Earth Revealed VIDEO #17: Sedimentary Rock

Video 17 SEDIMENTARY ROCKS: THE KEY TO PAST ENVIRONMENTS

This assignment can be found at: http://www.learner.org/resources/series78.html

0:00-1:45 Remarks by series host

Images of the Grand Canyon are shown. In 1869, John W. Powell performed the first geologic study of the Grand Canyon. Geologists read the layers of rock exposed at the Grand Canyon like a book of Earth's history. The layered sedimentary rocks provide evidence of past conditions on Earth and the life that lived on Earth throughout geologic history. The minerals contained in the rock, the rock's color, and the structure of the rock are just a few of the many characteristics studied in layered sedimentary rock.

1:46-3:01 Images

01 is the product of mechanical and chemical weathering and also of the wind, water; and ice. Biological activity also plays a role in producing sediment. Sediment may be deposited in a wide variety of ways and locations. When sediments pile up, the particles near the base of the pile are compacted under the overlying deposits. Eventually they are cemented together to form a solid aggregate rock. Although 95 percent of Earth's crust is composed of igneous and metamorphic rocks, the surface itself consists mainly of sedimentary rocks, or rocks formed from sediment. The composition of sediment is controlled by weathering and erosion**.**

3:02-5:22 Interview with Dee Trent, Citrus College (with images)

02 weathering breaks the rocks up into smaller pieces that can then be carried away by the agents of erosion. Mechanical weathering also provides more surface area for chemical weathering to affect rocks. **03** weathering changes the composition of certain minerals in preference to others. One of the most common forms of sediment is called **04** . Clastic sediments are classified according to size. They range from boulders downward to small cobbles and sand. Silt-sized and clay-sized sediments also exist. A montage of sediments being transported in three different ways is presented. Three ways in which sediments may be transported are sliding down a hill, being blown by the wind, and being carried by water Images of sediment in transport are shown. As sediment is transported, it tends to be smoothed and rounded. Heavier sediment falls out of the water first with the lightest sediment being carried the farthest. This process is called **05** Deposition generally occurs wherever there is slowing of the running water or other agent. The further away from the source of the sediment you are, the finer the type of clastic sediment that settles out. An explanation of where sand and other sediments get deposited is presented.

A. Chemical	**B. Clastic**	**C. Mechanical**	**D. Sediment**	**E. Sorting**

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5:23-6:25 Interview with Walter E. Reed, UCLA (with images)

Images of sedimentary rocks are shown. The **06** of sedimentary rocks is explained. The processes of **07** and cementation are described. Compaction and **08** (called **09** because the material that is used as cement precipitated out of solution) work together in the lithification process. Examples of **10** sedimentary rocks are shown.

A. **Cementation**	**B. Clastic**	**C. Compaction**	**D. Lithification**	**E. Precipitation**

6:26-9:09 Images • Interview with Dee Trent

Sedimentary rocks may also form from the precipitation of chemicals out of water. One common site of **11** is desert lakes and lagoons. As evaporation occurs, chemicals become increasingly concentrated in the water. Eventually they begin to precipitate out of solution forming **12** . Because evaporation causes the precipitation, these minerals are called **13** . Images show examples of calcite, gypsum, and salt deposits in Death Valley, a lake at Badwater, the desert floor, and playas. Chemical sedimentation also takes place in the ocean. Biological activity helps to trigger this phenomenon. Algae, coral, and invertebrate organisms all utilize **14** in the construction of shells and reefs. Images of the ocean shore, coral reefs, shells, and the sea floor are shown. When these organisms die, their hard parts accumulate on the ocean floor and eventually form limestone**.** Varied deposits of many different types of limestone are shown. Sedimentary rocks other than limestone are also formed by biological activity. In some locations, radiolaria and diatoms use silica to form their shells. When they die and settle to the bottom of the sea, the silica accumulates to form layers of chert and diatomite. The formation of **15** is described and images of coal deposits as well as the action that causes coal to form are shown.

A. **Coal**	**B. Calcium carbonate**	**C. Evaporites**	**D. Precipitates**	**E. Chemical sedimentation**

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9:10-11:27 Images • Remarks by series host

Montages of depositional environments are shown including a glacial valley, a lake, the ocean shore, a river delta, the sea floor, and reefs. These places of deposition are almost always associated with water, but may eventually turn into dry land. The Principle of **16** is described and examples of how geologists use this principle are presented.

11:28-17:40 Interview with Walter E. Reed (with images and animation)

Sedimentary rock structures are very useful to geologists. They allow geologists to reconstruct the environments of **17** **.** The structures are formed during the depositional process. Images of sedimentary rock structures are shown. Rock beds or layers and bedding planes separating rock strata are described and what they tell geologists is explained. Original **18** states that most bedding originally forms in a horizontal orientation. Reasons for rock beds not forming horizontally are shown. Footage of wind blowing sand over dunes and animation are used to show how and why tilted beds of sediment form. Animation shows the development of **19** in dunes, sand bars, and river deltas. Information about the depositional system and paleocurrent direction that geologists obtain from the study of crossbeds is presented. In-depth explanation of flow directions and the calculation of average paleocurrent direction are provided. Examples of **20** in sedimentary rocks are shown. Animation is used to show how ripple marks form and explanation is provided to describe how symmetric and asymmetric ripple marks are used to determine if paleocurrent was in one direction or back and forth. Mud cracks are shown in a variety of settings some filled with sediment. Explanation is provided as to what mud cracks indicate about the environment of deposition. Images are included of several different sedimentary rock structures and textures.

A. **Crossbeds**	**B. Deposition**	**C. Horizontality**	**D. Ripple marks**	**E. Uniformity**

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17:41 -22:56 Interview with Cathy Busby-Spera, University of California, Santa Barbara (with images and animation)

One place sedimentary rock records are being used to reconstruct the physical appearance of ancient landscapes is known as the Ridge Basin. Images of Ridge Basin with geologist Cathy Busby-Spera walking up to and looking at the bedding present in the rocks are shown. The very thick succession of fine grain deposits can be characterized as forming in a lake or **21** There are several lines of evidence that can be used to determine the **22** of the sediments at Ridge Basin. Several forms of evidence are illustrated in the rock outcrop and an explanation of how each type of evidence is used is presented. Also, close study of the microfossils present in some of the beds indicates deposition in fresh water. **23** and ripples are also used as indications of deposition in a lacustrine environment. Images of the lacustrine sediments and ancient shoreline are shown. Periodically rivers build into a lake forming a delta. Images of sediments showing characteristics of deltaic environments, thickening and coarsening upward through the sequence of sediments, are shown. Another sedimentary structure known as **24** indicates that the velocity of the river fluctuated over time. Animation is used to show how activity on the San Gabriel Fault might have caused a pull apart basin thus allowing a lake to form in the basin. A summary of the geologic history of the Ridge Basin is presented.

22:57-end Remarks by series host (with images)

In addition to reconstructing the history of Earth's surface, geologists use an understanding of the history of sedimentary rock to find economically valuable resources. Virtually all buildings and public structures require sedimentary rocks in their construction. Images of many uses of sedimentary rocks are shown. A summary of the geologic history of the **25** is presented as well as indications of the processes that are now working on the area.

A. Depositional environment	**C. Grand Canyon**	**E. Lacustrine environment**
B. Mud cracks	**D. Scour and fill**	