

Biology > Big idea BVE: Variation, adaptation and evolution > Topic BVE1: Variation








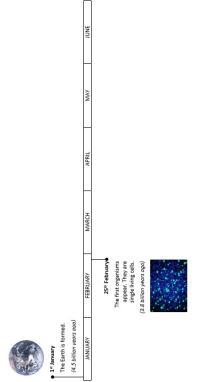


Progression toolkit: Changes in species over time – fossil evidence

Learning focus	The fossil record provides evidence that species change over time, but it is incomplete and there are limitations to the conclusions that can be drawn from it.				
As students' conceptual understanding progresses they can:					
As students' conceptual understanding progresses they can:	Recall that fossils provide evidence about organisms from long ago and their habitats. P	Recall that fossils are between ten thousand and billions of years old.	Recognise that all fossils are the mineralised remains of once-living organisms or of traces left behind by once-living organisms.	Explain how the fossil record provides evidence that species change over time.	Explain why there are limitations to the conclusions and explanations that can be made from fossil evidence.
Diagnostic questions	How do we know? What can we learn from fossils?	How old are fossils? Billions of years	Could it become a fossil?	The fossil record	<i>Archaeopteryx</i>
Response activities	The year of life		Fossilisation		<i>Stegosaurus</i>

Key:

P Prior understanding from earlier stages of learning

B Bridge to later stages of learning

<h3>How do we know?</h3>  <p>BEST STUDENT WORKSHEET</p> <p>How do we know?</p> <p>Scientists lived on Earth a very long time ago. They have been extinct for millions of years.</p> <p>We know a lot about dinosaurs and other organisms that lived and died a long ago. Where does our knowledge of them come from?</p> <ol style="list-style-type: none"> From photographs of the living organisms. From observations made by people alive at that time. From fossils of their remains. From books and museums. <p>Simple multiple choice</p>	<h3>What can we learn from fossils?</h3>  <p>BEST STUDENT WORKSHEET</p> <p>What can we learn from fossils?</p> <p>Scientists have found many fossils of organisms that lived a very long time ago.</p> <p>What can fossils help us to work out? Tick one box for each answer.</p> <table border="1"> <thead> <tr> <th>Answers</th> <th>I am sure this is right</th> <th>I think this is right</th> <th>I think this is wrong</th> <th>I am sure this is wrong</th> </tr> </thead> <tbody> <tr> <td>1 The shape and size of the organisms.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2 The structure of the organisms' bodies.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3 Where the organisms lived.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4 How long ago the organisms died.</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Confidence grid</p>	Answers	I am sure this is right	I think this is right	I think this is wrong	I am sure this is wrong	1 The shape and size of the organisms.					2 The structure of the organisms' bodies.					3 Where the organisms lived.					4 How long ago the organisms died.					<h3>How old are fossils?</h3>  <p>BEST STUDENT WORKSHEET</p> <p>How old are fossils?</p> <p>The photograph shows one example of some fossils. Many different fossils have been found all over the world.</p> <ol style="list-style-type: none"> Think about the oldest fossils ever found. How long ago did the organisms preserved in these fossils die? <ol style="list-style-type: none"> Almost four hundred (400) years ago. Almost four thousand (4000) years ago. Almost four million (4 000 000) years ago. Almost four billion (4 000 000 000) years ago. Think about the youngest fossils ever found. How long ago did the organisms preserved in these fossils die? <ol style="list-style-type: none"> Around ten (10) years ago. Around one thousand (1000) years ago. Around ten thousand (10 000) years ago. Around one million (1 000 000) years ago. <p>Simple multiple choice</p>	<h3>Billions of years</h3>  <p>BEST STUDENT WORKSHEET</p> <p>Billions of years</p> <p>The Earth was formed approximately 4.5 billion years ago.</p> <p>The oldest fossils are of organisms that lived approximately 3.5 billion years ago.</p> <p>How long is a billion years?</p> <ol style="list-style-type: none"> Ten million (10 000 000) years. One hundred million (100 000 000) years. One thousand million (1 000 000 000) years. One thousand million (1 000 000 000 000) years. <p>Simple multiple choice</p>	<h3>Could it become a fossil?</h3>  <p>BEST STUDENT WORKSHEET</p> <p>Could it become a fossil?</p> <p>Adriana! The photograph shows an iguana. It is a type of lizard.</p> <ol style="list-style-type: none"> Could the iguana become a fossil? <ol style="list-style-type: none"> It will definitely become a fossil. It could become a fossil. It will not become a fossil. How would you explain your answer to question 1? <ol style="list-style-type: none"> All dead organisms are preserved as fossils. All dead organisms are preserved as fossils. It is not a living organism. It is too small to become a fossil. <p>Two-tier multiple choice</p>																	
Answers	I am sure this is right	I think this is right	I think this is wrong	I am sure this is wrong																																										
1 The shape and size of the organisms.																																														
2 The structure of the organisms' bodies.																																														
3 Where the organisms lived.																																														
4 How long ago the organisms died.																																														
<h3>The fossil record</h3>  <p>BEST STUDENT WORKSHEET</p> <p>The fossil record</p> <p>Scientists have found many thousands of fossils over the years. Together, all the fossils are known as the fossil record. The fossil record is a source of evidence. Scientists make conclusions from the evidence.</p> <p>Draw straight lines to join each piece of evidence to the conclusions you could make from it. One has been done for you.</p> <table border="1"> <thead> <tr> <th>Evidence from the fossil record</th> <th>Conclusions that you could make from the evidence</th> </tr> </thead> <tbody> <tr> <td>Fossils and living organisms of the same species have different features.</td> <td>The species has adapted to a new habitat.</td> </tr> <tr> <td>Fossils and living organisms of the same species are found in different locations.</td> <td>Many species have become extinct.</td> </tr> <tr> <td>Many fossils are of species which no longer exist.</td> <td>The order in which organisms evolved.</td> </tr> <tr> <td>Older fossils do not have features seen in newer fossils.</td> <td>New species have evolved gradually from older species.</td> </tr> <tr> <td>Some fossils have features of both older and newer species.</td> <td>The characteristics of organisms in a species change over time.</td> </tr> </tbody> </table> <p>Linking ideas</p>	Evidence from the fossil record	Conclusions that you could make from the evidence	Fossils and living organisms of the same species have different features.	The species has adapted to a new habitat.	Fossils and living organisms of the same species are found in different locations.	Many species have become extinct.	Many fossils are of species which no longer exist.	The order in which organisms evolved.	Older fossils do not have features seen in newer fossils.	New species have evolved gradually from older species.	Some fossils have features of both older and newer species.	The characteristics of organisms in a species change over time.	<h3>Archaeopteryx</h3>  <p>BEST STUDENT WORKSHEET</p> <p>Archaeopteryx</p> <p>Photograph 1 shows a famous fossil of an animal called Archaeopteryx. Photograph 2 shows an artist's idea of what Archaeopteryx looked like, based on fossil evidence.</p> <p>Archaeopteryx is extinct. Only two Archaeopteryx fossils have ever been found.</p> <p>Why might the artist's idea not look exactly like a real Archaeopteryx? Tick one box for each answer.</p> <table border="1"> <thead> <tr> <th>Answers</th> <th>I am sure this is right</th> <th>I think this is right</th> <th>I think this is wrong</th> <th>I am sure this is wrong</th> </tr> </thead> <tbody> <tr> <td>1 There are no living Archaeopteryx to look at.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2 Fossils are often incomplete organisms.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3 There would be variation between individual Archaeopteryx.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4 The artist had to use imagination.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5 Fossils cannot show us what colour an organism was.</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Confidence grid</p>	Answers	I am sure this is right	I think this is right	I think this is wrong	I am sure this is wrong	1 There are no living Archaeopteryx to look at.					2 Fossils are often incomplete organisms.					3 There would be variation between individual Archaeopteryx.					4 The artist had to use imagination.					5 Fossils cannot show us what colour an organism was.					<h3>The year of life</h3>  <p>BEST STUDENT WORKSHEET</p> <p>The year of life</p> <p>The Earth is formed 4.5 billion years ago.</p> <p>Timeline: 4.5 BYA, 4 BYA, 3.5 BYA, 3 BYA, 2.5 BYA, 2 BYA, 1.5 BYA, 1 BYA, 0.5 BYA, 0 (Present).</p> <p>1. The first life on Earth appeared about 3.5 billion years ago.</p> <p>2. The first plants appeared about 1.5 billion years ago.</p> <p>3. The first animals appeared about 600 million years ago.</p> <p>4. The first dinosaurs appeared about 230 million years ago.</p> <p>5. The first modern humans appeared about 200,000 years ago.</p> <p>Challenge to thinking, discussion</p>	<h3>Fossilisation</h3>  <p>BEST STUDENT WORKSHEET</p> <p>Fossilisation</p> <p>The photograph shows a fossil of an animal.</p> <p>Some of the statements in the boxes below together to explain how the fossil was made.</p> <p>To talk about your group</p> <ol style="list-style-type: none"> Which statements are part of the correct explanation? What is the correct order for the statements you have chosen? <ol style="list-style-type: none"> Some parts of the animal decomposed. The animal's remains were submerged in water. The animal's remains were dissolved by water seeping through the rock. The animal died. The material around the animal was compacted to form rock. The animal's remains were buried in sediment. The animal's remains turned to rock. The animal's remains were replaced by minerals. <p>Ordering/Sequencing, discussion</p>	<h3>Stegosaurus</h3>  <p>BEST STUDENT WORKSHEET</p> <p>Stegosaurus</p> <p>The fossil of a Stegosaurus is kept at the Natural History Museum in London, UK.</p> <p>It has been given the nickname 'Sopha'.</p> <p>Dr Charlotte Brassey is a scientist. She has studied the fossil of Sopha the Stegosaurus.</p> <p>Dr Charlotte Brassey is a scientist. She has studied the fossil of Sopha the Stegosaurus.</p> <p>The Stegosaurus is a very well known type of dinosaur! So we have only found fossils from fewer than ten individual Stegosaurus. Sopha is the most complete Stegosaurus fossil ever discovered.</p> <p>The fossilised skull of Sopha the Stegosaurus was found in many small pieces. Scientists had to work out how to put the skull back together.</p> <p>Discussion</p>
Evidence from the fossil record	Conclusions that you could make from the evidence																																													
Fossils and living organisms of the same species have different features.	The species has adapted to a new habitat.																																													
Fossils and living organisms of the same species are found in different locations.	Many species have become extinct.																																													
Many fossils are of species which no longer exist.	The order in which organisms evolved.																																													
Older fossils do not have features seen in newer fossils.	New species have evolved gradually from older species.																																													
Some fossils have features of both older and newer species.	The characteristics of organisms in a species change over time.																																													
Answers	I am sure this is right	I think this is right	I think this is wrong	I am sure this is wrong																																										
1 There are no living Archaeopteryx to look at.																																														
2 Fossils are often incomplete organisms.																																														
3 There would be variation between individual Archaeopteryx.																																														
4 The artist had to use imagination.																																														
5 Fossils cannot show us what colour an organism was.																																														