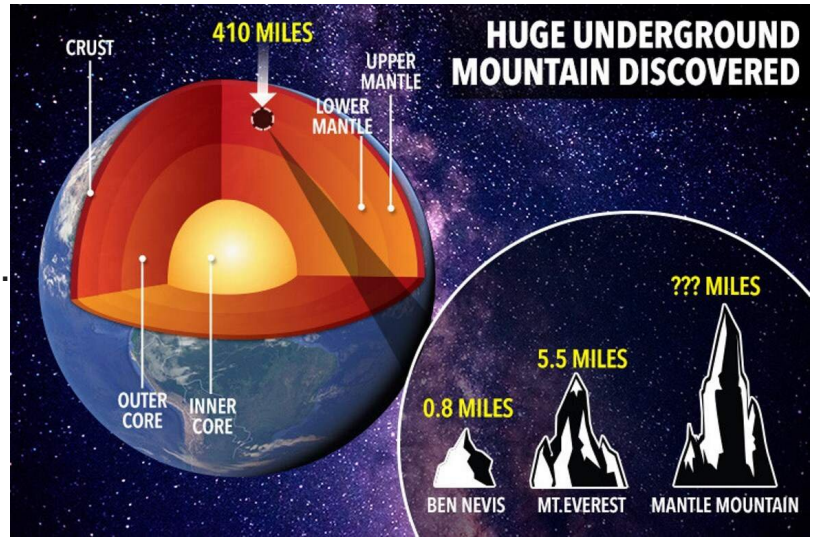
Massive Mountains Discovered under Earth's Crust

Scientists have discovered massive mountains in the Earth's mantle.

- The mountains were located **at the boundary of the outer and lower mantle at a depth of 660 km.**



- Lacking a formal name for this layer, the researchers simply call it **"the 660-km boundary."**

How it was Discovered?

- Scientists have used the **earthquake data from the 8.2 magnitude earthquake which shook Bolivia in 1994.**
- This earthquake was the second-largest deep earthquake ever recorded, with a focal point estimated at a depth of 650 kilometers.
- **This earthquake was also the first big earthquake to be measured on a modern seismic network, providing researchers with unprecedented data.**
- Data was gathered from earthquakes waves that travel in all directions and can travel through the core to the other side of the planet.

Findings

- From earthquake waves, the researchers came to know that the **upper and lower mantle boundary at 660 km depth is rough.**
- The researchers also examined a layer 410 km down, at the top of the mid-mantle "transition zone," and the surface is not similarly rough.

Significance

- Due to technical limitations, scientists were not able to determine the height of these mountains, but there's a chance that these mountains are **bigger than anything on the surface of the Earth.**
- This discovery is also important for understanding **how the earth formed and continues to function.**

Interior of the Earth

The Earth has three layers: **a crust, mantle, and core,** which is subdivided into an inner and outer core.

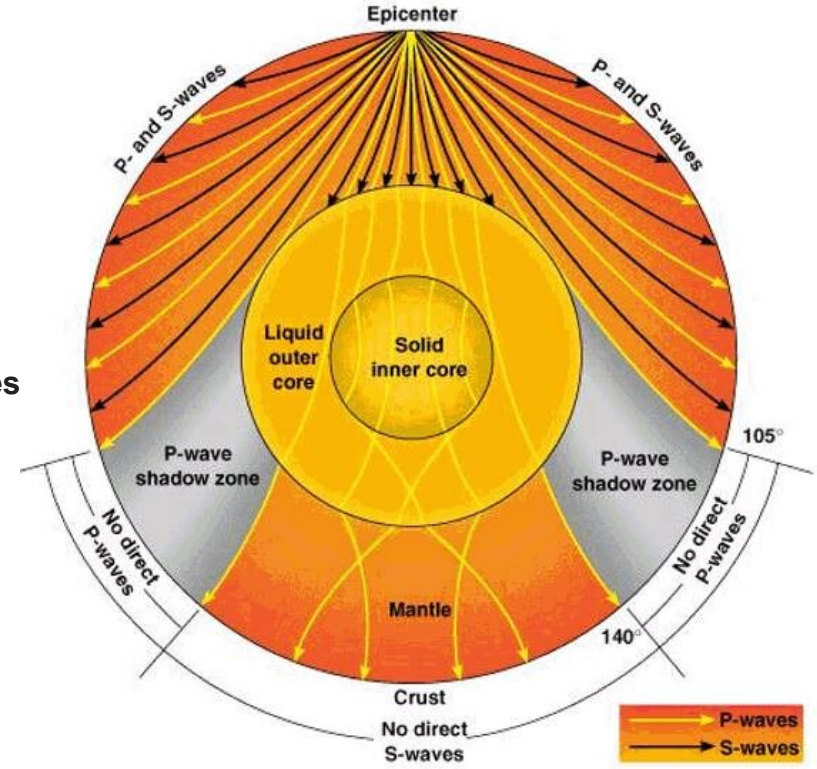
Information about Interior of the Earth

- There are two sources of information for scientists about the interior of the earth: Direct and Indirect.
- **Direct Sources**
  - **Surface rock** or the rocks from **mining**.
  - **Deep Ocean Drilling Projects:** The deepest drill is at Kola, in the Arctic Ocean, which has reached a depth of 12 km.
  - **Volcanic eruptions.**
- **Indirect Sources**
  - **Meteors** from space.
  - **Gravitation**, **magnetic** field.
  - **Seismic activity**: Seismic activity is one of the most important sources of information about the interior of the earth.

Earthquake

- An earthquake in simple words is **shaking of the earth.** It is a natural event. It is caused due to the release of energy, which generates waves that travel in all directions.
- **Focus and Epicenter**
  - The release of energy occurs along a fault. The **point where the energy is released** is called the **focus of an earthquake.**
  - The energy waves traveling in different directions reach the surface of the earth. The **point on the surface, nearest to the focus, is called Epicenter.**

- **Earthquake Waves**



  - Earthquake waves are basically of two types — body waves and surface waves.
  - **Body waves**
    - Body waves are generated due to the release of energy at the focus and move in all directions traveling through the body of the earth. Hence, the name body waves.
    - There are **two types of body waves**. They are called P and S-waves.
    - **P-waves:** P-waves move faster and are the first to arrive at the surface. These are also called **primary waves.**

      The P-waves are similar to sound waves. **They travel through gaseous, liquid and solid materials.**
    - **S-waves:** S-waves arrive at the surface with some time lag. These are called **secondary waves.**
      - An important fact about S-waves is that they **can travel only through solid materials.**
      - This characteristic of the S-waves is quite important. It has **helped scientists to understand the structure of the interior of the earth.**
  - **Surface waves**

    The **body waves interact with the surface rocks** and generate a new set of waves called surface waves.

Shadow Zones

Earthquake waves get recorded in seismographs located at far off locations. However, there exist some specific areas where the P and S waves are not reported. Such a zone is called the ‘shadow zone’.