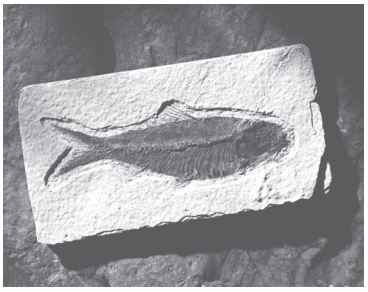
Sedimentary Rocks

Teacher's Guide
High/Middle School

Editors:
Brian A. Jerome, Ph.D.
Stephanie Zak Jerome

Assistant Editors:
Heidi Berry
Sara Herberger
Anneliese Brown

Visual Learning Company
Brandon, Vermont
1-800-453-8481
www.visuallearningco.com



Reviewers:

Gerald VanOrden
Earth Science Teacher
Dewitt Middle School
Ithaca, New York

Ray Coish Ph.D.
Geology Department
Middlebury College
Middlebury, Vermont

Sara Herberger
Former National Park
Service educator
Cleveland, Ohio

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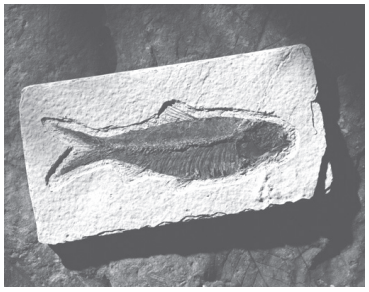

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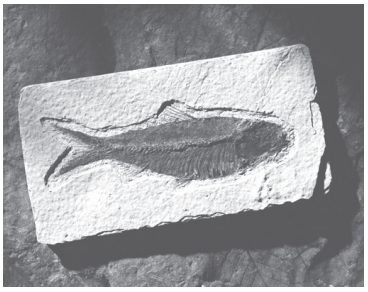

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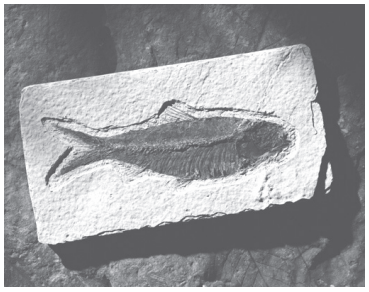


A Message from our Company ...

Dear Educator:

Thank you for your interest in the educational videos produced by the *Visual Learning Company.* We are a Vermont-based, family owned and operated business specializing in the production of quality educational science videos and materials.

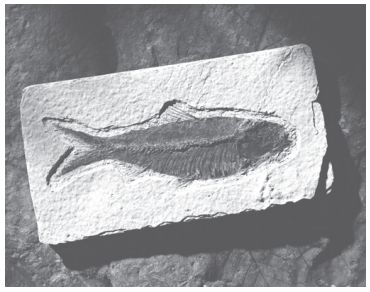
We have a long family tradition of education. Our grandmothers graduated from normal school in the 1920's to become teachers. Brian's mother was an elementary teacher and guidance counselor, and his father was a high school teacher and superintendent. This family tradition inspired Brian to become a science teacher, and to earn a Ph.D. in education, and lead Stephanie to work on science educational programs at NASA.

In developing this video, accompanying teacher's guide, and student activities, our goal is to provide educators with the highest quality materials, thus enabling students to be successful. In this era of more demanding standards and assessment requirements, supplementary materials need to be curricular and standards based - this is what we do!

Our videos and accompanying materials focus on the key concepts and vocabulary required by national and state standards and goals. It is our mission to help students meet these goals and standards, while experiencing the joy and thrill of science.

Sincerely,

Brian and Stephanie Jerome



Standards Correlations

National Science Education Standards

(Content Standards: 5-8, National Academy of Sciences, c. 1996)

Earth and Space - Content Standard D:

As a result of their activities in grades 5-8, all students should understand that:

- Some changes in the solid earth can be described as the "rock cycle." Old rocks at the earth's surface weather, forming sediments that are buried, then compacted, heated and often recrystallized into new rock. Eventually, those new rocks may be brought to the surface by the forces that drive plate motions, and the rock cycle continues.
- Fossils provide important evidence of how life and environmental conditions have changed.

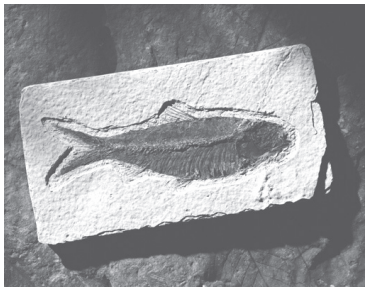
Benchmarks for Science Literacy

(Project 2061 - AAAS, c. 1993)

The Physical Setting - Processes that Shape the Earth (4C)

By the end of the 8th grade, students should know that:

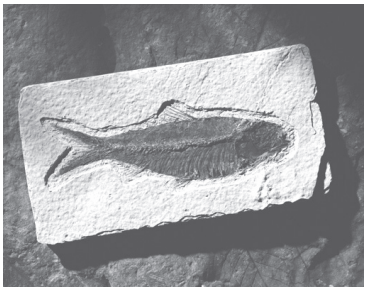
- Sediments of sand and smaller particles (sometimes containing the remains of organisms) are gradually buried and are cemented together by dissolved minerals to form solid rock again.
- Thousands of layers of sedimentary rock confirm the long history of the changing surface of the earth and the changing life forms whose remains are found in successive layers.



Student Learning Objectives

Upon viewing the video and completing the enclosed student activities, students should be able to do the following:

- Describe possible sources of sediments;
- Explain three ways sedimentary rocks are formed;
- Describe the role compaction and cementation play in the formation of sedimentary rocks;
- Define the term lithification;
- Differentiate between different types of clastic rocks, including breccias and conglomerates;
- Describe how organic rocks such as limestone and coal are formed;
- Explain how chemical rocks such as precipitates and evaporites are formed;
- Explain the different processes by which fossils may form; and
- Differentiate between mold fossils and cast fossils.



Assessment

Preliminary Test:

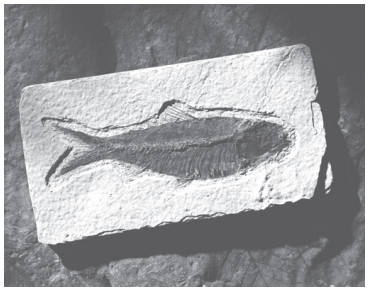
The Preliminary Test, provided in the Student Masters section, is an assessment tool designed to gain an understanding of student preexisting knowledge. It can also be used as a benchmark upon which to assess student progress based on the objectives stated on the previous pages.

Video Review:

The Video Review, provided in the Student Masters section, can be used as an assessment tool or as a student activity. There are two main parts. The first part contains questions titled "You Decide" that can be answered during the video. The second series of ten questions consists of a video quiz to be answered at the conclusion of the video.

Post-Test:

The Post-Test, provided in the Student Masters section, can be utilized as an assessment tool following student completion of the video and student activities. The results of the Post-Test can be compared against the results of the Preliminary Test to assess student progress.



Introducing the Video

Before showing the video ask students if they have ever walked on a sidewalk, or seen a picture of the Grand Canyon, or used a piece of chalk to write on a blackboard. Chances are they have experienced all these things. Next explain to them how these experiences relate to sedimentary rocks. Ask the students how they might go about making a rock from sand or other sediment. Chances are they will come up with the idea of compacting the sediment together and then cementing it with a glue-like substance. Finally discuss how they might go about making a fossil. After this discussion, tell student to closely watch the video for detailed explanations of these processes.

Video Viewing Suggestions

The Student Master "Video Review" is provided for distribution to students. You may choose to have your students complete this Master while viewing the program or to do so upon its conclusion.

The program is approximately 20-minutes in length and includes a ten-question video quiz. Answers are not provided to the Video Quiz on the video, but are included in this teacher's guide. You may choose to grade student quizzes as an assessment tool or to review the answers in class.

The video is content-rich with numerous vocabulary words. For this reason you may want to periodically stop the video to review and discuss new terminology and concepts.

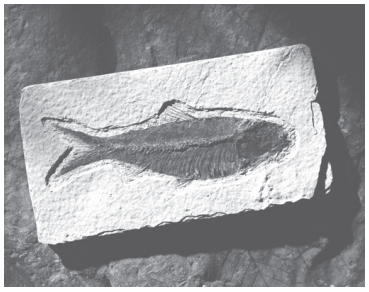
Student Assessments And Activities

Assessment Masters:

- Preliminary Test
- Video Review
- Post-Test

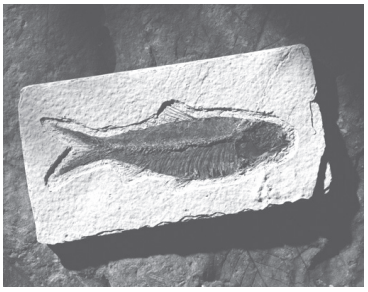
Student Activity Masters:

- Layer Cake Geology
- Sedimentary Rocks: A Virtual Field Trip
- The Perspective of Sediment
- Boulder, Cobble, or Pebble?
- Vocabulary of *Sedimentary Rocks*



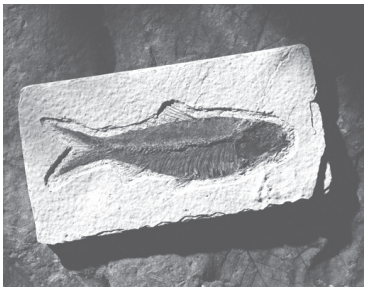
Video Script: *Sedimentary Rocks*

1. What do the following things have in common - the rocks in this canyon,...
2. …the stones in this building,...
3. …this fossil of a plant,...
4. …this rock being crushed to make concrete,...
5. …and this pile of burning coal, which is fueling this fire?
6. All these things are examples of sedimentary rocks.
7. We, directly or indirectly, benefit from sedimentary rocks everyday.
8. Every time you walk on a cement sidewalk, you are walking on a product made from sedimentary rocks.
9. When you use chalk to write on a chalkboard, you are using sedimentary rock.
10. And when salt is used to melt ice, you are using a sedimentary rock.
11. During the next few minutes we are going to take a look at some of the different types of sedimentary rocks and study some of their characteristics.
12. **Graphic Transition – Sediments**
13. **You Decide**! What do sedimentary rocks consist of?
14. They are made of sediments.
15. Sediments are small particles of loose rock, mineral, plant, and animal remains.
16. Sedimentary rocks are formed when sediments are pressed and cemented together, or when they precipitate out of a solution.
17. Where do all these sediments come from?
18. There are a variety of sources of sediments.
19. If you have ever been to the beach, you have seen millions of grains of sand particles, which are actually tiny pieces of rock...
20. …that have been scattered by wind,...
21. …water,...
22. …and ice.
23. While at the beach you may have also noticed pieces of dead animals, such as shells. These too get broken down into sediment.
24. And within seawater there are many elements.
25. All of these things have the potential to one day form sedimentary rocks.
26. Wind, water, and ice move sediments from one place to another in the process of erosion. When sediments come together. it is possible for sedimentary rocks to form.
27. **Graphic Transition – Formation of Sedimentary Rocks**
28. There are many different ways sedimentary rocks are formed. Let's look at an example.
29. This muddy river is carrying thousands of pounds of sediment.
30. This sample of water reveals thousands of particles. As rivers begin to slow down or empty into a lake, the sediments gradually fall, settling to the bottom.
31. Over time, layers of sediment slowly build up, eventually forming sedimentary rocks.
32. Sedimentary rocks are also formed in ocean environments. Here, close to the shore, larger particles of sand settle to the bottom to form sandstone.
32. Or where marine life is abundant, limestones may form.



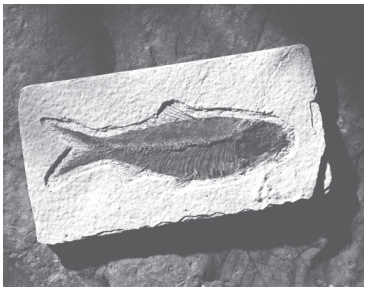
Script (cont.)

33. Whereas in deeper, less turbulent ocean waters, smaller particles settle to the bottom to form finer grained shales.
34. Large bodies of water once existed here in southern Utah. Over many years, the thick layers of sediment you see here were deposited.
35. As the layers got thicker, the weight of the top rock layers pressed down on the bottom layers of rock.
36. The spaces between the layers got smaller and water was squeezed out. Compaction is the process of overlying sediments pressing down on underlying sediments to become rocks.
37. Perhaps you have pushed down papers in a wastebasket down. This too is compaction.
38. As sediments are compacted, dissolved minerals in the water form a thin film around the particles,...
39. …binding them together in a process called cementation.
41. Lithification is the term used to describe the process of sediments forming into rocks.
42. **Graphic Transition- Rock Layers**
43. **You Decide**! What is the name of this large canyon?
44. If you said the Grand Canyon, you are exactly right!
45. The Grand Canyon, in the southwestern United States, is a mile deep,...
46. …and is made of many layers of mostly sedimentary rock.
47. A rock layer is a bed of rock covering an area.
48. The oldest layers are at the bottom of the canyon,...
49. …and the younger layers are towards the top, having been deposited on top of the older layers.
50. The Grand Canyon is an amazing place to study millions of years of sediments.
51. Every year millions of people from throughout the world come to see these marvelous, deep cut layers.
52. **Graphic Transition- Sedimentary Formation**
53. These strange looking rock formations are located in Bryce Canyon National Park.
54. **You Decide!** What are these formations called?
55. They are referred to as hoodoos. It's an African word meaning to "cast a spell."
56. These hoodoos are made primarily of limestone, a sedimentary rock deposited when shallow seas covered the area 40 to 60 million years ago.
57. Since then, the area was lifted and tilted, creating vertical cracks or joints.
58. Water and ice working through these joints carried away sediment,…
59. …leaving standing columns, spires, arches and walls.
60. Hard layers of rock capping the hoodoos protect the spires from rapid disintegration.
61. Vivid reds, pinks, yellows, and browns are the result of iron oxides staining the limestone.
62. **Graphic Transition- Clastic Sedimentary Rocks**
63. How would you categorize the following three sedimentary rocks?
64. You may have said color, but geologists use the shape and size of the grains to group these particular rocks called clastic rocks.
65. The word "clastic" comes from the Greek word "clastos," meaning broken. Clastic rocks are made of broken down pieces of other rocks.
66. Clastic rocks, also referred to as detrital rocks, are based on grain size and shape.
67. Different types of clastic rocks are made of varying sizes of rock fragments.



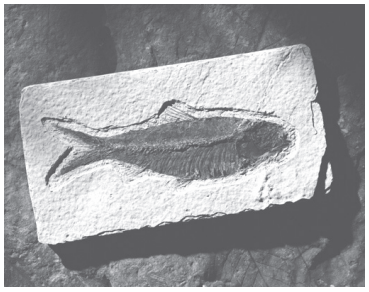
Script (cont.)

68. Conglomerates contain large rock fragments that are smooth.
69. Concrete is a type of conglomerate.
70. Whereas breccias contain rock fragments that are jagged.
71. Small particles, such as sand,...
72. …are cemented together to make sandstone.
73. Even smaller particles, such as silt and clay, form sedimentary rocks generally referred to as shale.
76. **Graphic Transition- Organic Rocks**
77. You Decide! What is the meaning of the word organic?
78. Organic refers to anything that is or was living.
79. Living things, as well as dead things, contain the element carbon.
80. Believe it or not, organic rocks are rocks made of once living things.
81. Limestone, seen here in Mexico in these ancient Mayan ruins, is an organic, sedimentary rock,...
82. …made up of once living corals, shells and other marine organisms.
83. These organisms, once dead, fall to the ocean floor, forming deposits of calcium carbonate which, when compacted and cemented, forms limestone.
84. Limestone is a very useful sedimentary rock;...
85. ...it can be used to make cement,...
86. …to build large structures such as the Hoover Dam,...
87. …and even to make house patios.
88. Another economically important organic rock is coal.
89. Coal, a type of fossil fuel, is commonly burned for heat,...
90. …and is often used in facilities such as this to generate electricity.
91. Coal consists of the remains of dead plants and animals deposited eons ago...
92. …in large swamps.
93. Graphic Transition- Chemical Rocks
94. Another method by which sedimentary rocks form occurs in solutions which are saturated with dissolved minerals.
95 These large structures were formed underwater when the lake level was much higher.
96. The lake water is saturated with dissolved substances, which include calcium and carbonate, seeping from underwater springs.
97. These substances form calcium carbonate, a whitish limestone material called tufa, which makes up these large towering structures.
98. Rocks such as tufa, which form as a result of chemical reactions, are referred to as chemical rocks. These chemical rocks are referred to as precipitates.
99. Precipitates are rocks formed from solutions which are saturated with dissolved minerals.
100. This is Death Valley, California. The valley, much of which is below sea level, is bathed in unmerciful heat for half the year.
101. It is the lowest point in the Western Hemisphere…
102. ...and is considered one of the hottest and driest, as well as one of the windiest points on the globe.
103. These forces combine to make it a very arid place.



Script (cont.)

104. It is so dry that a lake 20-feet, or 6 meters, deep would entirely evaporate in just a year.
105. Rain rarely gets past these high peaks.
106. The little rain that does fall occasionally accumulates in the low-lying areas of the valley.
107. These areas of water are usually only a few centimeters deep but they can cover vast areas.
108. Because of the intense heat of Death Valley, these ephemeral lakes quickly evaporate, leaving behind mineral deposits.
109. **You Decide!** What is this large expanse of white?
110. If you said a salt flat, you are right.
111. These deposits, found in Death Valley, California, are generally referred too as evaporites. Evaporites are formed when water evaporates, leaving behind dissolved solids.
112. Formations found in caves are another type of chemical rock.
113. They are formed when mineral rich water dripping into the cave evaporates, leaving behind these deposits of limestone.
114. Over time, these deposits can build to form quite large formations, such as these stalactites.
115. **Graphic Transition- Fossils in Sedimentary Rocks**
116. **You Decide!** What are these colorful objects lying on the ground?
117. These objects are petrified tree trunks.
118. These once living trees are the main objects of attraction here at Petrified Forest National Park in Arizona.
119. Millions of years ago, a lush forest blanketed the landscape.
120. The trees fell and were buried under water and layers of sediment.
121. Over time they became fossils.
122. Fossils are the remains of living things, or evidence of once living things.
123. There are many kinds of fossils.
124. One way fossils are formed is via petrification. In this process once living things are replaced by minerals.
125. These trees became petrified as minerals gradually replaced the once living cells in the wood.
126. Fossils very often form along with sedimentary rocks because organisms can be quickly buried by sediments
127. These dinosaur tracks are found in sedimentary rocks.
128. It is believed these dinosaurs were walking through moist sediments, which hardened. This type of fossil is called a trace fossil.
129. This plant fossil is referred to as imprint fossils and was created when the fallen plant left its impression or imprint on sediments.
130. Fossils can also form when a body of an organism creates a mold after being buried.
131. When the surrounding rock hardens, it leaves a hollow mold in the shape of the original organism.
132. If the organism decays and the mold fills with sediment which then hardens, a cast fossil forms.
133. Quite often, cast fossils look nearly identical to the original organism.
134. **Graphic Transition- Summing Up**
135. During the past few minutes, we have taken a look at some of the characteristics of sedimentary rocks.

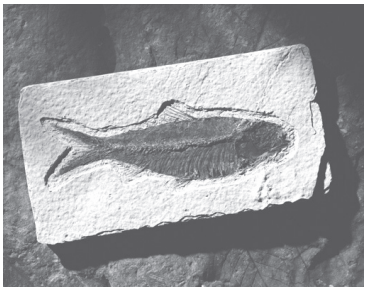


Script (cont.)

136. We have taken a look at how sedimentary rocks form when sediments are pressed and cemented together.
137. We took a look at how chemical sedimentary rocks are created.
138. We also studied how sedimentary rocks are categorized according to the shape and size of their sediments.
139. We investigated how some rocks, such as limestone, are created from once living things.
140. Finally we studied how sedimentary rocks provide a record of the past through fossils.
141. So the next time you walk on a cement sidewalk,…
142. …burn coal to heat something,…
143. …or look at layers of rock, think about the characteristics of sedimentary rocks.
144. You might just look at your world a little differently.

Fill in the correct word when you hear this tone ____. Good luck and let's get started.

1. Sedimentary rocks are made up of _____.
2. _____ occurs when the weight of layers presses particles together.
3. A ____ _____ is a bed of rock.
4. The _____ rock layers are at the top of the Grand Canyon.
5. _____ contain large, smooth rock fragments.
6. These hoodoos are made primarily from _____
7. Rocks which form as a result of chemical reactions are _____rocks.
8. _____ is the process in which once living things are replaced by minerals.
9. When an organism decays and the mold fills with sediment, a ____ fossil forms.
10. _____ rocks are rocks made of once living things.



Answers to Student Assessments

Preliminary Test

1. sediments
2. limestone
3. precipitates
4. clastic
5. bottom
6. lithification
7. cool
8. organic
9. evaporation
10. cast
11. True
12. False
13. True
14. True
15. False
16. False
17. True
18. False
19. True
20. True

Video Review

You Decide:

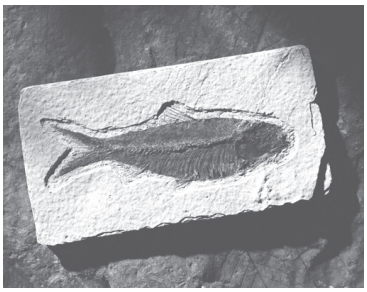
1. Sedimentary rocks consist of sediments and fragments of rocks.
2. This large canyon is the Grand Canyon.
3. These formations are called hoodoos.
4. Organic refers to anything that is or was living.
5. This large expanse is a salt flat.
6. These colorful objects are petrified trees.

Video Quiz:

1. sediments
2. compaction
3. rock layer
4. youngest
5. conglomerates
6. limestone
7. chemical
8. petrification
9. cast
10. organic

Post Test

1. True
2. False
3. True
4. True
5. False
6. False
7. True
8. False
9. True
10. True
11. evaporation
12. coal
13. sediments
14. lithification
15. precipitates
16. bottom
17. limestone
18. organic
19. clastic
20. cast



Answers to Student Activities

Layer Cake Geology

1. A. The cake appears rectangular with predictable, symmetrical layers.
B. One would expect to see this in sedimentary layers that have not been lifted or tilted. The Grand Canyon is a good example of a structure with many undisturbed, horizontal layers.
C. The oldest layers are at the bottom. There are no tilted layers in our example.
D. The inside is unknown without inspection. From the outside it looks as if the interior layers are flat and symmetrical.
E. To further inspect the layers it would be necessary to cut the cake or core into the cake.
F. In real life it is impractical to actually cut deep into the earth. However, it is possible to drill into the earth and take core samples.
2. A. The core sample from the center of the cake reveals frosting which represents an intrusive deposit.
B. This tells us that the configuration of the interior layers is no what one would expect by looking at the outward structure of the cake. A different material has been deposited in the area. It could represent molten rock that solidified to form intrusive rock.
3. A. The thick layer represents a new and unexpected area, or a thickened layer of similar stone that could represent oil containing stone, salt or another type of valuable rock, such as coal.
B. The results of multiple cores help explain how widespread the deposit is. It is possible to develop a geologic map of underlying rocks from multiple core samples.

Sedimentary Rocks: A Virtual Field Trip

Student findings will vary.

The Perspective of Sediment

Student stories will vary.

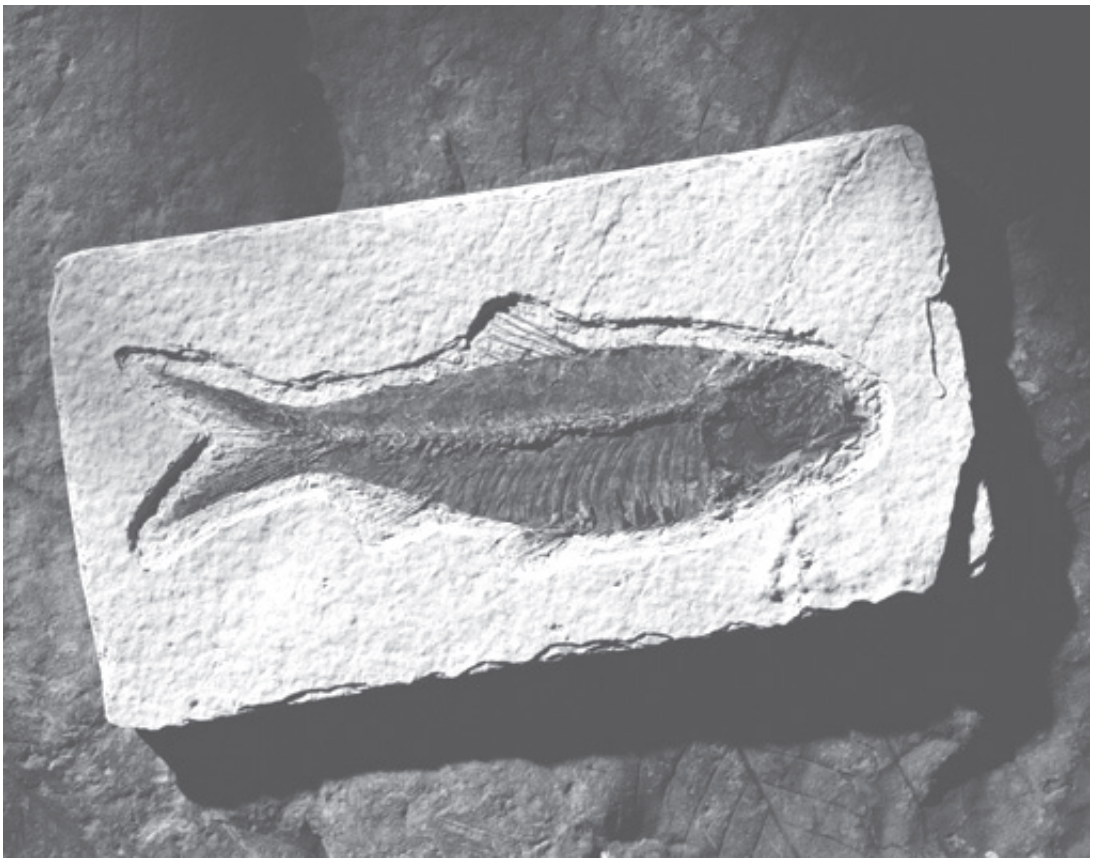
Boulder, Cobble, or Pebble

Student answers will vary.

Vocabulary

1) sediments, i
2) cementation, e
3) fossilization, b
4) lithification, c
5) fossil, h
6) clastic rocks, d
7) conglomerates, a
8) breccias, f
9) organic rocks, j
10) chemical rocks, g

Assessment and Student Activity Masters



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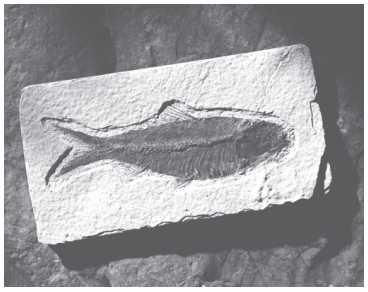


Preliminary Test

Directions: Fill in the blank with the correct word. A list of possible answers is provided at the bottom of the page.

1. Sedimentary rocks are made of _____ that have been compacted and cemented.

2. Hoodos are formed from _____, a sedimentary rock composed of marine organisms.

3. _____ are sedimentary rocks formed in mineral rich solutions.

4. _____ rocks are classified according to grain size and shape.

5. The oldest rock layers are found at the _____ of the Grand Canyon.

6. _____ is the term used to describe the process of sediments forming rocks.

7. _____ consists of the remains of dead plants and animals that were once deposited in large swamps.

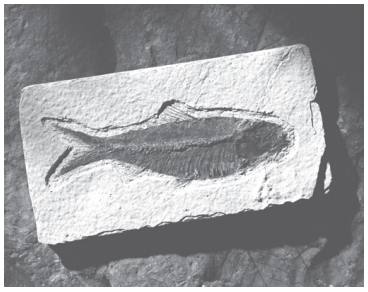
8. _____ rocks are composed of previously living material.

9. Chemical rocks are formed by _____ or chemical reactions.

10. _____ fossils look nearly identical to the original organism.

top	bottom
sediments	lithification
limestone	organic
precipitates	evaporation
coal	cast
clastic	imprint

Name_____



Preliminary Test

Directions: Decide whether the answer is True (T) or False (F).

11. Petrification is a form of fossil formation. T F

12. Weathering is the process that results in the movement of sediments. T F

13. Limestone can be formed from once living sea creatures. T F

14. A conglomerate is a type of sedimentary rock. T F

15. Fossils often form in igneous rocks because organisms can be quickly buried by sediment. T F

16. Coal is a metamorphic rock. T F

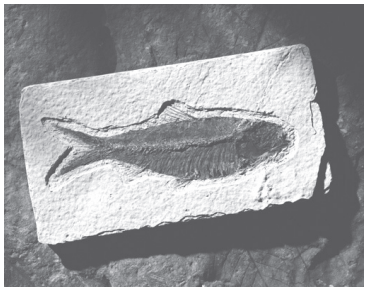
17. The lowest point in Death Valley is far below sea level. T F

18. Fossilized dinosaur tracks are an example of a cast fossil. T F

19. Salt flats are formed via the evaporation of salt solutions. T F

20. Precipitates are sedimentary rocks usually formed in the water. T F

Name_____



Video Review

Directions: During the course of the program, answer the "You Decide" questions as they are presented in the video. Answer the Video Quiz questions at the end of the video.

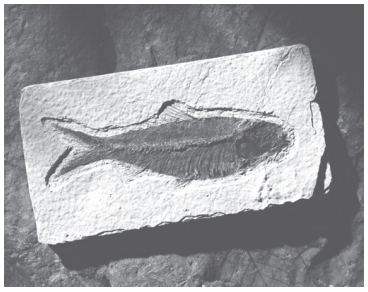
You Decide:

1. What do sedimentary rocks consist of? Answer _____
2. What is the name of this large canyon? Answer _____
3. What are these formations called? Answer _____
4. What is the meaning of the word organic? Answer _____
5. What is this large expanse of white? Answer _____
6. What are these colorful objects lying on the ground? Answer _____

Video Quiz:

1. Sedimentary rocks are made up of _____.
2. _____ occurs when the weight of layers presses particles together.
3. A ____ _____ is a bed of rock.
4. The _____ rock layers are at the top of the Grand Canyon.
5. _____ contain large, smooth rock fragments.
6. These hoodoos are made primarily of _____.
7. Rocks which form as a result of chemical reactions are called _____rocks.
8. _____ is the process in which once living things are replaced by minerals.
9. When an organism decays and the mold fills with sediment, a ____ fossil forms.
10. _____ rocks are rocks made of once living things.

Name_____

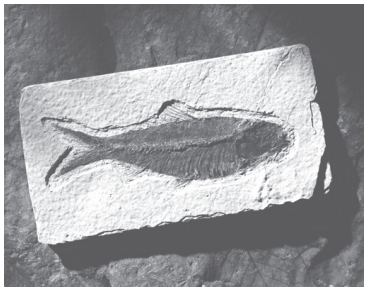


Post Test

Directions: Decide whether the answer is True (T) or False (F).

1. Limestone is formed from once living sea creatures. T F
2. Weathering is the process that results in the movement of sediments. T F
3. Petrification is a form of fossil formation. T F
4. Precipitates are sedimentary rocks usually formed in the water. T F
5. Fossils often form in igneous rocks because organisms can be quickly buried by sediment. T F
6. Fossilized dinosaur tracks are an example of a cast fossil. T F
7. Salt flats are formed via the evaporation of salt solutions. T F
8. Coal is a metamorphic rock. T F
9. The lowest point in Death Valley is far below sea level. T F
10 . A conglomerate is a type of sedimentary rock. T F

Name_____



Post Test

Directions: Fill in the blank with the correct word. Choose from the list of possible answers at the bottom of the page.

11. Chemical rocks are formed by _____ or chemical reactions.

12. _____ consists of the remains of dead plants and animals that were once deposited in large swamps.

13. Sedimentary rocks are made of _____ that have been cemented and compacted over time.

14. _____ is the term used to describe the process of sediments developing into rocks.

15. _____ are sedimentary rocks formed in mineral rich solutions.

16. The oldest rock layers are found at the _____ of the Grand Canyon.

17. Hoodos are formed from _____, a sedimentary rock composed of marine organisms.

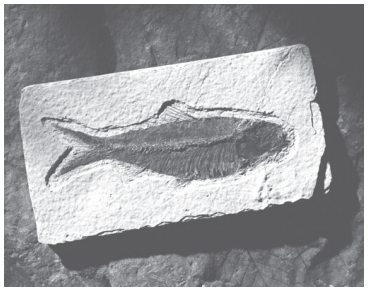
18. _____ rocks are composed of previously living organisms.

19. _____ rocks are classified according to grain size and shape.

20. _____ fossils look nearly identical to the original organism.

bottom	top
lithification	sediments
organic	limestone
evaporation	precipitates
cast	coal
imprint	clastic

Name_____



Layer Cake Geology-
Teacher Master

Objective: Students will take "core samples" of a layer cake to model rock structures beneath the earth's surface.

Background: Reacquaint yourself with sedimentary geology by reviewing two important concepts of layered rock: superposition (the progression of rock layers according to age, with oldest layers on the bottom and youngest on the top) and original horizontality (sediments are deposited in horizontal layers until forces change their orientation).

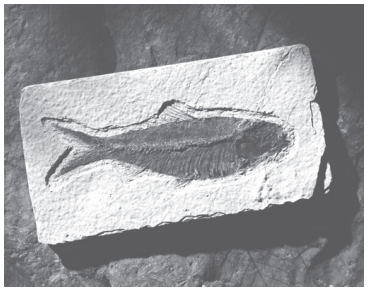
Materials

- Multiple-layer cake prepared according to the following instructions:
    1. Use a moist pound cake mix (or another dense, sturdy cake). One mix is sufficient for the activity if the layers are made thin enough.
    2. Bake 4 – 6 thin cakes (between 0.5 and 2.0 cm thick), each a different color (mix in food coloring before baking). Use square or rectangular pans.
    3. Trim the edges of the cakes if necessary so that all cakes are the same size. Stack the cakes in any order. Apply icing between the layers but not on the top or sides of the cake.
    4. Inject a big glob of icing in the center area of the cake, but underneath the surface so it cannot be seen. Do not tell students you did this!
- Knife for cutting the cake
- Three transparent plastic tubes (with a 1 – 2 cm diameter) at least as long as the cake is tall. Clear drinking straws could be used, but wider tubes produce better results.
- Pictures of non-horizontal (folded and/or faulted) sedimentary rock exposures (outcrops in mountains, canyons, road cuts, etc.).

Procedure

Display the cake in a central location where all students will have a clear view of it. The cake represents a portion of the earth's crust with the top of the cake representing the surface of the earth. Each different layer (including icing layers) represents a separate layer of sedimentary rock within the earth's crust. Provide students with the following student activity, which includes a description of the activity and questions to be answered upon its conclusion.

Name_____



Layer Cake Geology-

Student Activity

Activity

1. Your teacher will provide your class with a layer cake. The cake represents layers of sedimentary rock. Study the cake and answer the following questions.

   A. What does the cake look like from the side? Sketch it.
   B. Where on earth would you expect to see rock layers having this orientation?
   C. Which "sedimentary rock" layers are the oldest? Have any of the layers been tilted?
   D. What does the cake look like in the middle? Predict the appearance of the center of the cake. Sketch your prediction. How might you test your prediction? What tools or "equipment" would you need?
   E. How could you see the rock layers inside the earth?
   F. Is your test procedure practical for use on the real earth? What real tools or equipment would you need?

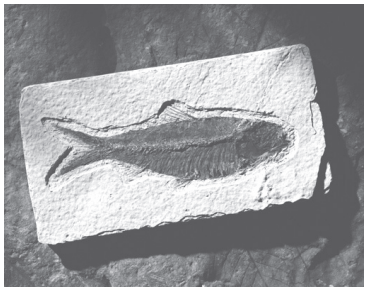
2. You may be tempted to cut into the cake to inspect its center. This test will work, but it will destroy the structural integrity of the cake. This procedure does not have a real-life counterpart, as the ability to "slice open" the earth is rare. Instead, do what geologists do - take several random core samples out of the cake to view its cross-section. Compare three (or more) core samples of the cake using the transparent plastic tubes. Sketch the layers in the three tubes and note the location of the tubes in the cake.

   A. Does the core sample from the center of the cake appear different from other samples? What geological structure does the center of the cake represent?
   B. What does this tell you about the layers of sedimentary cake and icing in that spot? How does that layer of icing differ from the layer in other areas of the cake, and what does this difference represent in a geological context?

3. The procedure of drilling holes into the earth to collect core samples is a practical way of determining what lies inside beneath the surface of the earth. This procedure is used extensively in oil and mineral exploration, and in ground water monitoring for pollution.

   A. Explain the thick layer of icing sandwiched between two sedimentary layers as if you were a geologist exploring for oil, salt, or pollution.
   B. How would you know if you had a trapped deposit in one location and not in another?

Name_____



Sedimentary Rocks:
A Virtual Field Trip

Objective: In this activity students will go on a virtual field trip on the Internet to gain a better understanding of the sedimentary rocks of the world.

Background:
At any given moment sedimentary rocks are being created, buried, altered, exposed, eroded, changed, studied, moved, built with, built on, and even climbed upon. In this investigation, you will use the World Wide Web to learn more about sedimentary rocks.

Go to **www.nps.gov** and **www.usgs.gov** or **www.nrcan.gc.ca/gsc** and **www.parkscanada.gc.ca** to get started. It is possible to go anywhere in the "world," from these pages, enabling you to access a wide variety of sedimentary rocks.

Procedure:
1) Brainstorm with your class or partners to create a list of sedimentary rock topics and determine ways to use the Internet to investigate these topics. Topics might include limestone rocks, Utah, rock climbing, sandstone buildings, clastic deposits, etc. Use your textbook for a quick reference of sedimentary rock terminology.

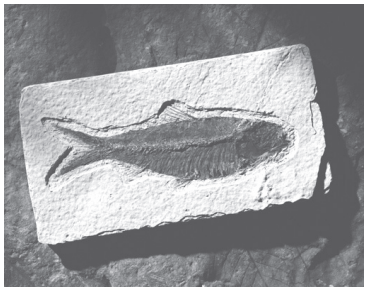
2) Your teacher will give you very specific instructions as to how to proceed. Follow his/her instructions carefully. Your class may be given a very specific assignment (i.e. Utah national parks with sedimentary rocks) or it may be more generalized (i.e. dinosaur fossils). Your teacher may give you a specific web addresses to work from.

3) Each student or working group will investigate the class topic using the Internet.

4) Write down or print out three interesting facts about sedimentary rocks that you learned from your investigation. Examples may include: a map, a landform description, a chemical composition of a rock formation, historical evidence of the formation of the rock, how the rock is used today, etc. You may need to do some follow-up research with books in the library (looking up the meaning of geologic terms or processes) or you may be able to print the information directly.

5) Place the information into a "class scrapbook." At the end of this activity, the class will have produced a virtual field guide of sedimentary rocks.

Name_____



The Perspective of Sediment

Objective: In this activity students will explore sedimentary rock formation from the perspective of sediment.

Background: In this unit we have gained knowledge of how a sedimentary rock forms. Take a minute to review the types of sedimentary rocks—clastic, organic, and chemical, and how lithification occurs by cementation and compaction. Also review some of the characteristics of sedimentary rocks and the different processes by which sedimentary rocks form.

Procedure:
In this activity you will write a children's story to explain to younger students how a sedimentary rock is formed.

Tell the story from the perspective of a piece of rock, a grain of mud, a fossil, precipitate, or evaporite. Name your sediment and create its characteristics. The plot should illustrate the process of sedimentary rock formation and dramatize your understanding of the special features of sedimentary rocks.

Make sure you cover the following points in your story:

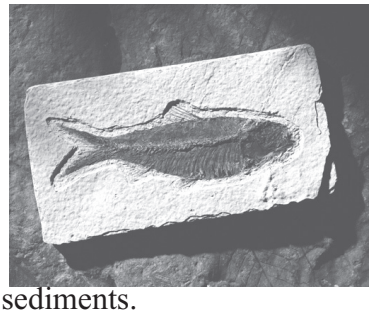
- What was the environment like when sedimentary rock formed?
- How was the rock formed?
- What is the rock made of?
- Why it is a sedimentary rock?
- Is it a clastic, organic, or chemical sedimentary rock and what does this mean?
- Are there any special features of the rock? (If it is a clastic rock, does it contain fossils? How did the fossils get there? Speculate how they might have been buried).
- Is the rock currently weathering or being built up? What does it look like right now?

The stories should contain colorful pictures or illustrations to help the younger children visualize geologic processes.

Remember this is a story, so you can be creative and imaginative. However, because you are writing the story for a young audience, be sure to convey information that is scientifically correct.

Presentation:
Invite a group of younger children (1st or 2nd grade) to your classroom from a local elementary school. Take turns reading your story to the younger children. Your class can even prepare a few hands-on activities about sedimentary rocks for the children.

Name_____



Boulder, Cobble, or Pebble?

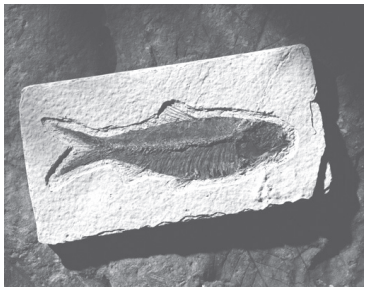
Objective: Students will simulate the lab technique geologists use to classify sediments.

Materials: (for each working group)
Several pieces of corrugated cardboard
Metric ruler
10-inch dinner plate
Lid to an 18 oz. jelly jar
Dried lentil
Dried couscous grain
Pile of various sized sediments rocks (cobble, pebbles, sand, and soil), preferably whatever is available the school grounds or other community area.
Hand lens

Procedure:
1) Lay the dinner plate face down on a piece of cardboard and trace around the edge. With scissors, cut out the circle. Any rock that cannot fit through this opening is classified as a **boulder**. Lay the jar lid on another piece of cardboard and trace around it. Cut out the circle. Rocks that will fit through the boulder opening but not through this opening are called **cobbles**. Lay the lentil on a piece of cardboard and trace around it. Very carefully, cut out this small circle and tape it in your lab notebook. Rock pieces which fit through the cobble opening but not through this opening are classified as **pebbles**. Lay the couscous grain on another piece of cardboard and trace around it. Very carefully cut or poke out this circle and tape it in your lab notebook. Any rock that goes through this opening are soil **granules**, most commonly either **sand**, or even smaller particles of **clay**.
2) Using your metric ruler, measure the circular openings. Record the measurements in the following chart.

Term	**Metric Particle size (cm or mm)**	**Number**
Boulder		
Cobble		
Pebble		
Granule		
Sand	0.006-0.2 cm (.06-2 mm)	
Silt or Clay	<0.006 cm (<. 06 mm)	

Name_____



Boulder, Cobble, or Pebble? (cont.)

3) Lay the pieces of cardboard on top of one another, with the smallest opening on the bottom and the largest on top. Using your pile of rocks and sediments, determine which are boulders, cobbles, pebbles, and granules. Record the number of each rock type in the chart.
4) Use a hand lens to observe the remaining soil. Try to distinguish rock material (inorganic soil) from organic matter (decomposing leaves, sticks, pine needles etc.). Separate the organic material if possible. From the remaining sediments, estimate the amount of remaining sand and silt particles. Record this estimation in the chart.

Discussion:
Geologists use size to describe rocks and rock fragments. The terms *boulder, cobble*, *pebble*, and *granule* are used to describe sediment that is made from igneous, metamorphic, or sedimentary sources. When rocks are weathered, they are broken into smaller pieces. Therefore, boulders become cobbles, cobbles become pebbles, and pebbles become inorganic soil. The largest soil particle is sand, which can be weathered into silt, which in turn, can be weathered into clay. These sediments are the building blocks for detrital or clastic sedimentary rocks.

Geologists use wire screens (sieves), each with different sized openings (sieves), to measure the sizes of sediment. These screens have different size openings and are usually stacked on top of one another, similar to your cardboard openings. All the rock material is placed in the top and sifted down layer-by-layer, becoming trapped in the correct sized screen. The sieves on the top have the largest openings and those on the bottom have the smallest openings.

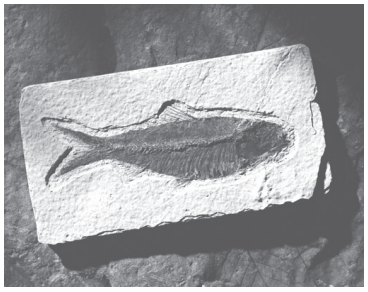
Answer the following questions in your lab notebook:

1) What was the most frequently occurring sediment size in your sample?

2) Predict what type of sedimentary rock would form if the sediments you studied in this activity were buried, compacted, cemented and lithified tomorrow.

3) How is your cardboard sorting system like a geologist's wire sieve? Explain how a geologist's sieve is more accurate.

Name_____



Vocabulary of *Sedimentary Rocks*

Sedimentary Rocks Vocabulary

___1) dientsems

___2) ttaonimeecn

___3) ontiaziilssof

___4) thiilcafiinot

___5) lisosf

___6) atciscl skocr

___7) atsenoclgoemr

___8) rbccesai

___9) nciarog sockr

___10) hcmeclai scokr

a. sedimentary rocks that contain smooth rock fragments

b. the process of preserving the remains or evidence of once living things

c. the process of sediments forming into rock

d. rocks composed of fragments of other rocks

e. “gluing together” of sedimentary rocks

f. sedimentary rocks that contain jagged rock fragments

g. rocks which form as a result of chemical reactions

h. evidence of a once living thing

i. small particles of loose rock, mineral, plant, and animal remains

j. rocks composed of once living things