

What causes earthquakes?

An earthquake is the violent shaking of the Earth caused by a sudden movement of rock beneath its surface. Rocks respond to stress (squeezed or pulled apart) near the Earth's surface by breaking, and when rocks move along either side of a fracture, it is called a fault. The land around a fault may shift horizontally, vertically, or a combination of these motions (see Figure 1). The force that causes the stress within the rock is a result of movement of giant sections of the Earth's crust (see Figures 2 and 3).

Plate tectonics

For hundreds of millions of years, the forces of continental drift have reshaped the Earth. Continental drift is based on the idea that the continents bumped into, and slid over and under each other and at some later time broke apart. Today, most people accept the theory that the Earth's crust is "on the move," and we call this theory plate tectonics. The crust (lithosphere) is broken into about 12 enormous plates that "float" on hotter, softer rocks in the underlying mantle (asthenosphere). The Earth's heat probably drives convection currents in the asthenosphere, moving the plates past one another very slowly. Plates move mere inches annually, carrying the continents and ocean basins with them as they drift about.

The majority of earthquakes worldwide occur at plate boundaries when plates stick and then jump past each other. These quakes often are the ones that are the most destructive and well understood in terms of plate tectonics. The cause of earthquakes in South Carolina is not so clear. South Carolina's quakes are located within a plate rather than at a plate boundary. Perhaps the intraplate quakes felt in South Carolina are the result of stresses transmitted inward from the boundaries of the North American plate. In our state, quakes may occur along ancient plate boundaries where existing faults are reactivated as the tectonic stress is released.

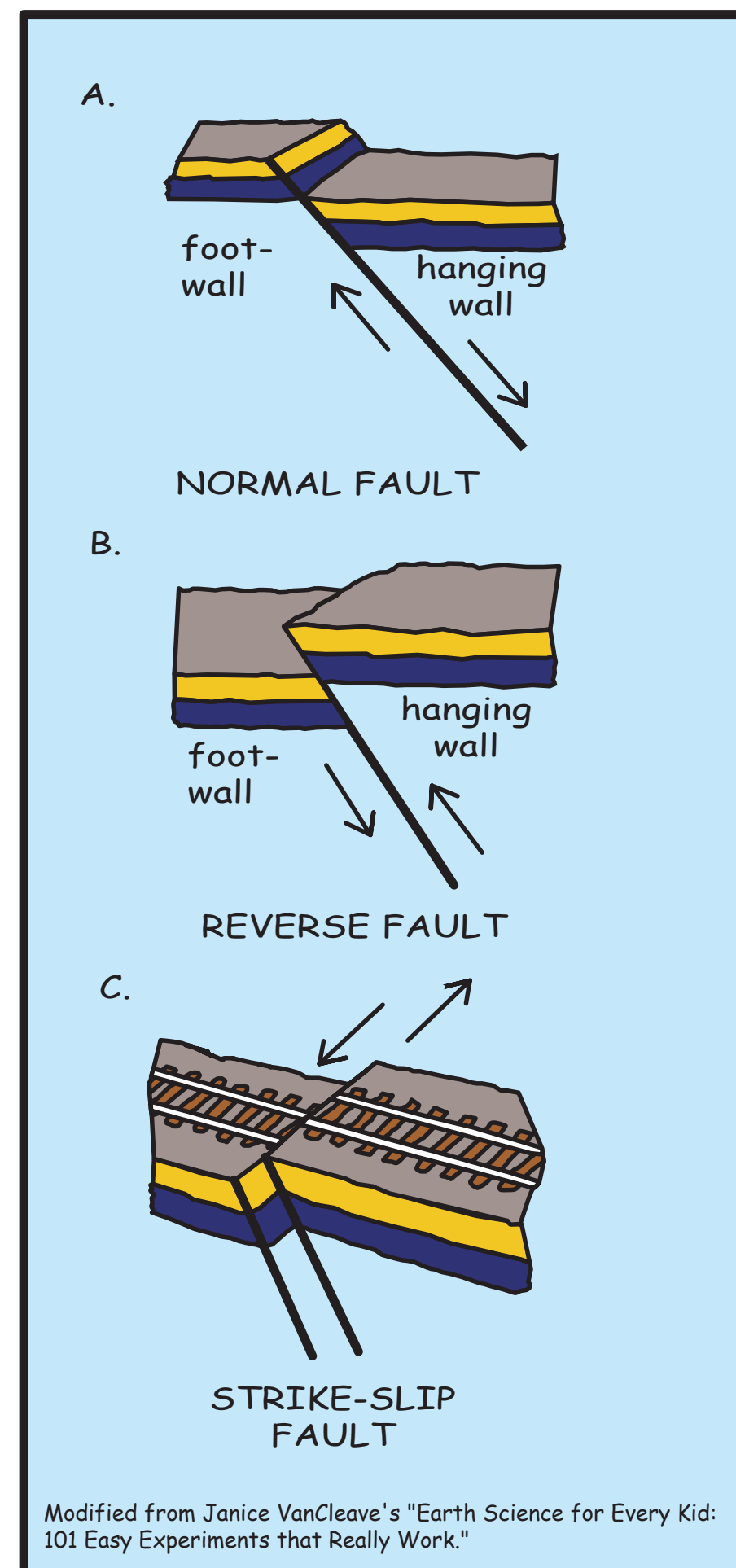


Figure 1. The three basic types of faults are normal, reverse, and strike-slip (lateral). (A) A normal fault is one in which the rocks above the fault plane, the hanging wall, move down relative to the rocks below the fault plane in the footwall. (B) A reverse fault is one in which the hanging wall moves up relative to the footwall. (C) When rocks on either side of a nearly vertical fault plane move horizontally, the movement is called strike-slip.

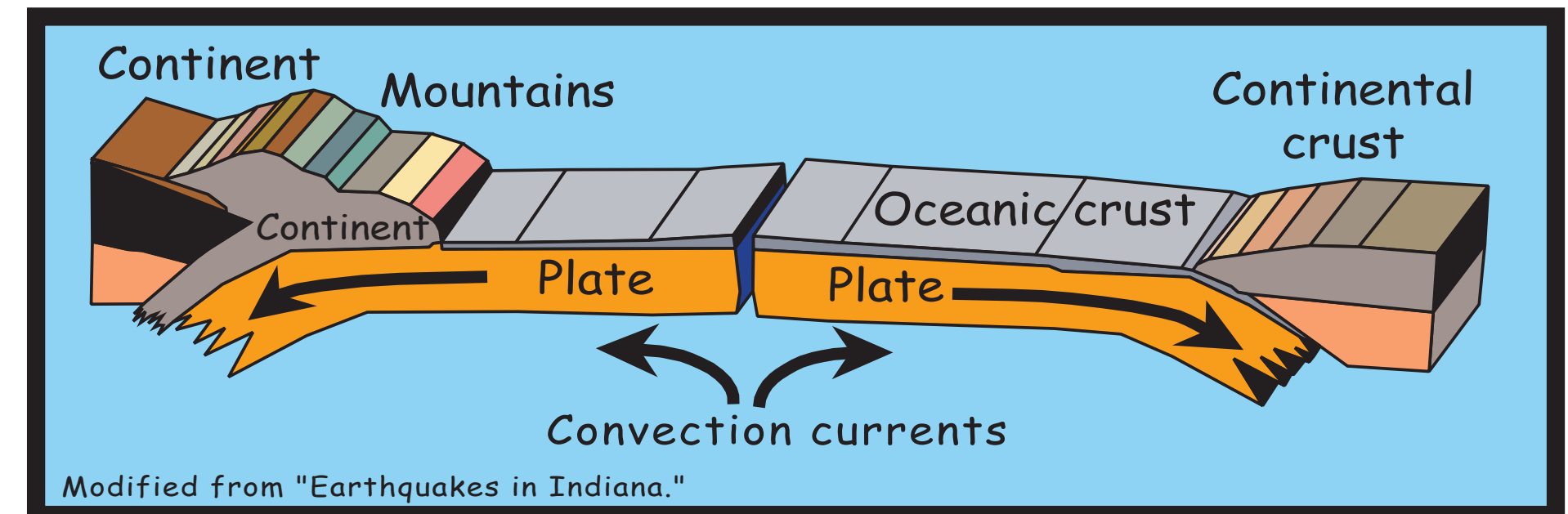


Figure 2. Cross section of the Earth's crust showing oceanic crust sliding under continental crust, and mountains being built as a result of collision of two continents.

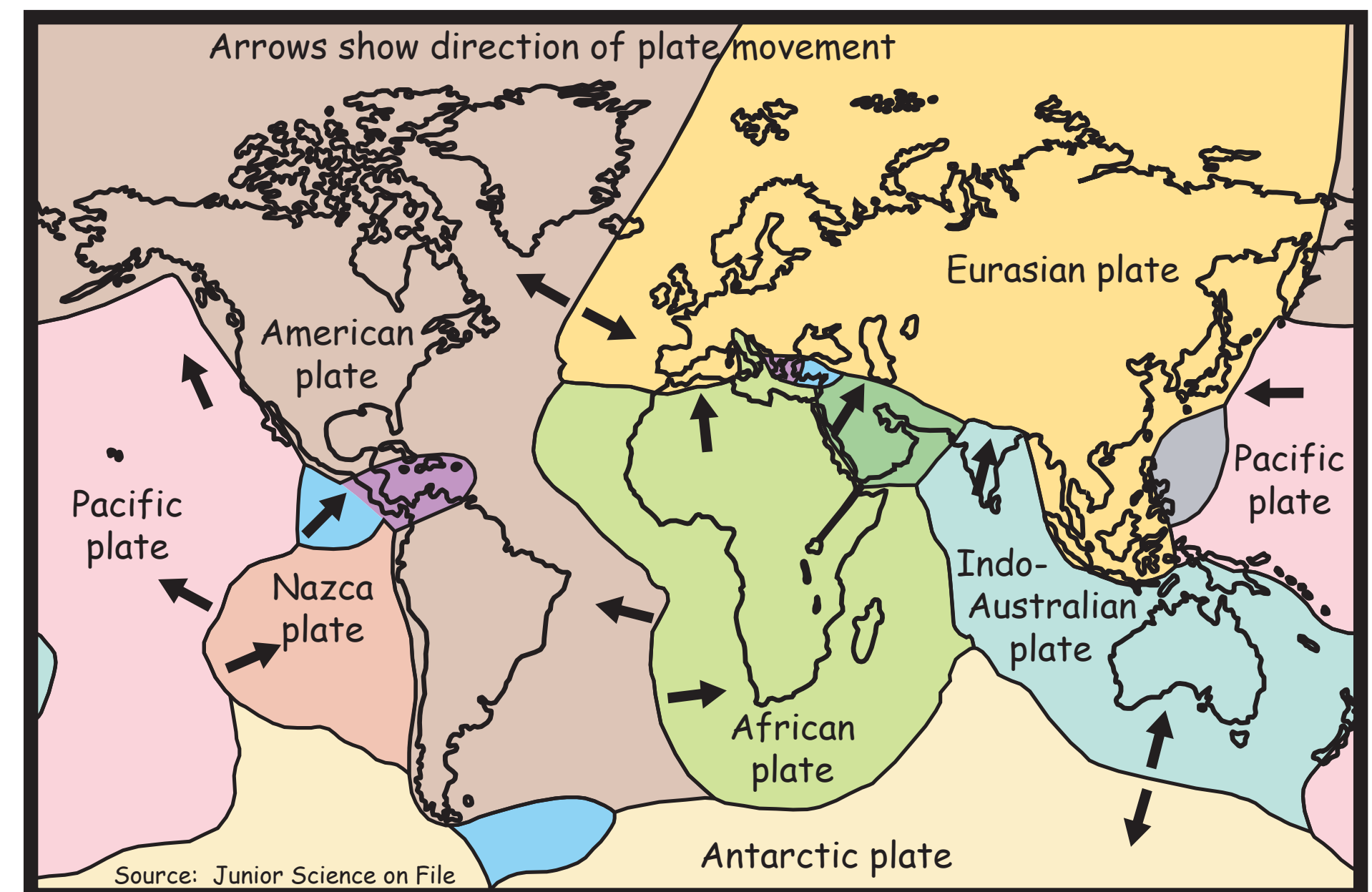


Figure 3. The plates of the Earth's crust.