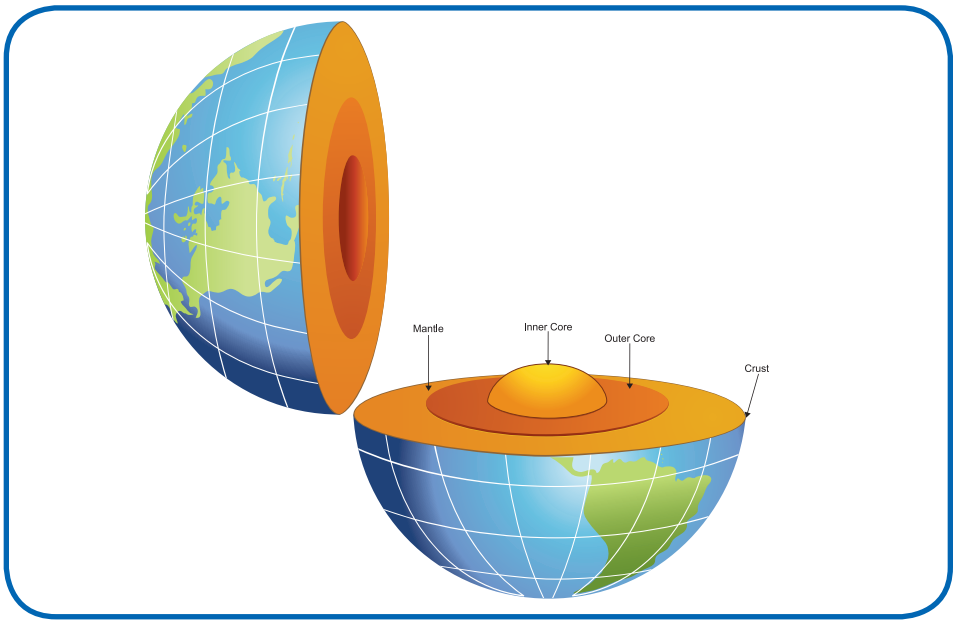
BENEATH THE SURFACE

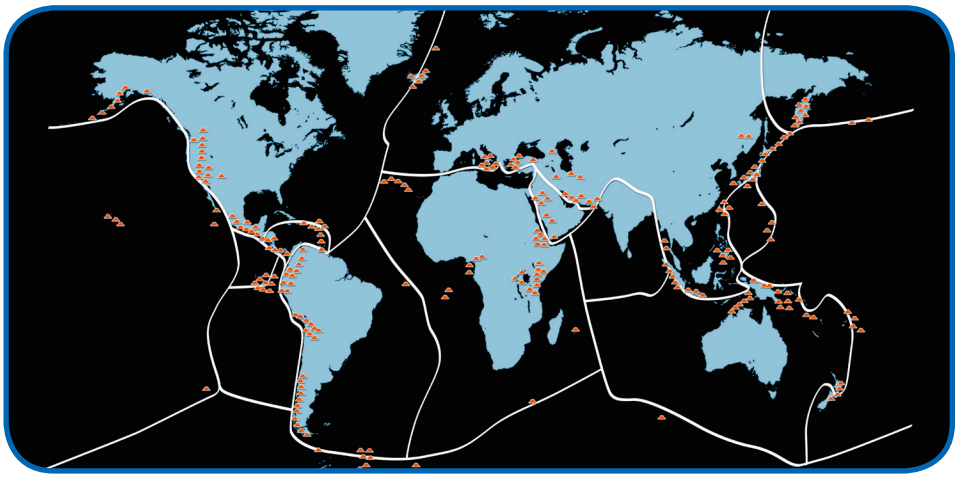
Imagine you could travel beneath the Earth's surface, deep into our planet's interior. You'd journey through four main layers: the crust, mantle, outer core, and inner core. First, you'd pass through the outer layer, the **crust**, which is where we live. Just under that is a layer called the **mantle**, the thickest layer. If you kept tunneling, you'd reach the outer core, which is made up of iron and nickel metals. The outer core is so hot that these metals are totally liquid! The final layer—closest to the center of the Earth—is the inner core. Like the outer core, the inner core is made up of iron and nickel, and it's very hot. However, because the inner core is under so much pressure as a result of its position deep within the Earth, this layer is solid.

We'll focus on the Earth's two outermost layers, the crust and mantle, and the way that these two layers interact—this is where plate tectonic activity (like volcanoes and earthquakes) occurs. Believe it or not, the crust is very thin relative to the other layers: it makes up less than 1% of the Earth's mass, and ranges in thickness from about 8–32 kilometers. But the crust is not a single rigid layer. It's broken into tectonic plates—sort of like a boiled egg that was dropped and now has a cracked shell. In fact, these plates are always moving slowly, floating on the layer beneath called the **mantle**.



The Earth is made up of four main layers

The mantle is the thickest of the four layers: it begins about 32 kilometers below the surface of the Earth and reaches nearly 2,900 kilometers deep. It's also very hot, reaching about 2,200°C near the core (its hottest temperature) and about 870°C near the surface of the Earth. Much of the Earth's mantle is made up of **magma**, a molten mixture of minerals, dissolved gases, and water. Extremely high temperatures and pressure in the mantle means that the mantle is in a fluid state. What's more, because of convection, the mantle is constantly moving—warmer material rises closer to the crust, and cooler material sinks toward the center of the Earth. Scientists think this movement contributes to the movement of the tectonic plates of Earth's geosphere (a combination of the crust and outer mantle).



Like a cracked egg shell, the Earth's crust is broken into tectonic plates, which move slowly on the mantle

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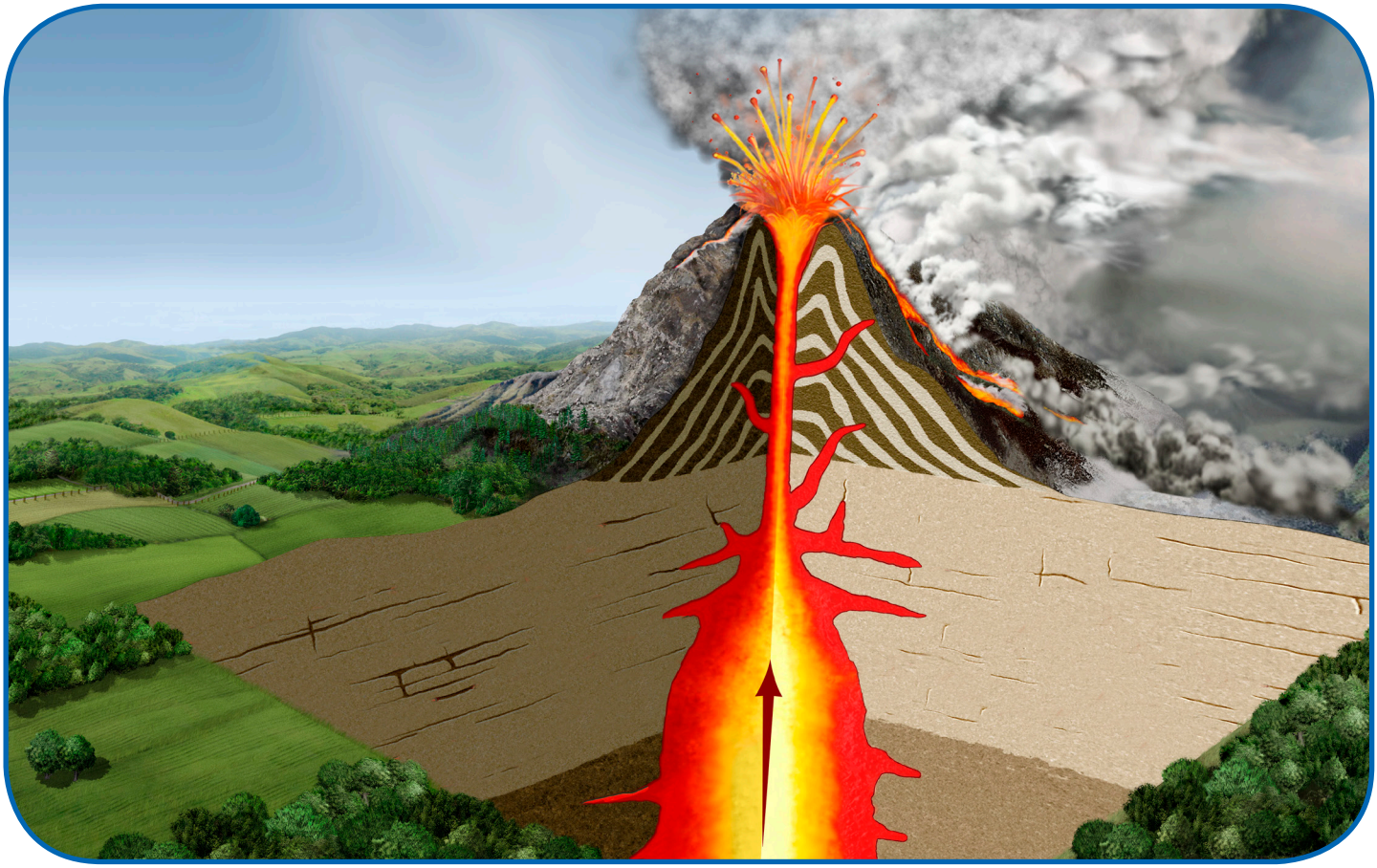

Magma often collects in magma chambers and may eventually push through the crust, leading to a volcanic eruption

Magma often collects in **magma chambers**, which lie beneath the Earth's surface. In a magma chamber, one of three things happens:

1. The magma moves into a different magma chamber
2. The magma rises up and out toward the crust because it is less dense than the surrounding rock
3. The magma cools, solidifies, and forms rock.

Finally, the magma may push through holes or cracks in the crust, leading to a volcanic eruption. When magma reaches the Earth's surface, it's called **lava**. Depending on the lava's viscosity (how easily it flows), the volcano that forms may be different shapes. Very viscous (or thick) lava tends to form volcanoes with steep slopes, called stratovolcanoes. Volcán de Colima in Mexico is a stratovolcano. Thinner, runnier lava that flows more easily creates flatter volcanoes called shield volcanoes—like Mauna Loa and Mauna Kea in Hawaii.