldicum"

Click and drag the object to rotate

[CONTINUE →](#)

FOSSIL IDENTIFICATION

Fossils on the Bed T3

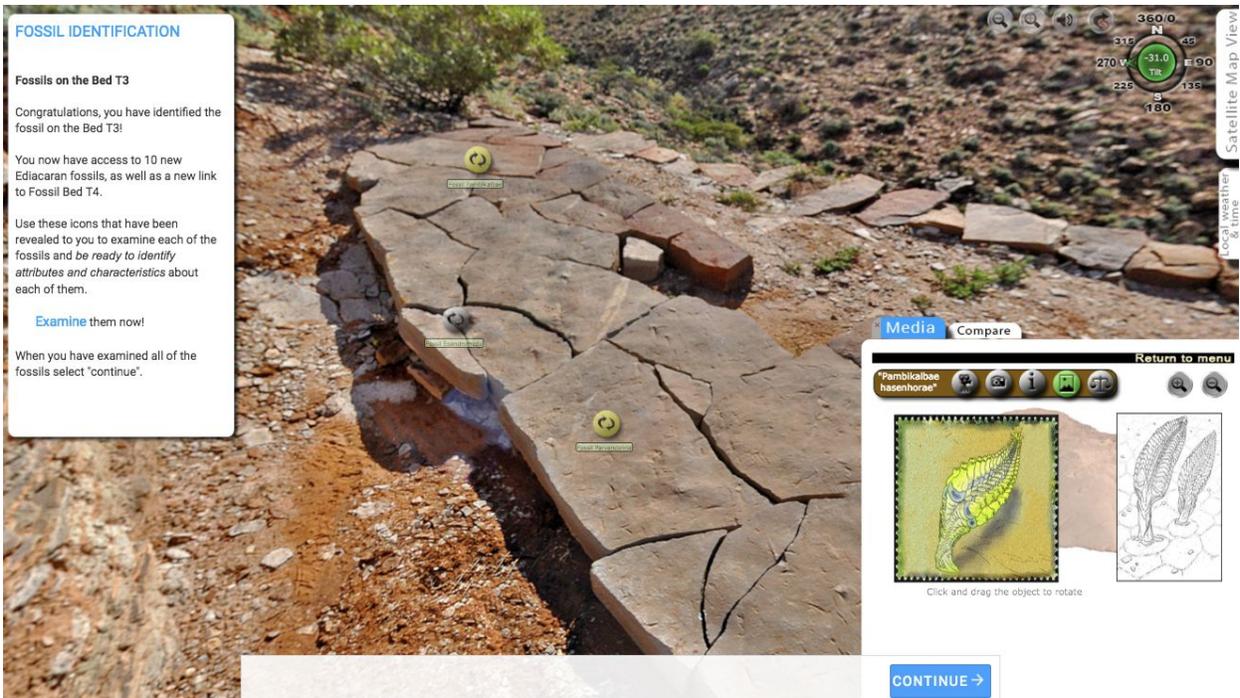
Congratulations, you have identified the fossil on the Bed T3!

You now have access to 10 new Ediacaran fossils, as well as a new link to Fossil Bed T4.

Use these icons that have been revealed to you to examine each of the fossils and *be ready to identify attributes and characteristics* about each of them.

[Examine](#) them now!

When you have examined all of the fossils select 'continue'.



360° N
315 45
270 W -31.0 E 90
225 135
180 S

Local weather & time

Satellite Map View

Media Compare

Return to menu

"Pambolikalbes hasenhorae"

Click and drag the object to rotate

[CONTINUE →](#)

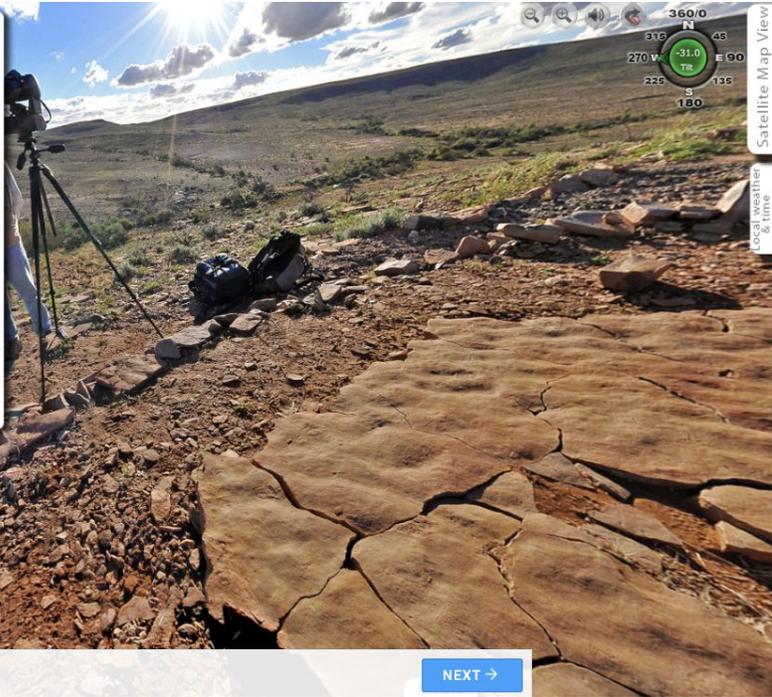
FOSSIL IDENTIFICATION

The role of microbes

Microbial mats are **complex communities of microorganisms** (single-celled organisms), usually organized into layers, that can be seen with the naked eye. Simple mats can be found in streams, lakes and soils, even in drinking fountains and rain gutters!

Microbial mats are the earliest form of life on Earth for which there is good fossil evidence, from 3.5 billion years ago, and have been the most important members and maintainers of the planet's ecosystems. The best known physical forms are flat mats and stubby pillars called stromatolites.

In the Ediacaran Period microbial mats covered large areas of the seafloor and provided food for the animals that grazed over them.



NEXT →

FOSSIL IDENTIFICATION

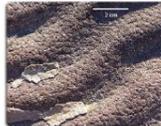
Fossil evidence of microbes

Fossil evidence for microbial mats on the seafloor has been found at Nilpena. It occurs as sedimentary textures called - **Textured Organic Surfaces (TOS)**.

TOS are patterned structures that partially or completely cover bedding surfaces. Here are a few examples from the rocks at Nilpena.



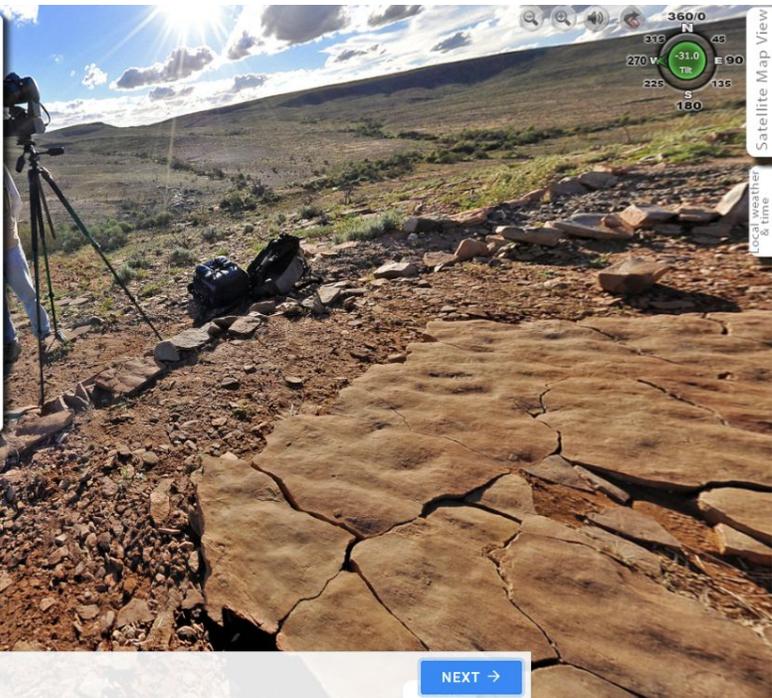
"Grooved" texture



"Elephant skin" on ripples



"Pucker" texture



NEXT →

FOSSIL IDENTIFICATION

Do Ediacaran animals resemble animals today?

Comparing Ediacarans with modern organisms helps scientists understand the development of Earth's earliest animal ecosystem. Below are a few comparisons between Ediacaran organisms and potential modern analogs, however scientists continue to intensely debate their relationships.



Dickinsonia



Kimberella



Medusoid



Charniodiscus



Flatworm



Mollusk - sea slug



Jellyfish



Sea pen



NEXT →

Fossil Identification Assessment

This section asks the student to summarize what they have learned about the Nilpena area fossils. This uses the concept map tool, explained on the first screen below.

FOSSIL IDENTIFICATION

Concept mapping with fossils.

Now that you have examined all of the fossils, you should have an idea of certain attributes and characteristics pertaining to them. For this activity you will match a fossil with the description that best matches that fossil.

PLEASE READ:
To connect a fossil with its description:

1. Click on the box with the name of a fossil and a link icon will appear.
2. Click on that link icon that appeared.
3. Click on the box of the fossil description to connect them.

Match all six fossils with their descriptions.

Item 1 Item 1 Description

Item 1 Item 1 Description

Item 1 Item 1 Description

NEXT →

FOSSIL IDENTIFICATION

Connect each fossil to its description

Pambikalbae Worm like arched head

Anchor shaped Sprigging

Trbrachidium 8 spiral arms

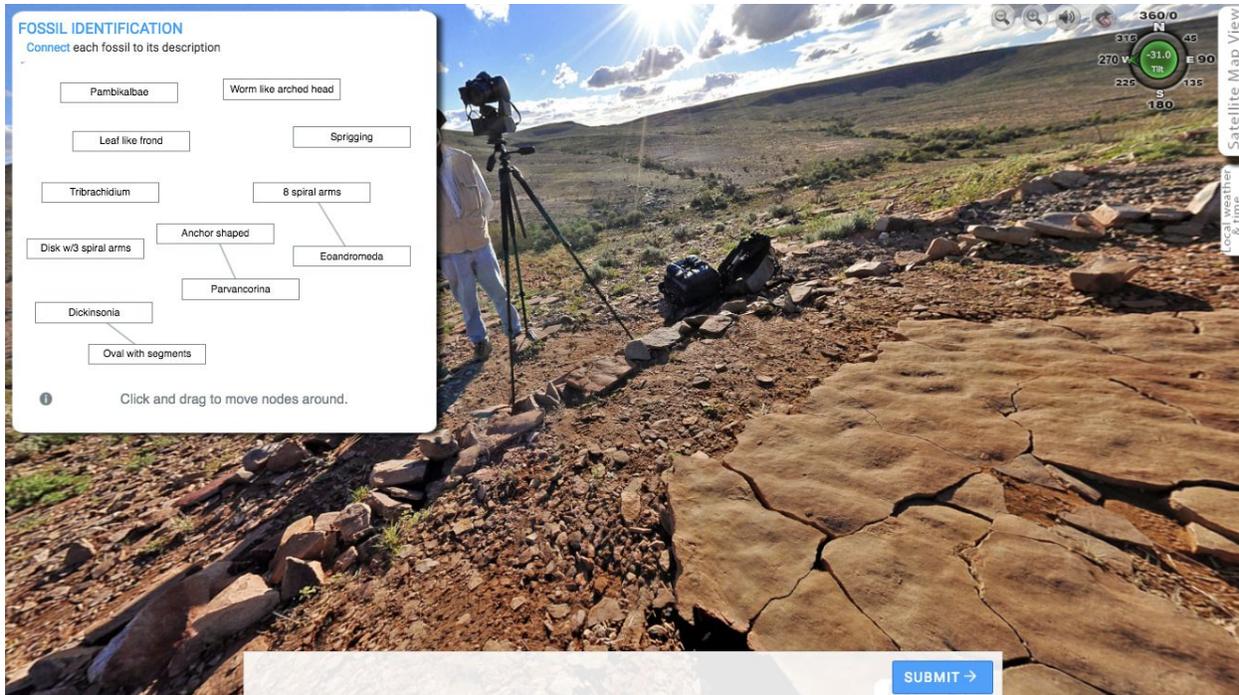
Disk w/3 spiral arms Dickinsonia

Eoandromeda Parvanorina

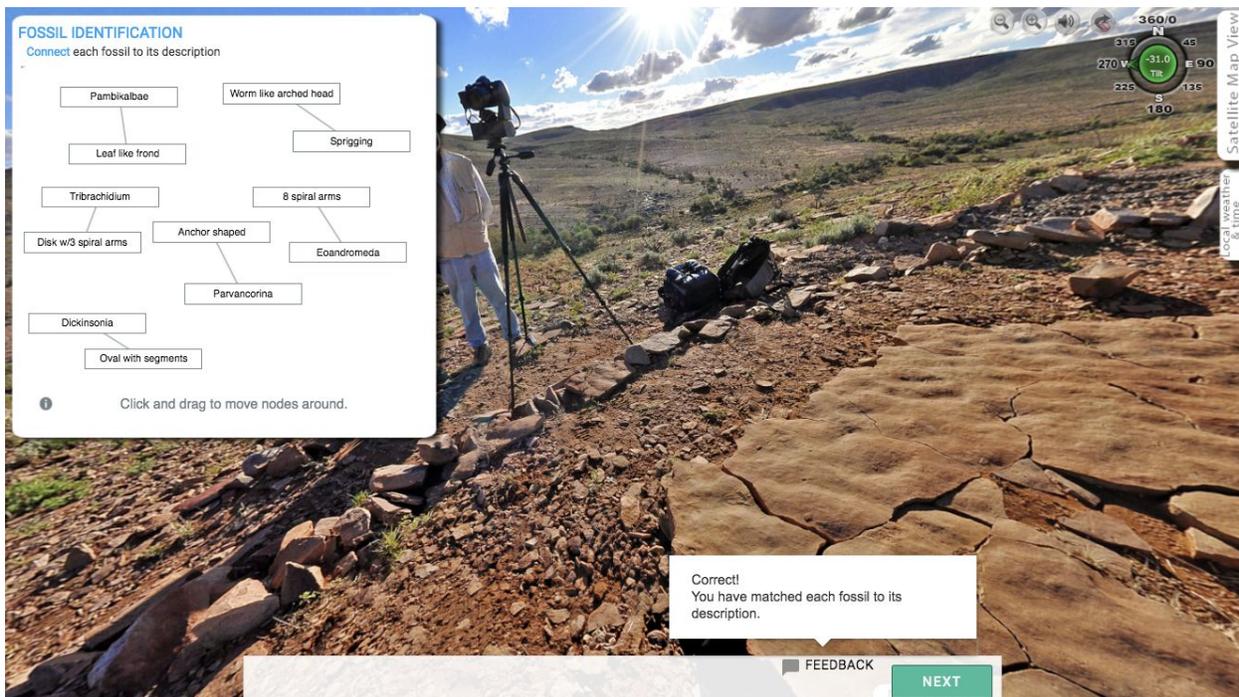
Oval with segments Leaf like frond

Click and drag to move nodes around.

SUBMIT →



The links between fossil name and descriptor are added by clicking on one concept, clicking the link icon, and then clicking on the second concept to complete a link. This screen shows the correct links for the three fossils discovered via the dichotomous key activity.



This screen shows the full correct answer.

THE DISAPPEARANCE

What happened to the animals of the Ediacaran?

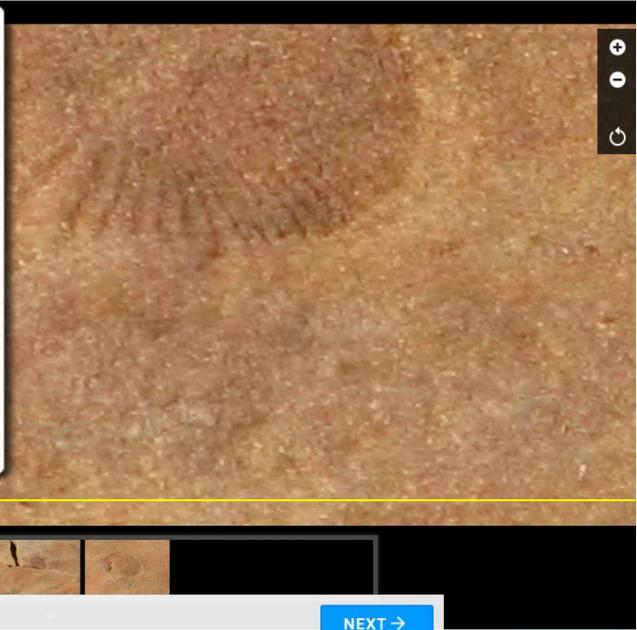
The Ediacara organisms ruled the oceans for about 40 million years, but around 540 million years ago, they disappeared from the fossil record.

Scientists debate the causes of their extinction, but the demise of the Ediacarans was most likely related to rise of predators and burrowers that destroyed their unique mat ground community.

The appearance of a variety of new animals in the Cambrian led to the development of new interactions between animals and between animals and their environment.

Some factors that brought about their extinction include:

- Rise of predators - and other types of more specialised feeding modes.
- Development of biomineralization - skeletons.
- Increase in complexity of the ecosystem and organisms interactions.
- Increase in depth and intensity of burrowing animals.
- Destruction of the microbial matgrounds.



NEXT →

Close Gigapan

Build an Ecosystem

In the final section of the lesson, the students uses an interactive ecosystem builder to visualize the ecosystem of the Ediacaran at Nilpena. This sets them up for the post-lesson quiz.

BUILD AN ECOSYSTEM

What did the Nilpena Ecosystem look like?

An "Ecosystem" is a biological community of interacting organisms and their physical environment.

Throughout this lesson, you have learned about a variety of characteristics that comprise the Ediacaran environment at Nilpena.

You have also examined the many types of organisms that inhabited that environment.

It is time to put all that knowledge together and Build an Ecosystem.



Local weather & time

Satellite Map View

360/0
315 N 45
270 W -9.0 E 90
225 S 135
180

NEXT →

BUILD AN ECOSYSTEM

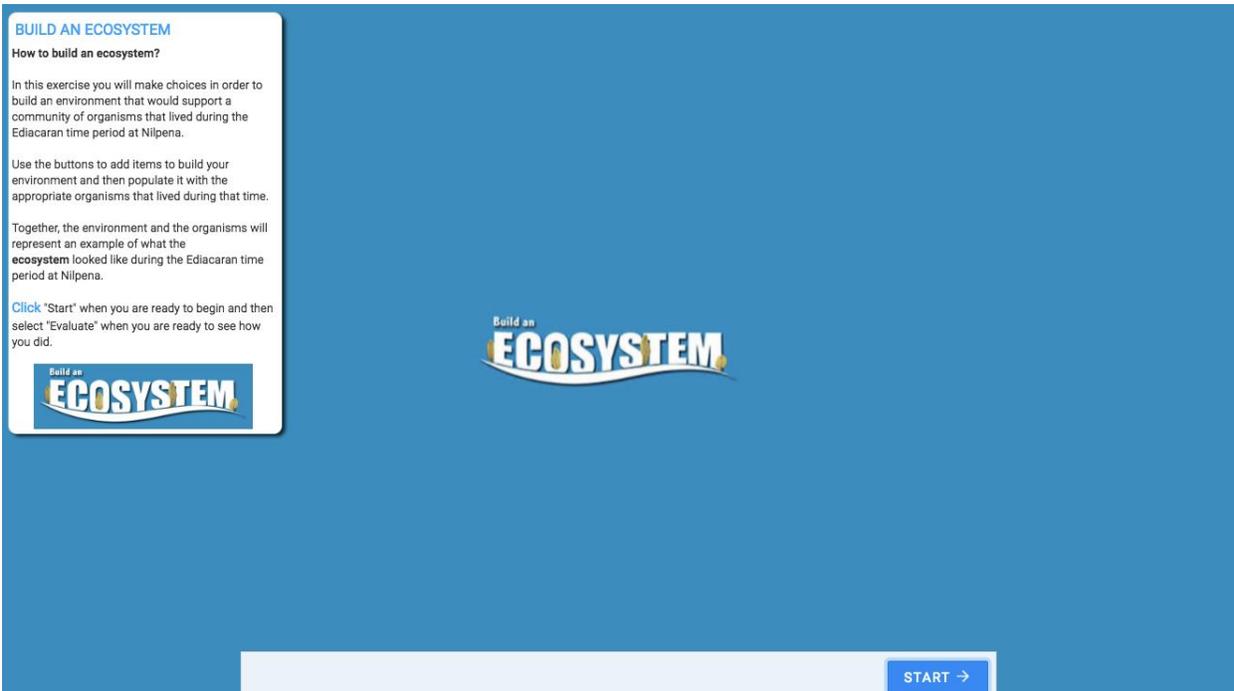
How to build an ecosystem?

In this exercise you will make choices in order to build an environment that would support a community of organisms that lived during the Ediacaran time period at Nilpena.

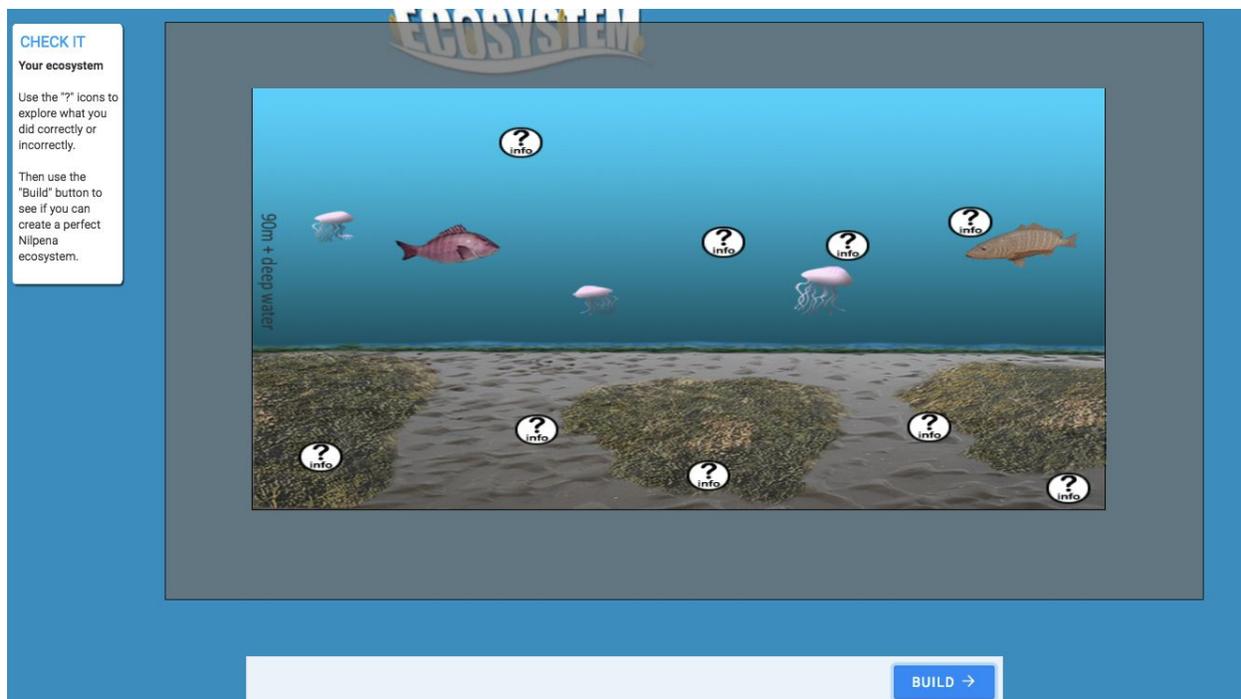
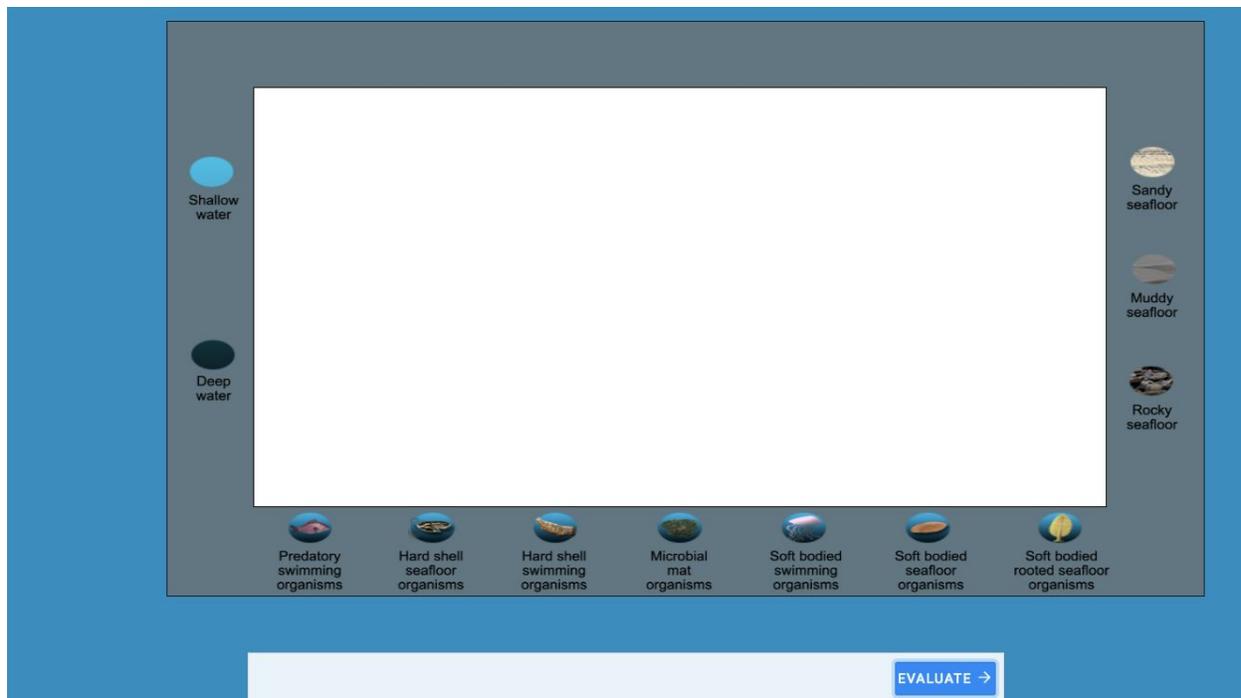
Use the buttons to add items to build your environment and then populate it with the appropriate organisms that lived during that time.

Together, the environment and the organisms will represent an example of what the ecosystem looked like during the Ediacaran time period at Nilpena.

Click "Start" when you are ready to begin and then select "Evaluate" when you are ready to see how you did.



START →



For a student who does not correctly replicate the Nilpena ecosystem, feedback is provided through short videos from expert geologists. These videos each describe a key ecosystem feature. The student can then redo the ecosystem builder to add the correct features.

COMPARE

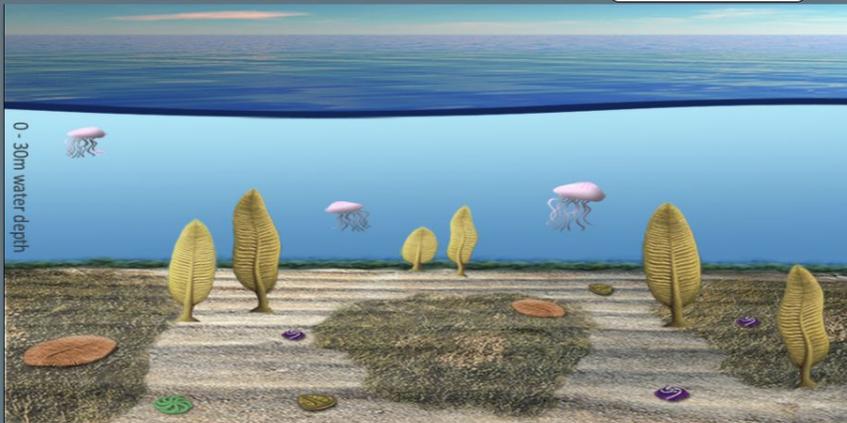
Your ecosystem

Use the buttons along the top to see how your first and second attempts compare with a perfect Nilpena ecosystem.

Ecosystem 1

Ecosystem 2

Correct Ecosystem



NEXT →

COMPARE

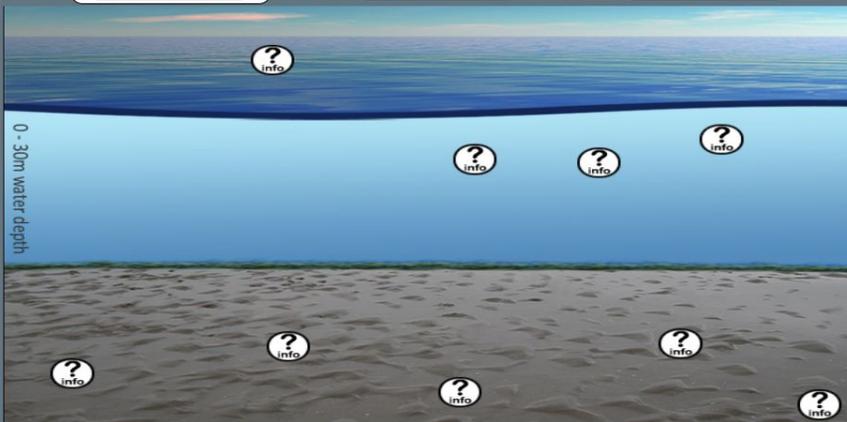
Your ecosystem

Use the buttons along the top to see how your first and second attempts compare with a perfect Nilpena ecosystem.

Ecosystem 1

Ecosystem 2

Correct Ecosystem



NEXT →

Having created the correct ecosystem, the student can compare it with whatever their initial guess was at the start of the lesson.

Post-Lesson Quiz

THE ENVIRONMENT

Putting it all together.

Now that you have explored what the environment was like during the Ediacaran Period at Nilpena, use what you have learned to answer the questions below. **Select** a feature from each of the four choices that existed in that environment.

Water Depth

Shallow water less than 30m - abundant sunlight

Deep water more than 200m - little to no sunlight

Water Type

Tropical marine Fresh water

Surface

Waves with some storm events

Very still and calm water

Seafloor

Rocky Sandy Muddy

SUBMIT →

Satellite Map View

Local weather & time

THE ENVIRONMENT

Putting it all together.

What types of organisms lived in that environment.

Choose which of these organisms existed during the Ediacaran Period. *(select all that apply)*

<input type="checkbox"/> Hard-shelled seafloor organisms	<input checked="" type="checkbox"/> Soft-bodied swimming organisms
<input checked="" type="checkbox"/> Soft-bodied non-rooted seafloor organisms	<input type="checkbox"/> Hard-shelled swimming organisms
<input checked="" type="checkbox"/> Soft-bodied rooted seafloor organisms	<input type="checkbox"/> Predatory swimming organisms
<input checked="" type="checkbox"/> Microbial mat organisms	

SUBMIT →

Satellite Map View

Local weather & time

These questions repeat exactly the pre-lesson quiz. They serve as a summary of the material covered in the Nilpena iVFT. They also follow directly from the Build an Ecosystem activity.

Wrap-Up

THE ENVIRONMENT
Putting it all together.

Here are your results for comparing your initial guesses with your final answers pertaining to what the environment was like during the Ediacaran Period at Nilpena.

Water Depth
Your initial guess:
Your end of lesson answer: Shallow water less than 30m - abundant sunlight
The Correct Answer: Shallow water less than 30m - abundant sunlight

Water Type
Your initial guess:
Your end of lesson answer: Tropical marine
The Correct Answer: Tropical marine

Surface
Your initial guess:
Your end of lesson answer: Waves with some storm events
The Correct Answer: Waves with some storm events

Seafloor
Your initial guess:
Your end of lesson answer: Sandy
The Correct Answer: Sandy

360/0
315 N 45
270 W -9.0 TRK E 90
225 S 135
180

Local weather & time
Satellite Map View

NEXT →

THE ENVIRONMENT
Putting it all together.

Here are your results for comparing your initial guess with your final answer pertaining to what types of organisms lived in the Nilpena environment during the Ediacaran Period.

Ediacaran organisms
Your initial guess: ,
Your end of lesson answer: Soft-bodied non-rooted seafloor organisms
Soft-bodied rooted seafloor organisms
Microbial mat organisms, Soft-bodied swimming organisms

The Correct Answer:
Soft-bodied non-rooted seafloor organisms, Soft-bodied rooted seafloor organisms,
Microbial mat organisms, Soft-bodied swimming organisms

360/0
315 N 45
270 W -9.0 TRK E 90
225 S 135
180

Local weather & time
Satellite Map View

NEXT →

These screens offer one more opportunity for the student to compare their pre-lesson guesses to the correct ecosystem features.

THE BIG IDEA

Great Job !

In a short paragraph summarize a few of the ideas that you have learned in this lesson.

ENTER ANSWER:

SUBMIT →

Satellite Map View
Local weather & time

CERTIFICATE OF COMPLETION

's paragraph.

has completed the lab
"The Emergence of Animals"
 with a score of: **58.0!**

IMPORTANT: Screen-capture this page right now before continuing in order to show your completion of this lab.

Great Job
 {q:149096765812:97
Score: 58.0

NEXT →

Satellite Map View
Local weather & time

This screen provides a completion screen. This may be useful for teachers who wish to assign the iVFT as homework. The lesson also tallies the student's final point total, which has a maximum possible score of 144 points. Points are deducted for each repeated screen attempt on most screens that ask for student input. Although the points could be used to assign grades, simple completion grading should generally be satisfactory.

Journey to South Australia

The Emergence of Animals

In this lesson you:

1. Explored and identified the oldest complex animals
2. Understood how early organisms were fossilized
3. Examined the first animal communities
4. Built a 560 million-year-old ecosystem

FINISH

Satellite Map View

Local weather & time