

"Using Fossils to Determine the Age of Rocks"

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Topic

The geologic range of fossil organisms and using fossils to determine the age of rocks

Introduction

Fossils collected from the same rocks can be utilized to determine the geologic age of the rocks. This is accomplished by plotting the geologic range of each fossil and determining where the ranges overlap. The overlap indicates when the organisms could have lived together, and thus, the age of the rocks. In this exercise, you will use the principle of geologic ranges of fossils to date hypothetical rock samples.

Objective

Students will apply the concept of the geologic range of fossils to determine the age of rocks or samples.

Relationship to National and State Science Education Standards

This activity addresses Content Standard D (K-4) for Earth and Space Science (fossils), Content Standard D (5-8) for Earth and Space Science (Earth History), and Content Standard C (5-8) for Life Science (diversity, adaptations, and extinctions). *State GLE's*. Grade 3: ESS-E-A7. Identify characteristics of selected fossils and explain how fossil records are used to learn about the past (GLE #52).

Time Needed

30 to 45 minutes

Materials

Geological time scale (handout supplied) and possibly reference books on fossils and paleontology

Introduction:

The diagram below illustrates how overlap in the geologic range of fossils can be used to date the age of rocks. The fossils were found together in a rock. Once the fossils are identified, then the geologic ranges of the fossils can be determined. The information on the geologic range of each fossil is shown graphically.

A = *Microcyclus* Geologic range = Devonian to Carboniferous

B = *Streptelasma* Geologic range = Ordovician to Devonian

Geologic time	Fossil A	Fossil B
Carboniferous		
Devonian		
Silurian		
Ordovician		

Fossil A (a coral) ranges from Devonian to Carboniferous (shown by the shaded area under A). Fossil B (a coral) ranges from Ordovician to Devonian (shown by the shaded area under B). Where do Fossil A and Fossil B overlap? The overlap is Devonian (the darkened area). Notice that both fossils could have been living during the Devonian. The rock containing these two fossil corals is Devonian in age.

The diagram illustrates the completed procedure for two fossil corals. You will use this procedure to analyze data about various rock samples. Note that lines can be drawn to show the range of fossils rather than shaded areas.

Procedure

1. Prepare handouts of the page entitled "Determining the Geologic Age of Rocks Using Fossils" for each student.
2. Present the information from the "Introduction" to the students. This can be done orally with discussion, through the use of an advance organizer, developing and using a PowerPoint, etc.
3. It is recommended that this activity be done in small groups (such as three or four students). However, it can be done individually.
4. After the activity has been completed, the teacher could have different groups explain answers to different problems. Then, the class could discuss if they agree with that groups findings.

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Instructions:

Use the overlap method to determine the age of the rocks in the examples below. Read the description of types of fossils found in each rock sample. Refer to the Geologic Time Scale to determine the geologic age of each rock sample.

1. A student collected the following fossils from the Graham Formation in Texas. What is the age of the formation?

Pentremites (type of echinoderm) = Carboniferous

Lophophyllidium (type of horn coral) = Carboniferous to Permian

Archimedes (type of bryozoan) = Carboniferous to Permian

2. The following trilobites were found together in a shale. Using the geologic range of the different trilobite genera, determine the age of the shale.

Phacops = Silurian to Devonian

Illaenus = Ordovician to Silurian

Dalmanites = Silurian to Devonian

3. A student collected fossils from two formations. He used *Index Fossils of North America* to identify the fossils and determine their geologic ranges. Determine the age of the two formations.

Formation 1

Halysites (coral)

Ordovician to Silurian

Astraeospongium (sponge)

Silurian to Devonian

Eurypterus (arthropod)

Ordovician to Permian

Phacops (trilobite)

Silurian to Devonian

Formation 2

Pentremites (blastoid)

Carboniferous

Lophophyllidium (coral)

Carboniferous to Permian

Archimedes (bryozoan)

Carboniferous to Permian

Neospirifer (brachiopod)

Carboniferous to Permian

4. The following fossil assemblage was found in a limestone. Determine the age of the limestone.

Allorisma (bivalve) = Carboniferous to Permian

Bellerophon (gastropod) = Ordovician to Triassic

Aulopora (coral) = Silurian to Carboniferous

Loxonema (gastropod) = Ordovician to Carboniferous

Sphenophyllum (plant) = Carboniferous

5. The plant fossils listed below were found in a formation. Is it possible for dinosaur remains to be found with them? (Hint: Dinosaurs lived from the Triassic to Cretaceous).

Poplar = Cretaceous to Recent

Willow = Cretaceous to Recent

Gingko = Jurassic to Recent

Birch = Cretaceous to Recent

Fig = Cretaceous to Recent

6. A movie showed a group of primitive humans fighting a *Tyrannosaurus rex* (the large, famous, theropod dinosaur). Look up the geologic range of humans in a reference book or use a reputable web site (i.e. how long have humans existed?). Based on your findings, what is wrong with the movie script? Explain your answer.