

Sedimentary Rocks*Sandstone: My Story*

Many years ago, far longer than I'd like to remember, my life as a sedimentary rock began. Millions upon millions of tiny, sand-sized sediments, were transported by local streams from where they were fragmented in what is now the northeastern United States. When the stream could carry them no farther, they were deposited at the edge of an ancient ocean.

As time progressed these sediments became thicker and heavier. The great weight of water and sediment upon the particles compressed them until they were very tightly packed. Ever so slowly the water was forced out the tiny spaces and minerals were left behind to crystallize. These tiny crystals cemented the particles into place and I was born.

But, as most things do, I aged and changed over time. Many layers of sediment were placed upon me, some of very different color or size. When they compacted they formed strata which could easily be seen. I was uplifted and folded by tectonic processes and was placed above sea level. A roadway was cut through me and people driving by could see my many layers. They marveled at the graceful curves and lines produced during my upheaval. However, being exposed this way ensured my doom.

Year after year the harsh weather has broken tiny fragments off my face. Gravity tugged them downward where many were picked up by the water of a nearby stream and carried away. Someday, maybe these sediments will reach the sea and form a rock much like me.

Background

Sedimentary rocks are formed from one or more types of rock fragments called sediments. These sediments are subdivided into three types:

1. **Clastic:** particles of various sizes carried in suspension by wind, water or ice. Sand is an example of a clastic sediment. Silt and sand size particles are carried in suspension by wind, water and ice.
2. **Chemical or precipitated sediments:** carried in water solution. Salt is an example of a chemical precipitate.
3. **Organic:** precipitated or accumulated by biological agents. Many organisms promote the precipitation of calcite to form biogenically precipitated calcareous muds.

Sediments are classified on the basis of the origin, size and mineralogical composition of the particles. They are produced by the action of weathering and erosion that break down pre-existing rocks by physical and chemical processes. The sediment is then transported by wind, water or ice to the site of deposition.

The character of the sediment is determined by the extent of weathering and the type and distance of transportation. Some sediments are weathering in place with little or no transport (e.g.. laterites). Others may be transported over vast distances from mountaintop to ocean.

The transport agents wind, water and ice generate distinctive sediments that can be identified by the extent of particle abrasion and the degree of sorting.

This activity deals mainly with clastic sedimentary rocks. Here is a shortened table that shows the different sizes of fragment/sediments.



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CLASTIC SEDIMENTARY ROCKS

Clastic sedimentary rocks are classified according to the grain size of the particles or clasts that are cemented together to form the rock. For our purposes, we will discuss mudstones/siltstones, sandstones, and conglomerates. If you're confused, check the following table.

SEDIMENT	PARTICLE DESCRIPTION	ROCK NAME
Gravel	Rounded rock fragments.	CONGLOMERATE
Gravel	Angular rock fragments.	BRECCIA
Sand	Quartz predominant, visible grains	SANDSTONE
Silt	Quartz predominant, grains barely visible	SILTSTONE
Clay	Thick beds >1cm blocky, fine mud, no particles	MUDSTONE
Clay	Laminated mudstone, fissile, splits into thin sheets.	SHALE

Objectives:

Students will:

- demonstrate how stratification can occur within a single layer of sediment,
- understand the characteristics of sedimentary layers,
- demonstrate one way sedimentary rocks form from sediments under the water, and
- examine the effects of particles consisting of a different rocks/minerals, which are held together by some sort of "cement."

Part 1, Layering by Clast Size

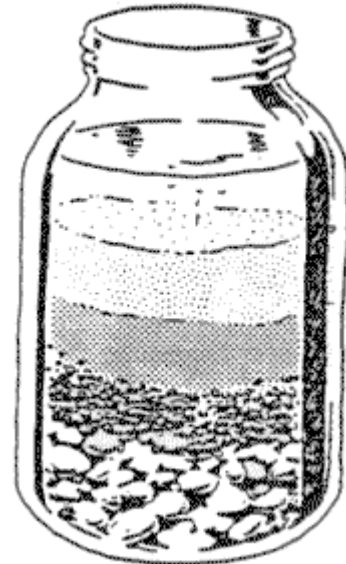
Sedimentary rocks are composed of different layers. These layers can consist of pebbles, sand, silt, or fossil fragments.

Materials:

glass jar with lid, water, rocks, pebbles, sand, and soil

Procedure:

1. As a group or individually collect rocks, pebbles, sand, and soil at school or home. Make sure the clast size is relatively small.
 2. Fill a jar about one-third full with the rocks, pebbles, sand, and soil or varying sizes. Add water. Seal the lid and shake jar carefully.
 3. Write a statement on what you predict will happen and why.
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4. Let the jar stand undisturbed for a few minutes and let the mixture settle. Describe what has happened below.



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5. Using a ruler, measure the thicknesses of the various sizes of the layers and graph the results below.

<i>Sediment Layer (top to bottom)</i>	<i>Clast Size Range</i>	<i>Layer Thickness</i>
Clay		
Silt		
Sand		
Gravel		

These sedimentary layers usually form in lakebeds and near running water. After a long period of time, they can form a conglomerate sedimentary rock.

Part 2, Making a Conglomerate Rock

Materials:

water, paper cup, 3 spoons of Epsom salts for each group, sand, gravel, magnifying glass

Procedure:

1. Fill the paper cup 1/2 full of water. Add the Epsom salts and stir until dissolved (warm water works best).
2. Add the sand, and gravel to the mixture and stir until everything is well mixed. Let sit undisturbed for several hours.
3. Pour off visible water as it appears over the next several days. It will take at least a week for the conglomerate to completely dry out.
4. Tear the paper cup away and examine the newly formed conglomerate rock with a magnifying glass. Make observations below.

Analysis and Conclusion Questions

Directions: Answer the following questions on a separate sheet of paper.

1. Where does deposition of sediment most commonly occur?
2. What is the meaning of "superposition" in reference to a layered sequence of sedimentary rocks?
3. How might one determine the original horizontality in a series of layers of sediment?
4. Describe how a sedimentary rock is typically formed.