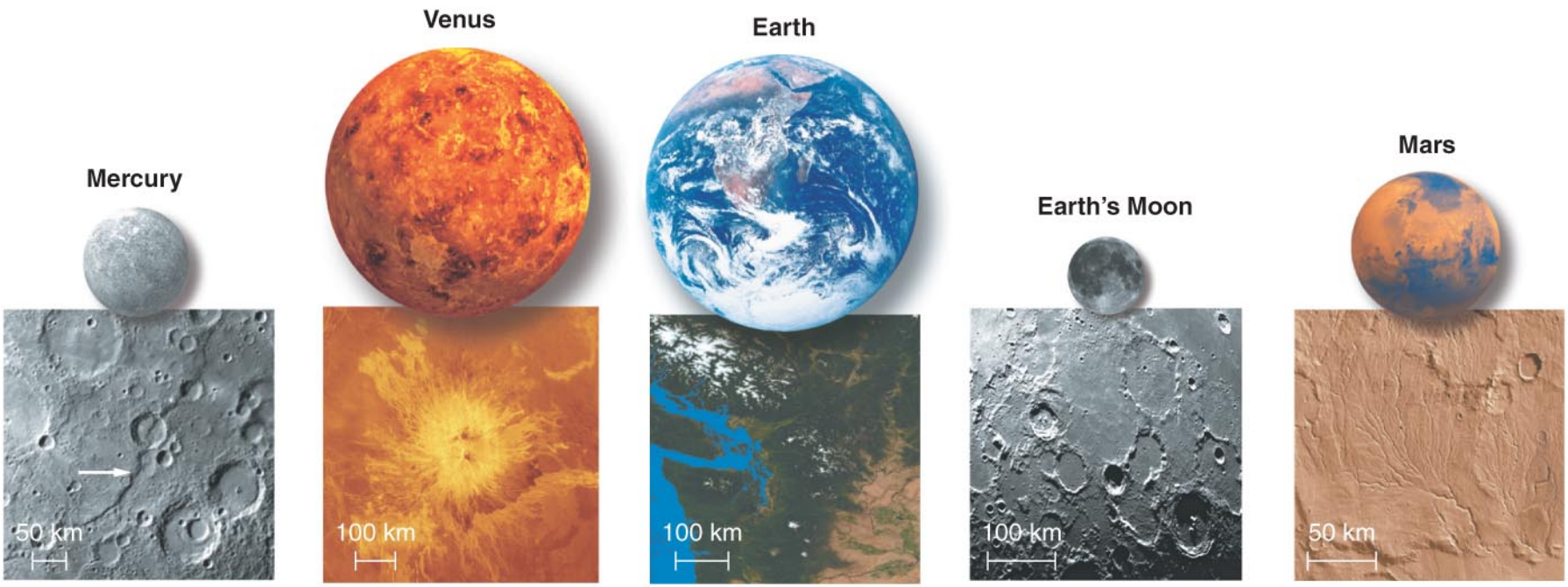
9.1 Connecting Planetary Interiors and Surfaces

- Our goals for learning:
  - **What are terrestrial planets like on the inside?**
  - **What causes geological activity?**
  - **Why do some planetary interiors create magnetic fields?**

What are terrestrial planets like on the inside?



Heavily cratered Mercury has long steep cliffs (arrow).

Cloud-penetrating radar revealed this twin-peaked volcano on Venus.

A portion of Earth's surface as it appears without clouds.

The Moon's surface is heavily cratered in most places.

Mars has features that look like dry riverbeds; note the impact craters.

Probing the Earth's Interior

How do we know what's inside Earth?

Probing the Earth's Interior

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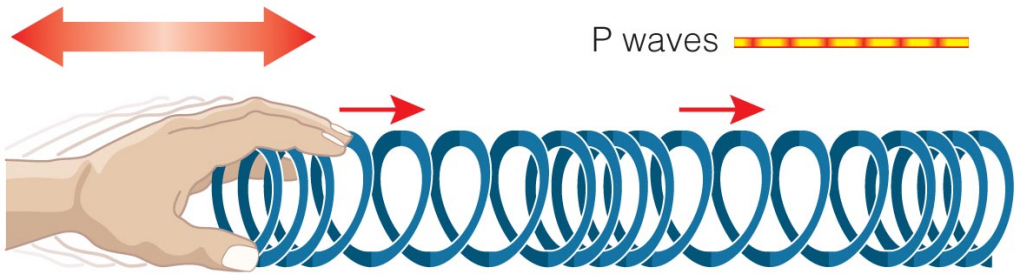
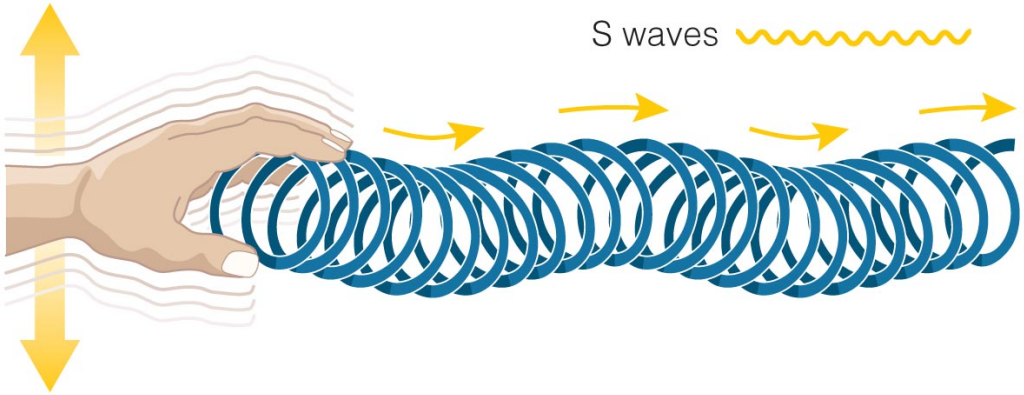


- P waves push matter back and forth.



- S waves shake matter side to side


HOT

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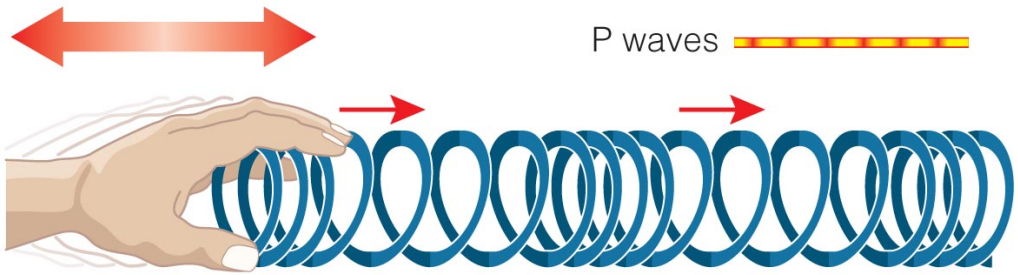
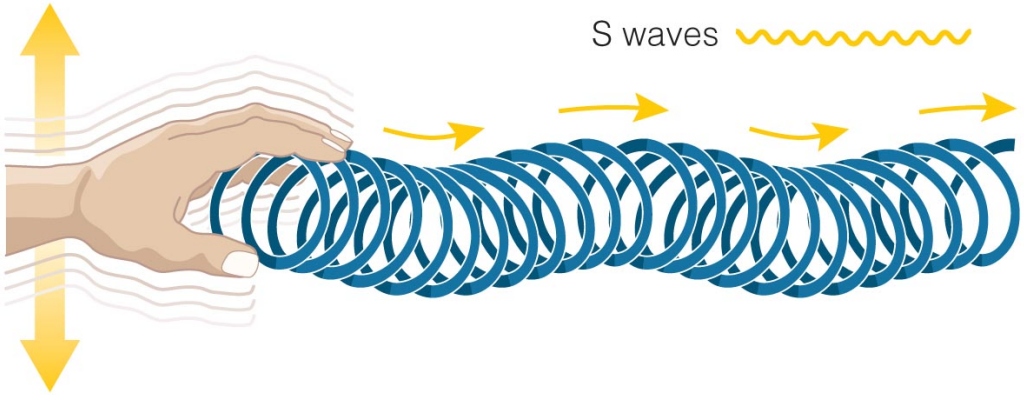


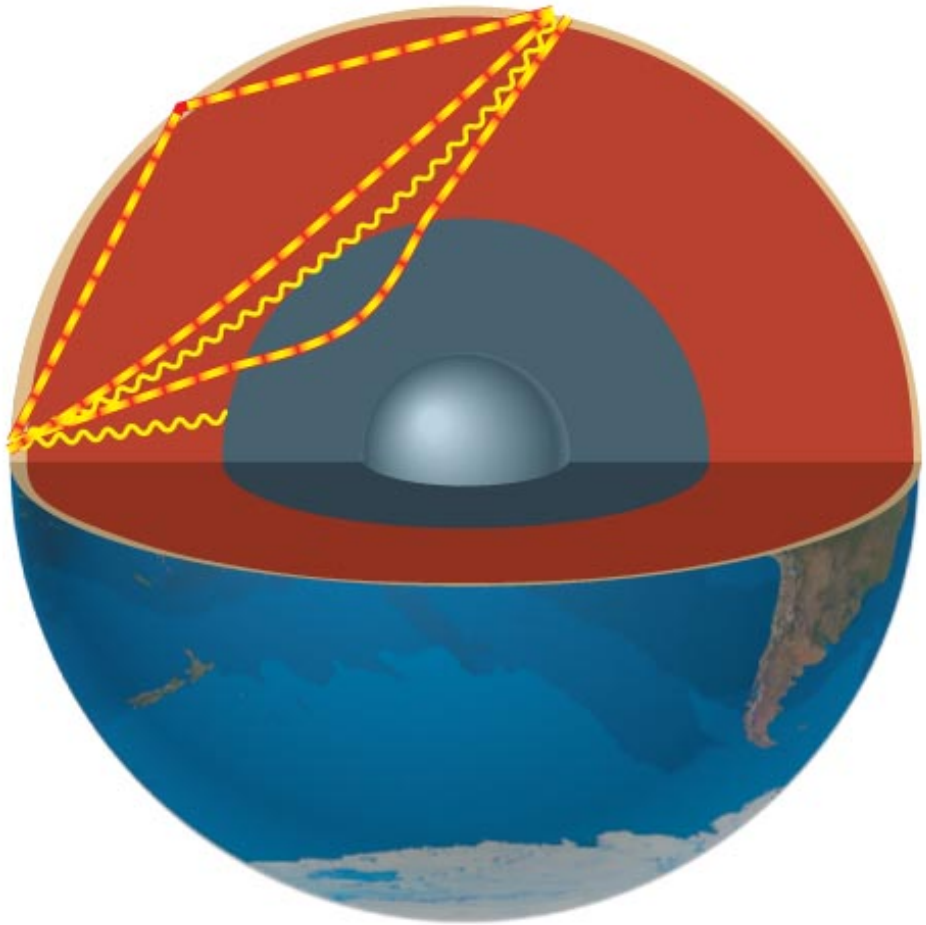
- P waves can travel through both liquid and solid phases.



- S waves do not travel through liquid

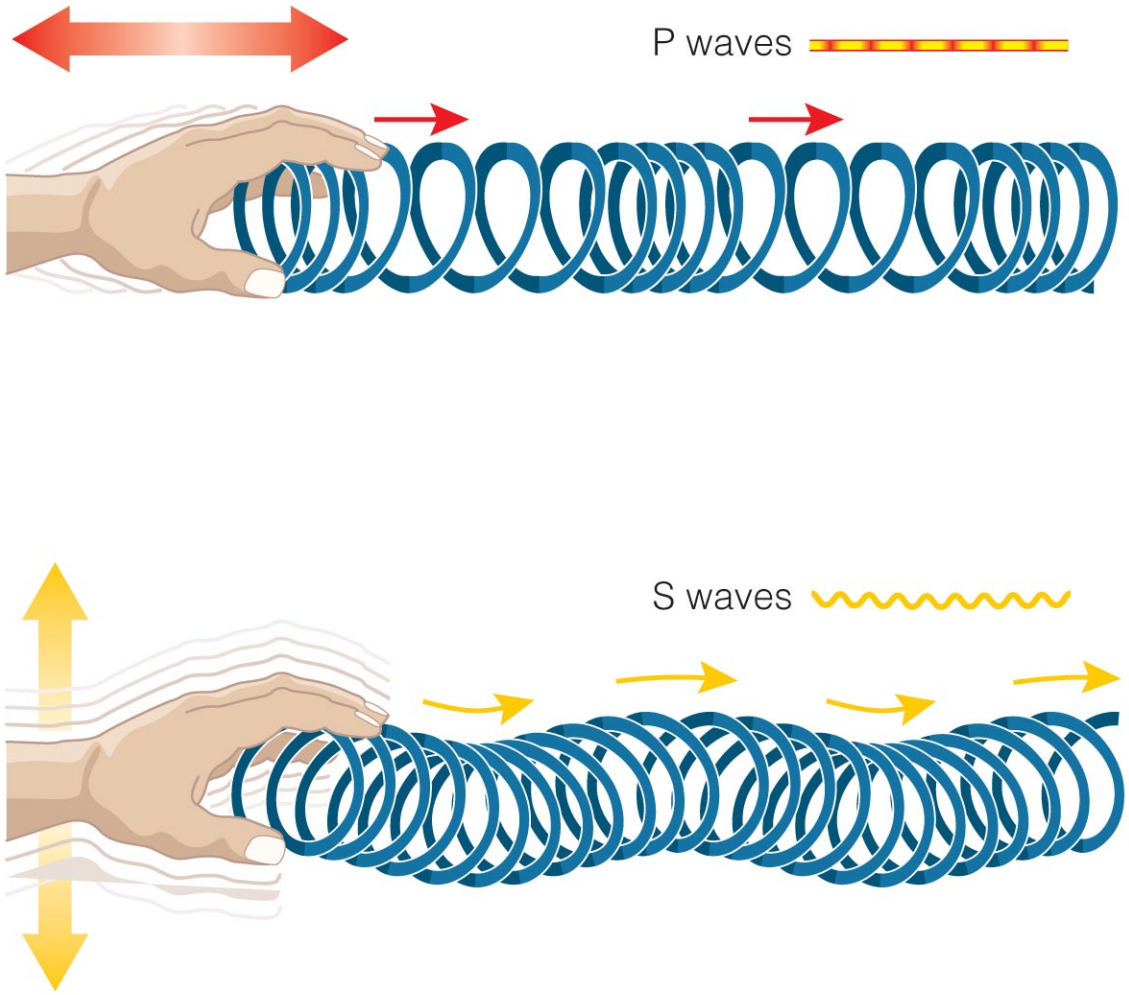
Probing the Earth's Interior

How do we know what's inside Earth?



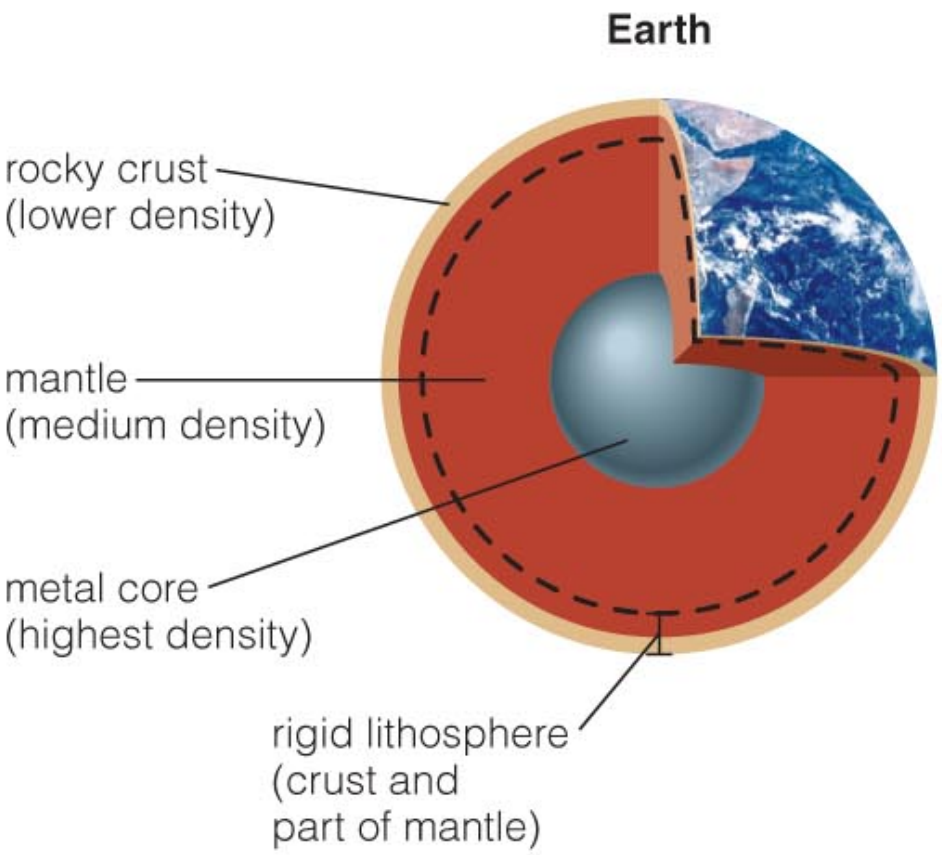
- P waves go through Earth's core, but S waves do not.
- We conclude that Earth's core must have a liquid outer layer.

Seismic Waves



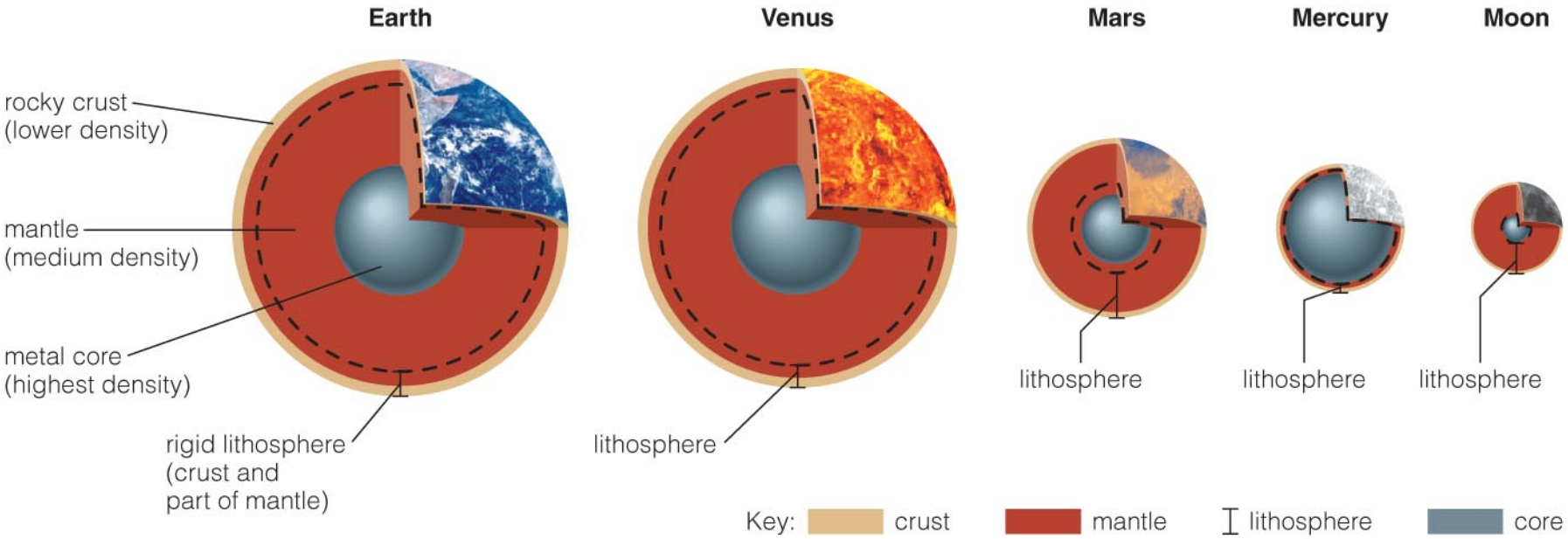
- Vibrations that travel through Earth's interior tell us what Earth is like on the inside.

Earth's Interior



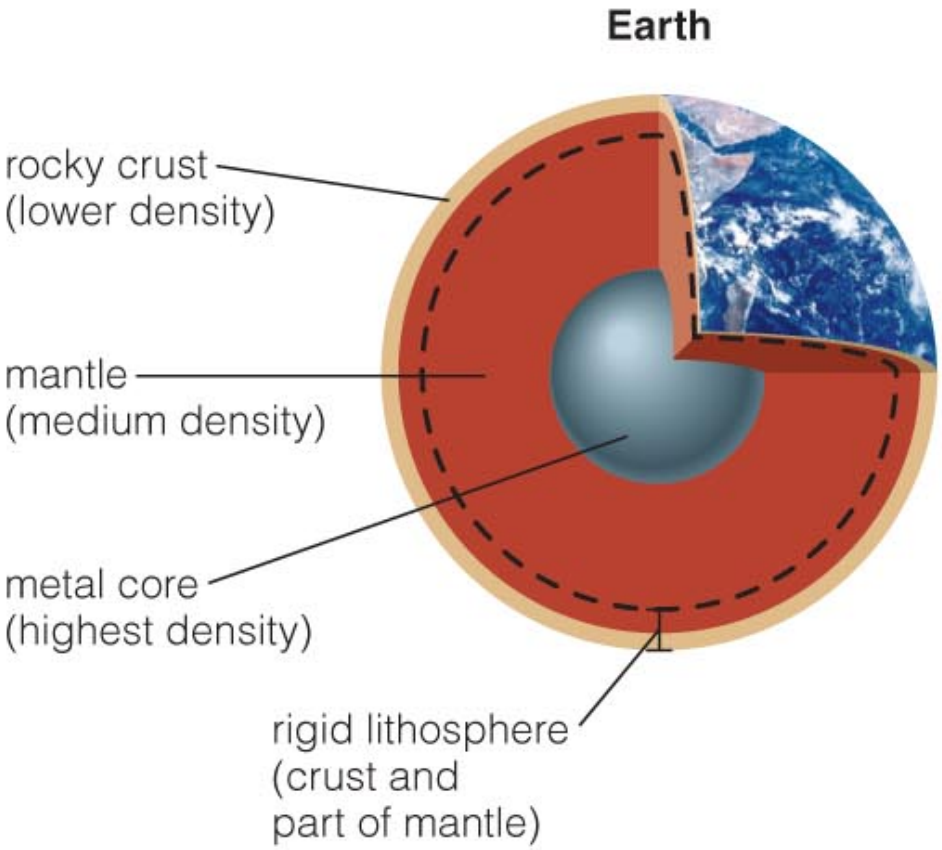
- **Core:** highest density; nickel and iron
- **Mantle:** moderate density; silicon, oxygen, etc.
- **Crust:** lowest density; granite, basalt, etc.

Terrestrial Planet Interiors



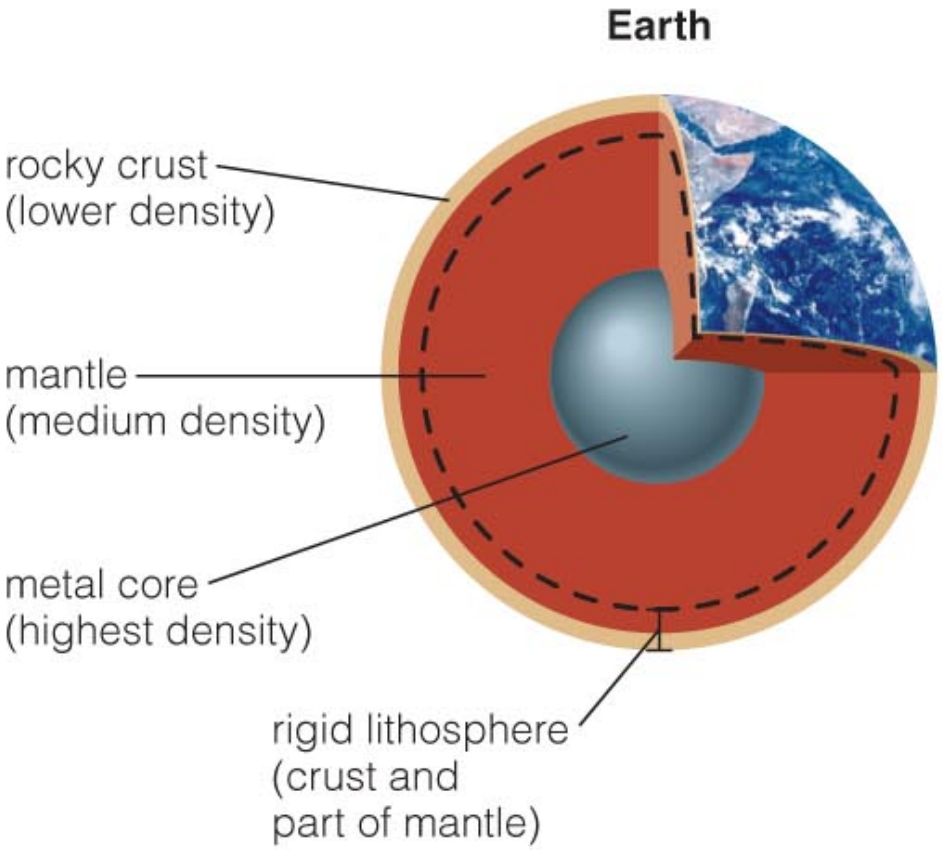
- Applying what we have learned about Earth's interior to other planets tells us what their interiors are probably like.

Differentiation



- Gravity pulls high-density material to center.
- Lower-density material rises to surface.
- Material ends up separated by density.

Lithosphere



- A planet's outer layer of cool, rigid rock is called the *lithosphere*.
- It "floats" on the warmer, softer rock that lies beneath.

Strength of Rock

- Rock stretches when pulled slowly but breaks when pulled rapidly.
- The gravity of a large world pulls slowly on its rocky content, shaping the world into a sphere.