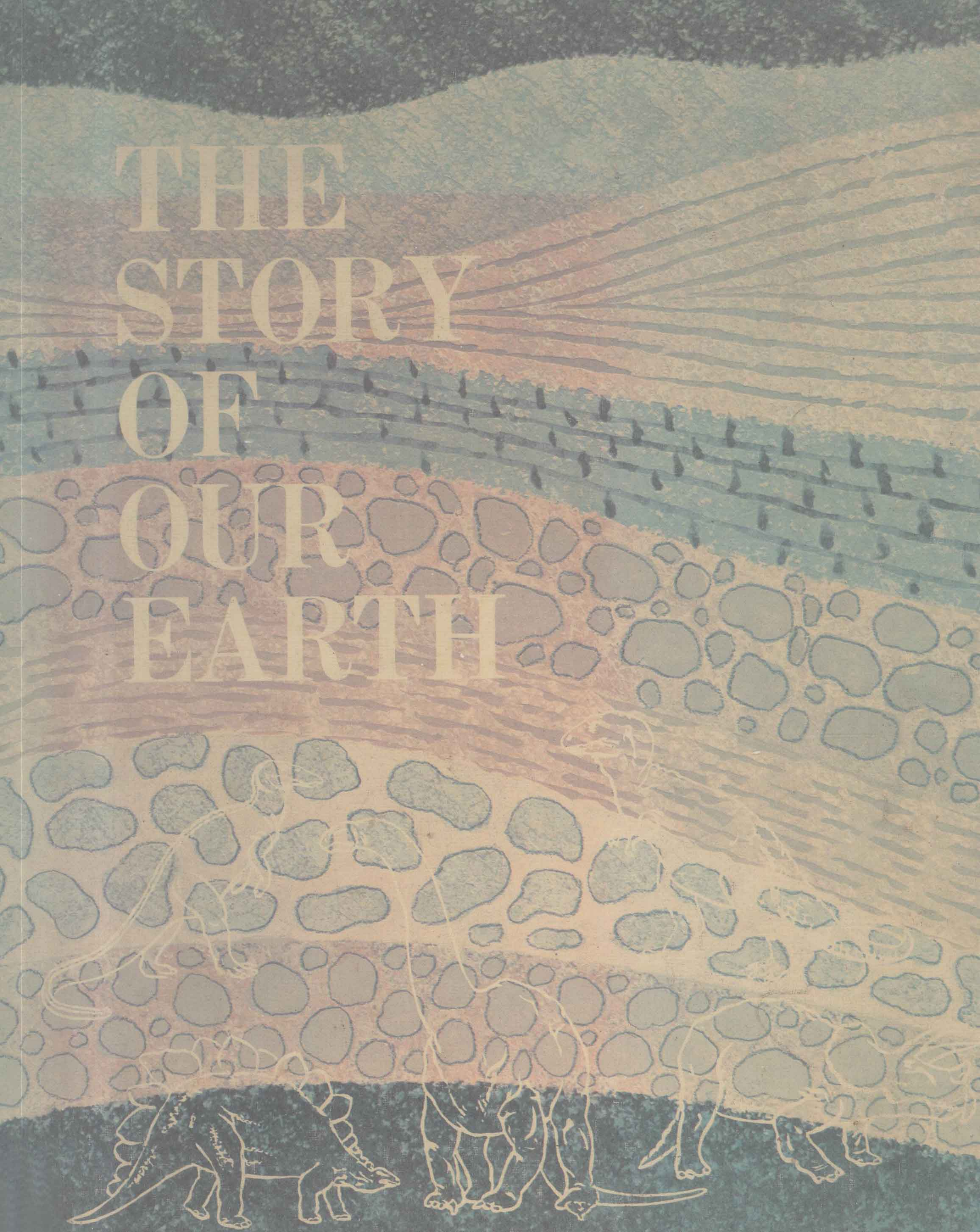
THE STORY OF OUR EARTH



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THE STORY OF OUR EARTH

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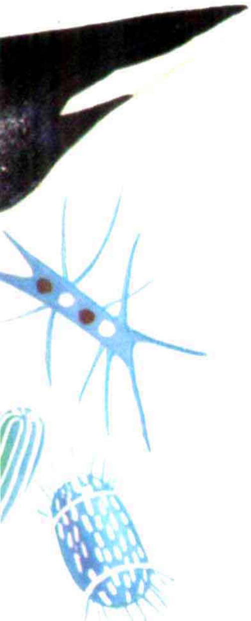
CHAPTER I

LEARNING ABOUT THE EARTH

How did the earth begin? What was it like millions of years ago?

Were the mountains and lakes always as they are today?



What did the first life look like, and when did it appear on the earth?

What were the ancient dinosaurs like? Why did they all die out? And what did early man look like?

These are only a few of the questions you may have already asked about our earth. Make a list of other questions you would like to ask. As you read, try to answer these questions. Also, try to find how questions about the earth are answered.

Maybe you have heard of geologists. What do you think a *geologist* does?

A geologist is a person who studies the earth. Some geologists study the rocks and minerals. Others study glaciers, earthquakes, or volcanoes, while still others study rocks to determine the history of the earth. This last type of geologist is called a historical geologist. It is this kind of geologist that we will be talking about. You may also want to know what tools he uses and how he has learned so much about past events which may have occurred millions of years ago.

We will try to introduce some of the methods the geologist uses. But first, let us take a quick look at the earth and how its history has been divided. Much is already known about the history of the earth. To make it easier to talk about, geologists have divided the time from the beginning of the earth to the present into a series of units. The largest of these units is called an *era.* An era covers millions of years of time. Each era represents a given portion of the earth's life. There are only four eras: the *Pre-Cambrian;* the *Paleozoic;* the *Mesozoic;* and the *Cenozoic.*

The first of these eras, the Pre-Cambrian, lasted by far the greatest amount of time. In fact, it covers 9/10 of all geologic time. It started when the earth began, and it lasted for more than 4 billion years. 500 million years ago, the next era, the Paleozoic, began. This era lasted for only 300 million years, a much shorter period of time.

Cenozoic Era	*Present day* *began* *about 60 million years ago*
Mesozoic Era	*Began* *about 200 million years ago*
Paleozoic Era	*Began* *about 500 million years ago*
Pre-Cambrian Era	*Began* *about 4½ billion years ago*

During the Paleozoic era, many changes occurred on the surface of the earth. Abundant life appeared first in the seas and then on the land. During the later part of the era, vast tropical forests covered large parts of what is now the United States. Burial of these forests eventually formed our valuable coal deposits of today.

Following the Paleozoic era is the Mesozoic era which lasted 140 million years. This also was an exciting time during our earth's history. It was the age of the dinosaurs, some of the largest animals that ever roamed our lands.

The last era, which brings us up to the very present, is called the Cenozoic. This is the shortest era of all, lasting only 60 million years. We know the most about this era, however, because it is the most recent. It was during this time that the earth began to take on the shape that we recognize today.

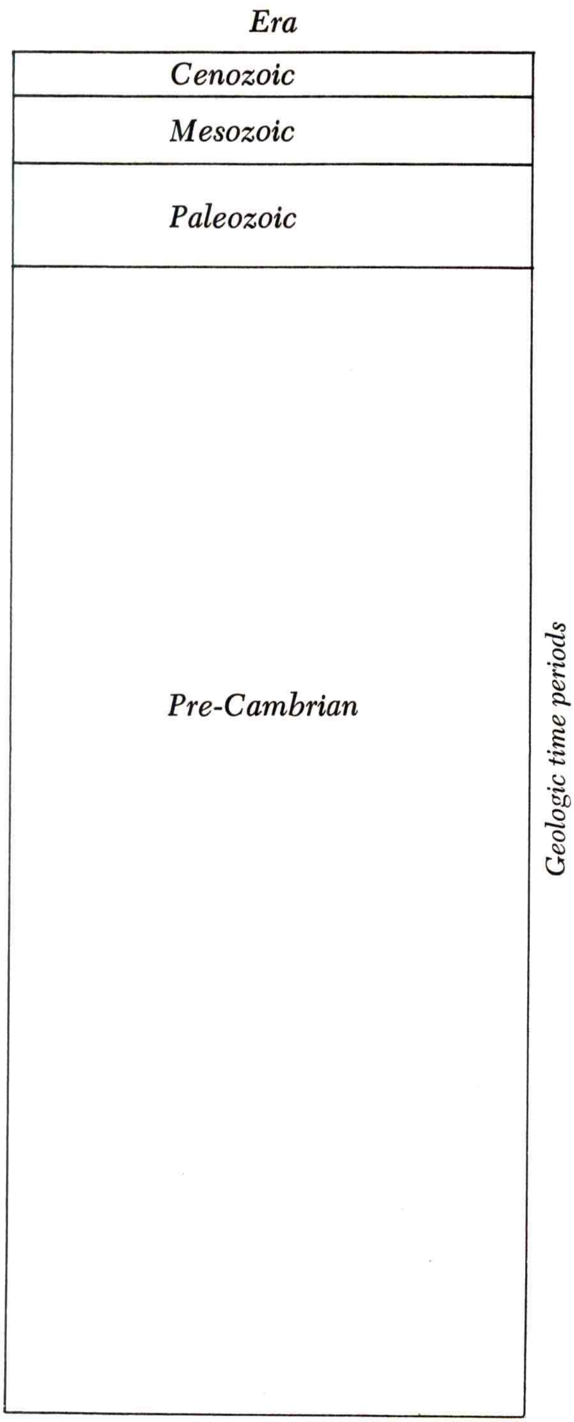
One of the most exciting events that occurred in the Cenozoic era was the huge series of glaciers that moved down from the north four times, covering much of what is now the upper part of the United States. Around the same time, man made his first appearance.

Tropical forest

Dinosaur

Glacier

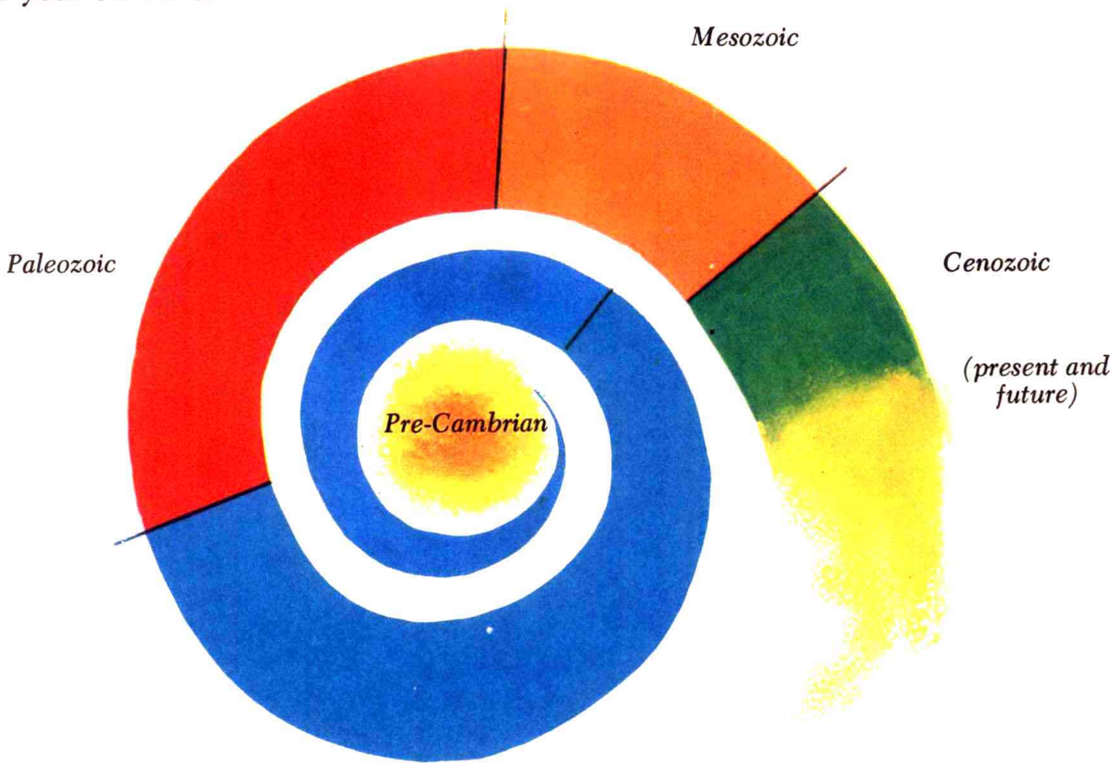
Caveman



Geologists have made a chart like the one on page 7 to show the four eras. They call this chart a *Geologic Time Table.*

Not all charts look the same. Another one might look like this. Study each chart. What is the difference between the two types of charts? What is the advantage of each one? Which do you think is better? Why?

Another type of chart might be in the form of a spiral. It could look something like this. Maybe you have still other ideas of a geologic chart that you could make for your own use.



Just for fun, it might be interesting to make a chart of geologic time, supposing that all of the events were to have occurred in just one year instead of during four and one-half billion years. When would the various eras and periods then have occurred?

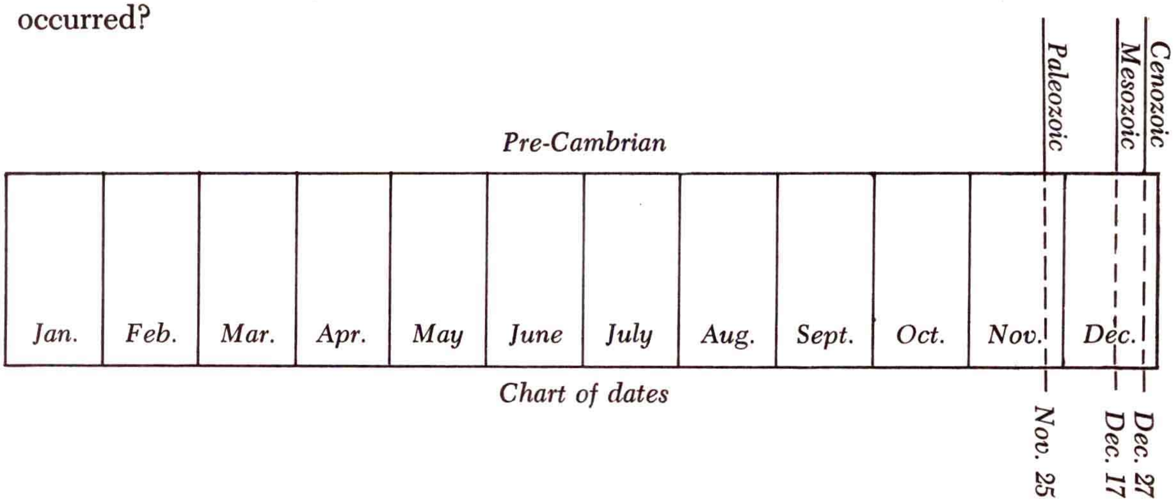
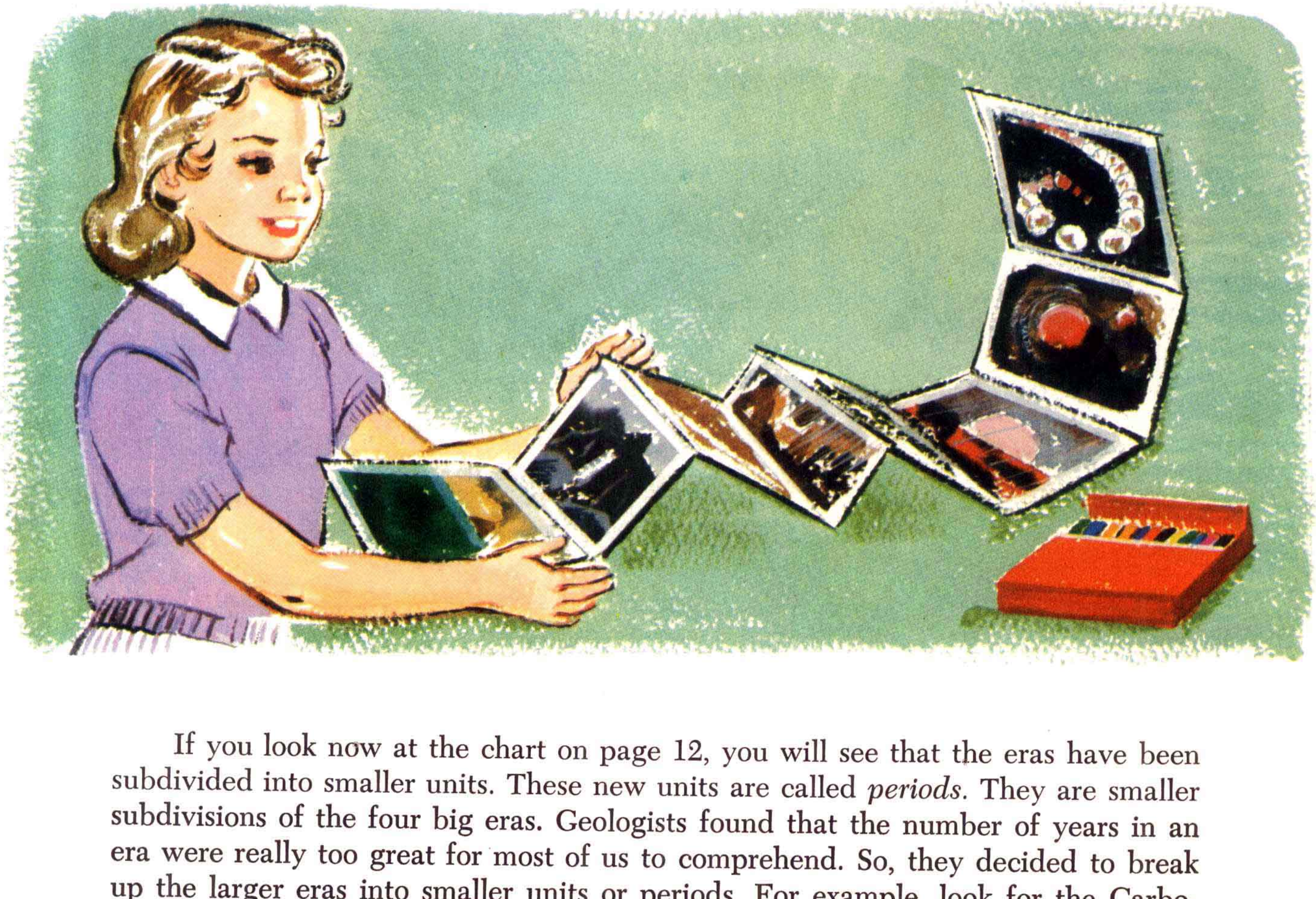


Chart of dates

You can easily make a chart of your own that folds out like an accordion. Individual pieces of paper can be put together with the use of scotch tape so that they will fold out into one long strip. You can add information to this type of chart after you have studied each chapter of the earth's history. You may want to draw pictures of the main events that occurred during each era, using these pictures as a record of your study of the earth. When completed, the chart will open out to display all of the events that occurred in the development of our earth.



If you look now at the chart on page 12, you will see that the eras have been subdivided into smaller units. These new units are called *periods.* They are smaller subdivisions of the four big eras. Geologists found that the number of years in an era were really too great for most of us to comprehend. So, they decided to break up the larger eras into smaller units or periods. For example, look for the Carboniferous Period listed under the Paleozoic Era. This was the time that we had the tropical forests that formed our coal. Can you tell how long ago this period began? When did it end? How long, then, did it last? Would you call this a large or a small part of all geologic time?

In looking at the chart, you will have to remember that the top represents the most recent times and the bottom represents the oldest times. Which occurred the longer time ago, the Carboniferous or the Cambrian Period?

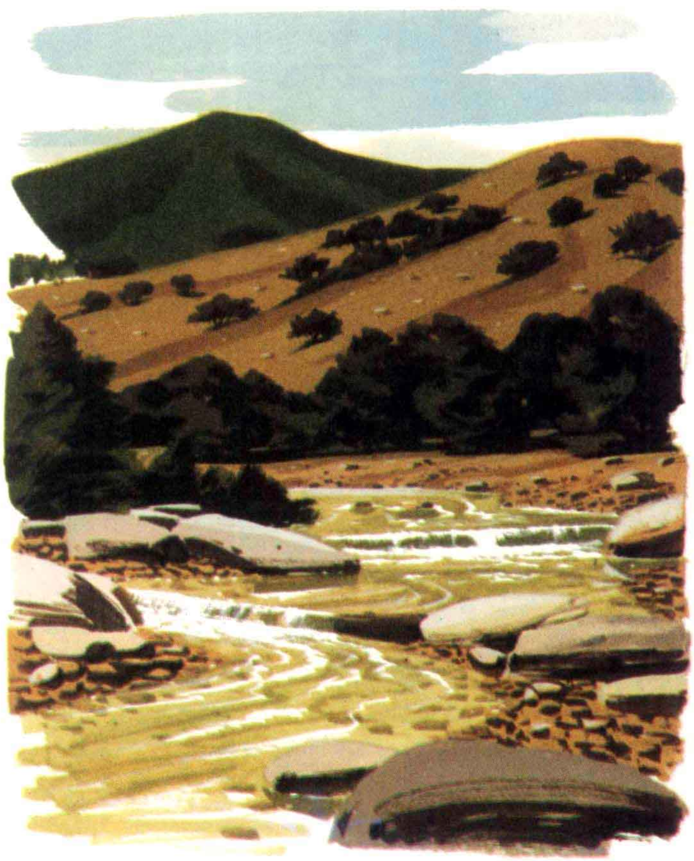
Era	*Period*	*Years Ago*
		(approximate)
Cenozoic		*60 million*
Mountain building – Rocky Mts. and Sierra Nevada		
Mesozoic		*200 million*
Appalachian Revolution		
Paleozoic	*Permian*	*230 million*
	Carboniferous	*290 million*
	Devonian	*330 million*
	Silurian	*360 million*
	Ordovician	*420 million*
	Cambrian	*500 million*
Pre-Cambrian		*4 1/2 billion*

But how did the geologist determine all this? How do we know what happened many years ago? And how do we know how long ago such things happened? Some answers are found by studying the rocks.

The historical geologist looks for different things in rocks than does the person who is looking for valuable minerals or beautiful stones. The historical geologist is trying to find out all he can about the earth.

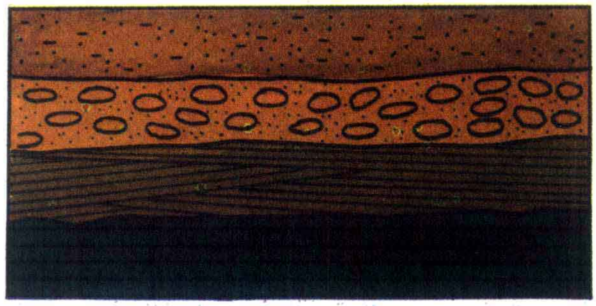
By studying the rocks, you can tell such things as the kind of climate, the types of life at any given time, and the conditions under which the rocks were formed. Rocks can tell us much about what has happened during their history. Let us take a typical sample of history to show this.

Every day rocks and mountains are slowly worn away by rain, wind, and ice. Have you noticed soil and small pebbles being carried away in water after a heavy rain? In just this way, tons and tons of material are carried in streams and finally dumped in stream beds, lake bottoms, and the ocean bottom.



Stream carrying soil and pebbles

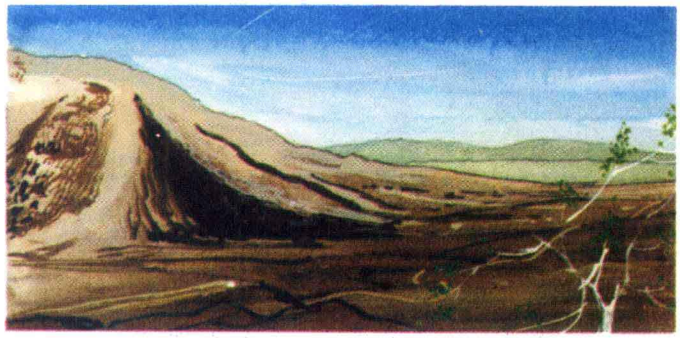
This material is laid down in nearly flat beds. Each new rain brings another layer which may be a different color or have a different appearance from the previous one. After millions of years, these deposits become pressed down and turned into rock. Thus, we have layers of rock representing deposits of different ages.



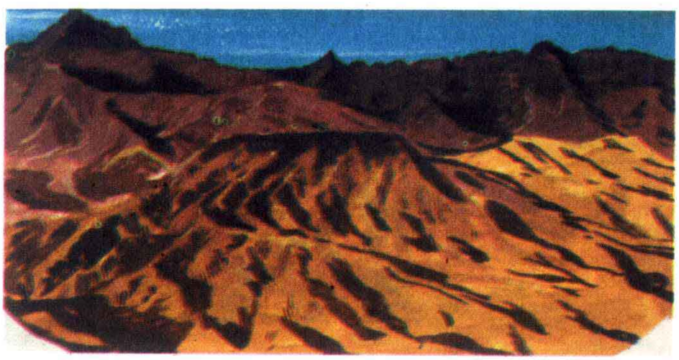
Layers of rock that are hardened deposits of pebbles, sand and mud

Maybe you have observed such layered-deposits in road cuts or along cliffs. Hunt for a place that has rock layers and make a sketch of it. What are the differences between the rocks in the various layers?

Where does all this material come from? It must come from the hills and mountains. Eventually, it might be possible to completely wear the mountains down to a flat plain. If this should ever happen, though, it would not last for long. The great volumes of sediments being deposited in the ocean would gradually tend to bend the ocean floor downward. Because these lighter-weight sediments would then become pushed down into the heavier rocks of the ocean floor, an imbalance would result. Therefore, periods of mountain building would occur which would push the sediments in the ocean floor upward and cause them to fold and buckle into new mountains.

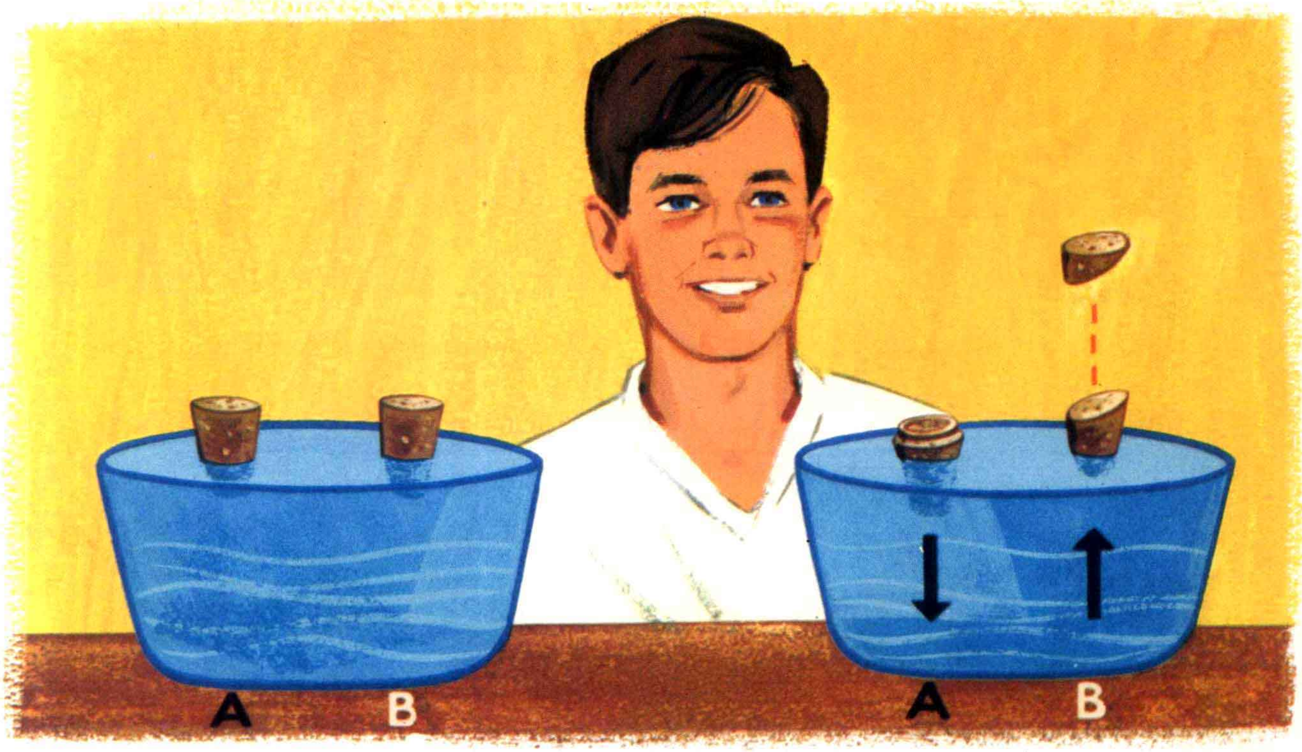


Mountains partially eroded down to a flat plain



Earth's crust raised up from the ocean floor and eroded

Why does all this happen? We don't really know the answer. Geologists have suggested many theories to help explain it. One theory likens the earth's crust to a cork floating on a very thick and sticky fluid. Put a nail or a heavy pin in the bottom of each of two corks. Float the corks in a pan of water. What happens when a cork becomes weighted down with additional material? Suppose we remove some material from the other cork. What will happen? Try it and see.

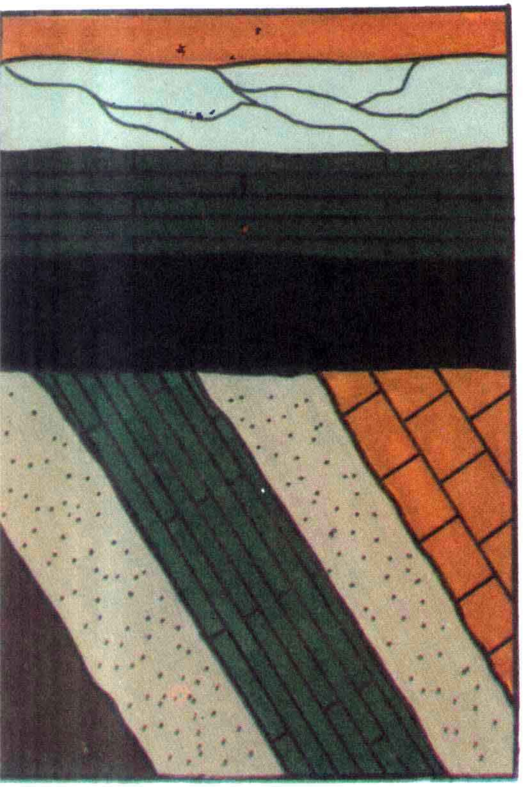


Corks floating in water

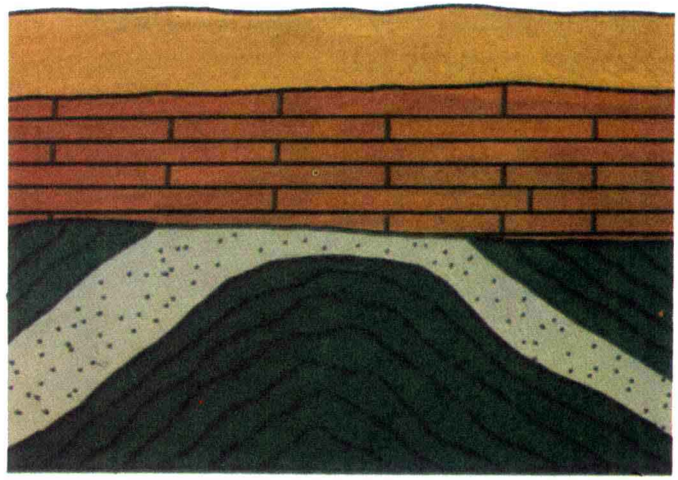
Material added to cork A. Part of cork B removed. What happens?

Can you compare the earth with what you discovered about the corks? How does this help to explain why mountains might rise when material is removed from them? Why do the oceans sink with all the sediments being deposited there?

When the new mountains are formed, the same thing happens over again. More rain wears away the new mountains and this, too, becomes deposited in the bottom of lakes and oceans. But this new deposit will be much younger than the previous deposits. Is there any way of telling them apart? Is there some way of telling what happened between the depositing of the two sediments?



Unconformity



Sediments deposited on older folded rocks

Look at the two illustrations above. The first sediments were warped and folded when the mountains were formed. They may also have been split by earthquakes or even intermixed with lava from volcanoes. These older rocks look quite different from the more recent evenly-layered sands and muds that would be deposited from new mountains.

This is a very important way that geologists are able to tell the relative age of rocks and what has happened on the earth during their formation. Whenever they see rocks that are quite different and do not seem to "fit" or conform, they call it an *unconformity*.

New mountains being worn down