

FIGURE 5.13,

The lateral movement of plates along the San Andreas fault in California. Displacements of distinctive geologic formations indicate that during the past several million years, movement has been at a rate of about 1 centimeter (0.4 in.) per year in northern and central California. Measurements of displacement that has occurred during the last century indicates an average rate of recent movement of about 5 centimeters (2 in.) per year.



Asia 50 million years ago. The force of this collision wrinkled and elevated the Earth's crust into the Himalayas (continued uplift is still in process today). Similarly, the Alps were probably formed when Italy was driven like a huge nail into Europe by the African plate.

Plates are also known to slip laterally past each other. The infamous earthquake-causing San Andreas fault in California is due, not to the collision of two plates, but to their lateral movement in opposite directions (see figure 5.13). The western plate which includes Los Angeles, Baja California, and the ocean is moving northward. The eastern plate which comprises the continental United States including most of California is moving southward. If these movements continue, Los Angeles will one day, 50 million years from now, be in Alaska. It will pass what is left of San Francisco on the journey north. Lest southern California real estate investors became nervous about the climate in Alaska, it should be pointed out that their real estate is moving only at the snail's pace of less than one inch a year.

Californians should be far more worried about earthquakes. The plates don't appear to move at a uniform rate along their boundaries at the fault line. Instead they build up tension and stress like a spring or rubber band. When the frictional bond finally breaks, the elastic strain of energy is released in the form of intense seismic vibrations called an earthquake. The last truly large movements along the San Andreas fault were felt in the destructive San Francisco earthquake of 1906 and the earthquake of 1940 in the Imperial Valley in southeastern California. Geologists predict that another large quake is in the offing in the near future.

Earthquakes and volcanic activity are most common at or near plate boundaries. The famous "ring of fire" around the volcanic island arc of the eastern Pacific Ocean is a good example of such a plate boundary. Peru and Chile also lie on an active plate boundary and are known for devastating earthquakes.

In a broad sense, nothing is fixed in place. We have seen in Chapter 1 that all the galaxies in the Universe are moving away from each other at enormous speeds. Our Solar System is revolving about the center of the Milky Way Galaxy, and the Earth is revolving around the Sun. The Earth itself is spinning around its own axis requiring twenty-four hours for a complete rotation. Here on Earth the oceans of the world have changed position over time. The water molecules themselves have been recycled through the atmosphere and fresh water systems about once every 2 million years.