Introduction

Figure 4.19: The White House of the United States of America is made of a sedimentary rock called sandstone.

You probably recognize the **Figure** 4.19 as the White House, the official home and workplace of the President of the United States of America. Do you know why the White House is white? Its color has a lot to do with the stone materials that were used to construct it.

Construction for the White House began in 1792, and most of the work was carried out by people who had only recently come to the newly formed country of America. Its outside walls are made of a type of sedimentary rock called sandstone. The sandstone that was used to construct the White House is very porous, which means that rainwater can easily penetrate the sandstone. This made the White House susceptible to water damage in its early days of construction. To stop the water damage, workers had to cover the sandstone in a mixture of salt, rice, and glue, giving the White House its distinct white color.

Sediments

In this lesson, you will learn about sedimentary rocks like sandstone, how they form, how they are classified, and how people often use sedimentary rocks.

Recall from Lesson 4.1 that sedimentary rocks are formed by the compaction of sediments. **Sediments** may include:

- fragments of other rocks that have been worn down into small pieces, like sand
- **organic** materials, or in other words, the remains of once-living organisms,
- or chemical **precipitates,** which are materials that get left behind after the water evaporates from a solution.

Most sediments settle out of water (**Figure** 4.20). For example, running water in rivers carries huge amounts of sediments. The river dumps these sediments along its banks and at the end of its course. When sediments settle out of water, they form horizontal layers. One layer at a time is put down. Each new layer forms on top of the layers that were already there. Thus, each layer in a sedimentary rock is younger than the layer under it and older than the layer over it. When the sediments harden, the layers are preserved. In large **outcrops** of sedimentary rocks, you can often see layers that show the position and order in which the original sediment layers were deposited. Scientists can figure out the relative ages of layers by knowing that older ones are on the bottom and younger ones are on top.

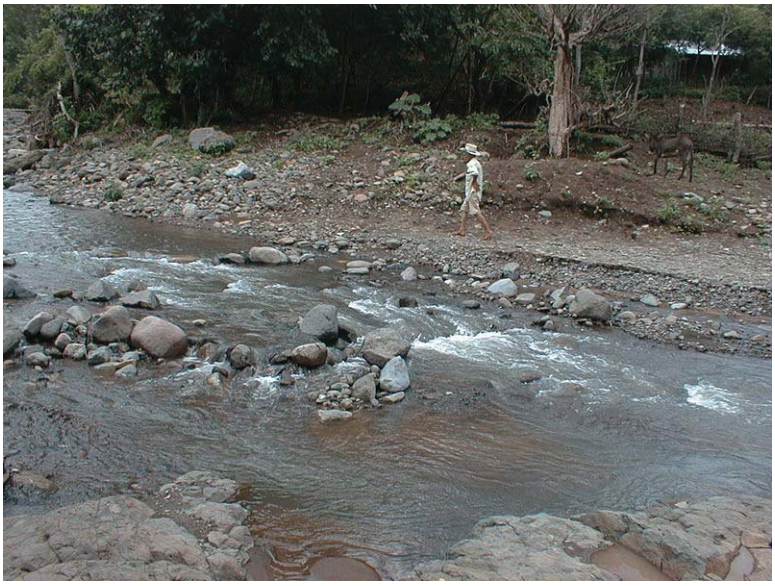

Figure 4.20: Most sediments settle out of running water, such as in this river.

There are many different types of environments where sedimentary rocks form. Some places where you can see large deposits of sediments today include a beach and a desert. Sediments are also continuously depositing at the bottom of the ocean and in lakes, ponds, rivers, marshes and swamps. Avalanches produce large unsorted piles of sediment. The environment where the sediments are deposited determines the type of sedimentary rock that will form there.

Sedimentary Rock Formation

Sediments accumulate and over time may be hardened into rock. **Lithification** is the hardening of layers of loose sediment into rock (**Figure** 4.21). Lithification is made up of two processes: cementation and compaction. **Cementation** occurs when substances crystallize or fill in the spaces between the loose particles of sediment. These cementing substances come from the water that moves through the sediments. Sediments may also be hardened

into rocks through **compaction.** This occurs when sediments are squeezed together by the weight of layers on top of them. Sedimentary rocks made of cemented, non-organic sediments are called *clastic* rocks. Those that form from organic remains are called *bioclastic* rocks, and sedimentary rocks formed by the hardening of chemical precipitates are called *chemical* sedimentary rocks. **Table** 4.2 shows some common types of sedimentary rocks and the types of sediments that make them up.

Figure 4.21: This cliff is made of a sedimentary rock called sandstone. The bands of white and red represent different layers of sediment. The layers of sediments were preserved during lithification.

Table 4.2: **Common Sedimentary Rocks**

Picture	Rock Name	Type of Sedimentary Rock
	Conglomerate	Clastic (fragments of non-organic sediments)

Table 4.2: (continued)

Picture	Rock Name	Type of Sedimentary Rock
	Breccia	Clastic
	Sandstone	Clastic
	Siltstone	Clastic
	Shale	Clastic
	Rock Salt	Chemical precipitate

Table 4.2: (continued)

Picture	Rock Name	Type of Sedimentary Rock
	Rock Gypsum	Chemical precipitate
	Dolostone	Chemical precipitate
	Limestone	Bioclastic (sediments from organic materials, or plant or animal remains)
	Coal	Organic
		

Note from the pictures in the table that clastic sedimentary rocks vary in the size of their sediments. Both conglomerate and breccia are made of individual stones that have been cemented together. In conglomerate, the stones are rounded; in breccia, the stones are angular around the edges. Sandstone is made of smaller, mostly sand-sized particles cemented together. Siltstone is made mostly of silt, particles that are smaller than sand but larger than clay. Shales have the smallest grain size, being made mostly of clay-sized particles and

hardened mud.

Lesson Summary

- Weathering and erosion produce sediments. Once these sediments are deposited, they can become sedimentary rocks.
- Sediments must be compacted and cemented to make sedimentary rock. This process is called lithification.

Review Questions

1. What are three things that the sediments in sedimentary rocks may be made of?
2. If you see a sedimentary rock outcrop and red layers of sand are on top of pale layers of sand, what do you know for sure about the ages of the two layers?
3. Why do sedimentary rocks have layers of different colors sometimes?
4. Describe the two processes necessary for sediments to harden into rock.
5. What type of sedimentary rock is coal?
6. Think back to the story at the start of the lesson about why the White House originally was white. Why do you think sandstone would be a particularly porous rock?

Vocabulary

crystal Solid substance that has a regular geometric arrangement.

outcrop Large rock formation at the surface of the Earth.

fossil Something that is left behind by a once-living organism, such as bones or footprints.

organic Made from materials that were once living things.

precipitate The solid materials left behind after a liquid evaporates.

compaction Occurs when sediments are hardened by being squeezed together by the weight of layers on top of them.

cementation Occurs when substances harden crystallize in the spaces between loose sediments.