

# *Almost Armageddon*

## *The day the Earth nearly died*

Outline plan – for adaptation as required by schools

Enquiry title	<b><i>What was to blame for the mass extinction at the end of the Permian period and how can we show and communicate this in the Geoplay park?</i></b>
Context and learning aims	<p>In this enquiry the children consider the <i>Permian</i> period in Torbay and in particular:</p> <ul style="list-style-type: none"> <li>• How fossils tell palaeontologists what lived in deep time over 250 million years ago.</li> <li>• How life in <i>Permian</i> times compared with today in Torbay?</li> <li>• The three causes of the mass extinction at the end of the <i>Permian</i> period which wiped out 95% of all living things.</li> <li>• How important it was for the human race that one creature in particular (<i>Thrinaxodon</i>) survived the mass extinction.</li> <li>• Design and make a model; exhibit or piece of play equipment to go in the <i>Permian</i> section of the Geoplay park to help inform people about the mass extinction and the importance of the survival of <i>Thrinaxodon</i>.</li> </ul>
Learning and teaching activities and curriculum progression	<p><b><i>Key Question 1: How do we know what was alive 250 million years ago?</i></b></p> <p><i>How do we know what Dimetrodon looked like?</i></p> <p>Show the children <b>Resource 1</b>. It shows a life size model of an animal called <i>Dimetrodon grandis</i> that lived in and around Torbay during the <i>Permian</i> period of deep time 250 million years ago. But how do we know what it looked like so accurately? What clues or evidence would the model maker have needed to have produced such a clear model? It is not a dinosaur because 250 million years ago the dinosaurs had not evolved. <i>Dimetrodon</i> was in fact a vegetarian eating reptile that used its long back fin to help it maintain a constant body temperature. Encourage discussion about how we know what things looked like so long ago? Fossils: such as the one of <i>Dimetrodon</i> in <b>Resource 2</b> that was found in America. Each fossilized bone was lifted separately and then put back together in museum with the bones being connected by wires (<b>Resource 3</b>). It was from this reassembled fossil that the model maker used to reconstruct a life size model of <i>Dimetrodon</i>.</p>

*So what exactly are fossils?*

Fossils are the remains of once living animals and plants. These remains must be over 10,000 years old and are either *body fossils* or *trace fossils*. Body fossils are the fossilized remains of animals or plants such as bones; shells and leaves. Sometimes this includes whole animals such as woolly mammoths frozen in ice or insects caught in the sap of trees which later forms amber. Trace fossils on the other hand, record only the activity of animals such as footprints; track ways or coprolites (fossil poo!)

*How do fossils form?*

The short video in **Resource 4** is an animation of how fossils are formed. Play the film a number of times and emphasise particularly the process by which bone fossils of animals are made.

*Can I make an accurate artist's impression of Gorgonopsian?*

Show the children the photograph of the fossilised skulls of *Gorgonopsian* in **Resources 5 and 6**. During the Permian period *Gorgonopsian* was the top predator. The skull is almost a meter long and the individual teeth up to 20cm long. What is the most distinctive feature of the teeth? Now, based on this evidence encourage the children to draw an artists' impression of what the whole creature might have looked like? Provide support and direction e.g. *Gorgonopsian* was a top predator during Permian times and nothing would have challenged its domination. Now think about top predators in the modern world such as lions, tigers and polar bears. What do they have in common? The main prey of *Gorgonopsian* was the herbivore *Lystrosaurus* (**Resource 7**) which were very flat faced with a beak and two teeth which resembled tusks. What would have *Gorgonopsian* needed to have brought down and killed a *Lystrosaurus*? For example it would have needed to run fast.

*How does my artists' impression compare with that of a professional?*

Encourage the children to present and describe their *Gorgonopsian* and in particular any design features they have incorporated to ensure that it is the 'king of the jungle' and the top predator of the Permian time. How do they compare with the professional artist's impression in **Resource 8**?

Extension work on rock and fossils.

A range of enquiries into rocks and fossils can be found on the Jurassic Coast website at

[www.jurassiccoast.org/education/download-resources/602-jurassic-coast-rocks-and-fossils](http://www.jurassiccoast.org/education/download-resources/602-jurassic-coast-rocks-and-fossils) particularly in the context of this investigation:

Key Question 3: *Rock detectives!*

Key Question 6: *What can we find out from fossils?*

**Key Question 2: What was the Permian period like compared with today?**

Begin the film in **Resource 9** at 01.21 ‘a quarter of a million years ago’ and play it until 08.49 ‘the test will begin’. It may be necessary to show the children this section twice. Ask the children to make a particular note of what the climate was like; what grew and what kind of animals existed. This section of the film will also show an animation of a *Gorgonopsian* hunting a *Lystrosaurus* and so will provide the children with an opportunity to compare their artist’s impression with the one in the film. How well did they do? *Gorgonopsian* was an excellent hunter but what was it about this reptile that was not well designed? It was also the first animal on Earth with incisors hanging down outside of the jaw line – *sabre teeth*.

**Key Question 3: Why did the Earth nearly die at the end of the Permian?**

Show the children **Resources 10** and **11** and explain that these two species – a *nautilus* which swam in warm seas and the very small *Dogbane Leaf Beetle* – were just two of the very few creatures that survived the end of the Permian. Although for 50 million years the land and particularly the seas swarmed with life, it was almost all destroyed by an event that is called *the mass extinction*. 95% of all living things was wiped out in one go. It would take the Earth 10 million years to recover. The Earth came very close to being wiped out for ever. Show the children the image in **Resource 12** as a clue. What do they think is happening and how might it have wiped out almost all life on Earth?

Next show the children the section of film in **Resource 9** from 08.50 – 14.25 ‘will escape their fate’. This shows the first event in the mass extinction – the earth splitting apart in Siberia and rivers of molten basalt rock flooding the land and destroying everything in its path. Geologically this event is referred to as the *Siberian Traps*. Take time to discuss with the children which living things would be most likely to survive? Obviously the larger and slower reptiles had virtually no chance against the lava flood. Those that survived had no food left e.g. trees and other animals and quickly starved. How might smaller creatures such as the *nautilus* in the sea have survived? Why would sea creatures stand more chance?

However, the volcanic floods of lava from Siberia were just the beginning. Something else happened next. Show the children 14.25 – 20.29 *'didn't need to find so much food'*.

*What were the two gases that built up in the atmosphere?*

*What affect did each have?*

*As the planet got warmer what element of the atmosphere went down?*

*How did this affect the animals?*

*What could the small Thrinaxodon do that meant that it survived?*

*Why did Proterosuchus cope well with the warmer temperatures?*

Return to the film at 20.30 and play until 23.18 *"the only survivor?"*

*After the basalt flows lava from volcanoes what was the next stage of extinction to hit the planet?*

*What combined to make sulphuric acid in the atmosphere?*

*What is the chemical formula which shows this?*

*Once again little Thrinaxodon was able to survive. Why?*

The short section of film from 23.20 to 25.57 *"starving to death"* talks about food chains and the importance of plants.

*Why was the death of the plants so disastrous for all of the animals even the meat eaters?*

*Why were the Gorgons so badly affected?*

After about 200 years on the 'extinction clock' one predator is rising to power. Show the section 25.58 – 29.28.

*Which predator is gaining power over everything else? Why?*

*Why is Thrinaxodon a 'born survivor'?*

*How do the scientists know that Thrinaxodon could be the ancestor of modern animals and even humans?*

Beginning at 29.99 and playing to 33.50 *'top carnivore'* this section shows the planet 10,000 years after the extinction began and life is almost extinct. Now the third stage of the extinction begins with changes in the seas and oceans. Towards the end of the *Permian* ocean currents stopped.

*What happened in the oceans after the ocean currents stopped?*

*What did the bacteria begin to produce?*

*What happened to this poison gas?*

*Once again why was Proterosuchus a winner as top predator?*

After 1.2 million years the great dying began to draw to a close and 95% of all living things were extinct. But *Lystrosaurus*, *Proterosuchus* and *Thrinaxodon* survived.

*From the few survivors what began anew?*

*Why was it 'lucky for us' that *Thrinaxodon* survived the 'great dying'?*

**Key Question 4: How can we represent the mass extinction and great dying of the Permian in the Geoplay park?**

At the Geoplay Park the *Permian* period is represented by the sand and water play area (**Resource 13**). The children can now be set a design and make challenge. What model; picture; or piece of play equipment could we add to the *Permian* zone of the play park to represent and communicate the causes and effects of the mass extinction to the children who visit? How can we inform people in an attractive and exciting way about what happened at the end of the *Permian*? Alternatively how can we tell people about the importance of the survival of *Thrinaxodon*? Do we need a model or a picture to go in the zone? How can we design an exhibit or a piece of play equipment around *Thrinaxodon*?

To do this they can be taken through a simple design brief process for apply to their choice of feature:

Researching This is the first stage and will involve children in investigating the features of existing play equipment, models of living ; information boards and pictures in each of four zones at the Geoplay park. *What design features work best?* For example the children may be drawn to the use of particular shapes and colours. *Does location in the play park matter?* *What materials have been used to make the existing play equipment, information boards and models? Is the same material used for each? What about safety considerations and durability? What is practical for use by young children? Do diagrams and pictures work better than a lot of words?*

Generating a design brief On paper draft a design of either:

A model; picture or piece of play equipment that makes a link to the mass extinction of most of life on Earth at the end of the *Permian* or highlights the importance to people of the survival of *Thrinaxodon*. It will need to be attractive and engaging. How will we encourage people to look at it; play on it or read the words? What will attract people? The design brief will include the chosen layout, dimensions and any patterns;

colours; particular shapes and materials to be used to make it. It will also include a simple explanation of how the design is conveying key messages. How can we help people to learn through what we are making and inviting them to play on; look at or read about how close the Earth came to extinction and how lucky we all are that *Thrinaxodon* survived? How can we create a design for a model; sculpture; picture or piece of play equipment that tells people about the three things which happened that almost ended life for ever i.e. volcanic eruptions; acid rain and poisonous gas release from the oceans? How can they all be incorporated into one design?

Making and evaluation Using available materials the children can be encouraged to make their product e.g. a model of the piece of play equipment or model or information board etc. and present it to the rest of the class. They can be encouraged to explain why they designed it the way they have. *What things about their design and model are the children most pleased with? Did they make any changes from their original design? How would they now make it better?*