GEOLOGY

How Mountains Grew

The Appalachians are the oldest mountains in North America. The Coast Range and the Cascade Range of the West Coast are the youngest.

By MARTHA G. MORROW

➤ MOUNTAINS ADD to the beauty of any scene. Majestic new mountains with their steep cliffs, many with their haughty peaks capped with snow, are rugged and awe-inspiring. Old, worn-down mountains with their gently sloping sides, some little more than hills with farms pushing their way to the very top, present a friendly, often orderly picture.

Each mountain has a story of its own. Some were formed by slow but gigantic upheavals of the earth's crust along with numerous other mountains in the neighborhood to make long chains. Others came into being through a slipping, contracting or blistering of the earth's crust in one place only. The past of some is written on their face with the age plainly evident; others keep their secrets well hidden.

The oldest mountains in North America are the Appalachian Mountains. This narrow range is 1,500 miles long and includes the Blue Ridge, the Smokies, the Adirondacks and White Mountains of New Hampshire. The range rises from beneath the coastal plain of Alabama and extends northeastward into Nova Scotia and New Brunswick, where it loses itself in the sea.

Thousands and perhaps hundreds of thousands of years passed while the Appalachian Mountains were being folded and uplifted. The range probably reached the height of its formation, however, about two hundred million years ago.

Earth's Crust Crinkled

The Appalachians were formed by the crinkling of the earth's crust which brought places dozens and hundreds of miles closer together than they had been originally. Since then the mountains have been worn down to level plains, and etched out by erosion so the ribs of the range are clearly seen.

The youngest mountains on the continent are probably those of the Coast Range that borders the Pacific Ocean from Mexico to Canada, and the Cascade Range that extends from Oregon up into British Columbia. They received their maximum growth within the last ten to twenty million years. These long ranges are composed largely of dead volcanoes, plug domes, and buried volcanoes that arched the rocks above them.

The entire Pacific Ocean is bordered by a region of actively growing mountains, volcanoes and earthquakes. From the tip of South America, up around Mexico, the United States, Canada, the Aleutian Islands, on around to Japan, the Philippines and Australia, mountains still are growing.

An extinct volcano on San Benedicto Island, 780 miles south of San Diego, Calif., erupted this summer. Earthquakes such as those recently felt in California may be the "growing pains" of mountains.

Highest Mountain Peak

Parallel to the Coast Range and farther inland lie the Sierra Nevada Mountains. This region was once low and flat. Then millions of years ago the land began to shift, rising and breaking into long blocks with the western side of the blocks tipping upward. Later the blocks were carved and shaped by glaciers to form some of the highest mountain peaks in the United States, some comparable to the Alps in steepness.

In the Sierra Nevadas one finds Mt. Whitney, with its peak a little over 14,500 feet above sea level. It is the highest point in the continental United States and dominates the range.

The highest point in the North American continent, however, is in Alaska. Mt. McKinley, which rises to a height of 20,300 feet, resulted from spectacular sculpturing by glaciers on older rocks. This sculpturing is going on even today.

The Rocky Mountains extend from Mexico through New Mexico, Colorado, Wyoming, Montana, and on up to the Arctic Circle. Created some sixty million years ago by the shifting and shrinking of the earth's crust, they show the effects of ancient volcanic eruptions and erosion by glaciers.

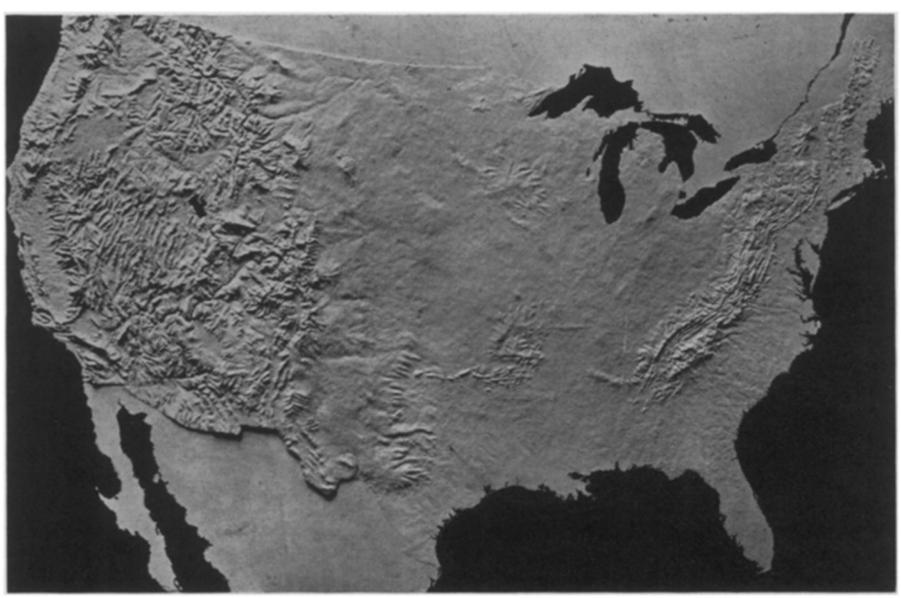
The Coast Range, the Sierra Nevadas, the Basin Ranges, the Wasatch Range and the Rockies are separated from each other by desert plains and basins. On a relief map they look like the ribs of an ancient sailing vessel, pointing toward Mexico, protruding through the sand. Though relatively near together, they were formed from parts of the earth's crust that in themselves show widely differing early histories.

Cannot Predict Development

The Black Hills, an isolated dome-shaped group of mountains in South Dakota, were probably formed some sixty million years ago at the time the Rockies began to rise. The Ozarks, although older, are somewhat similar, being part of a broad, dome-like plateau related to the Appalachians. Abrupt heights, characteristic of mountains, are not prominent here.

In between the Appalachians and the Great Plains at the foot of the Rockies the land is relatively low and flat. Only gently rolling hills vary the landscape.

Geologists cannot attempt to predict when the next mountain range will de-



RELIEF MAP OF U. S.—The principal mountain ranges of the United States stand out clearly on such a relief map, prepared by the U. S. Geological Survey.

velop or where. The now swampy coast of Louisiana and Mississippi, and of the adjacent Gulf of Mexico, however, seems a likely place. This region is somewhat similar to the area that later became folded into the Appalachian Mountains.

The great Mississippi and other rivers have deposited so much sediment in the Gulf of Mexico that the upper layers of our earth's crust are much thicker here than in most other regions. Such an area, because of the tremendous load on the earth's crust, is a likely spot for the localization of the terrific forces that build mountains.

Clue to Formation

If you look at a freshly cut roadbed, or the bank of a stream that has cut its way through rocks, you will get a hint as to how some mountains are formed.

Often the rocks, instead of lying parallel to the stream, are quite deformed. When banded with layers of different materials laid down thousands of years apart, you can easily see how they have been changed. Those that arch upward like the back of a mad cat suggest how the earth's crust was folded to form a mountain. Other rocks end abruptly, some obviously having been pushed or slid on top of neighboring rocks. These tell of another manner of mountain-making.

Mountains usually betray their age, but they are coy about it. It is fossils, often found in the rocks that make up the mountains, that give a clue as to how long ago they were formed. If the age of the youngest fossil-bearing rocks involved in the mountain range can be learned, geologists know that the mountains are younger than these fossils. And if other rocks, still younger, lie around the edges of the mountain range and were not folded with the mountains, they know that the mountains are older than the undeformed rocks. Thus some hint as to the time of formation can often be obtained.

Varying Theories on Creation

Experts disagree as to just how the mountains that we admire today were created millions of years ago. But a number of interesting theories have been advanced which suggest how these masses of rock and stone may have been pushed so high above the sea.

Contraction of the earth as it cools has long been believed to cause mountains. In shrinking, the more rigid rocks of the earth's crust have to wrinkle to fit a smaller inner core, just as the skin of an apple wrinkles when it dries. Thus some believe mountain ranges and the low places were created.

But recent radioactive studies show that the earth as a whole is probably not becoming appreciably cooler. Until this and other objections are overcome, this once popular theory seems discredited.

The convection theory concerns irregularities in the heating of the inner material of the earth. Convection currents thus created set up rising currents in some places, descending currents in others. Where there are down-sinking currents, the crust of the earth overlying this core is dragged downward too; where there are rising currents it is pushed upward.

Thick Earth Crust

Seismographic studies, however, indicate that the earth's crust is at least a few hundred miles thick. Its great thickness and the strength of the rocks make it difficult for us to imagine currents, similar to those in hot water heaters, strong enough to break and move the earth's crust.

Almost every schoolboy has noticed how the coasts of North and South America seem to fit into those of Europe and Asia. It is as though they were once part of the same body of land, then drifted apart. Those who believe that the continents actually did slide apart explain that the mountains on the Pacific Coast were raised at that time along the front of the moving continent like waves by the prow of a ship.

Some of the loveliest of the country's mountains have been set aside as national parks, forests and preserves. Open to the public, they are favorite vacation resorts. Other mountains lie nearer at hand if you will only take the time to look at them and speculate as to how they came into being.

Science News Letter, November 8, 1952

ENGINEERING

Indicator Tells How Good Landing Was

➤ IN CASE carrier-based pilots can not tell from the bump how good their landing was, a "two-eyed observer" on the landing deck can. It has the verdict ready by the time the pilot steps from his cockpit.

The mechanical watcher was designed to reveal how fast experimental airplanes come in for a landing on aircraft carriers. It supersedes photographic methods that required several days to interpret.

The device sends out two parallel beams of light, one above the other. When the plane intercepts the top beam, a mirror on the plane reflects some of the light to a photoelectric cell in the "watcher." As the plane descends further, the same thing happens to beam number two.

The first beam interception starts a condenser charging inside the device. The second interception stops the charging. The "watcher" gets its professional opinion, accurate to within 0.4 foot per second, from the amount of the electrical charge built up on the condenser during the elapsed time.

Called the Touchdown Rate of Descent Indicator, the device is being built by North American Aviation, Inc., and has been tested successfully by the Navy aboard the aircraft carrier Midway.

Science News Letter, November 8, 1952

Rheumatic diseases of one sort or another affect more than 10,000,000 persons in America 14 years old or older.