

# The Structure of the Earth: Review

Topics:

The Layers of the Earth and its Formation

Sources of Heat

Volcanos and Earthquakes

Rock Cycle

Rock Types

Carbon Tax

# Essay Question on Carbon Tax





# **\*\*\*How do we know what the centre of the Earth is like today? (5)**

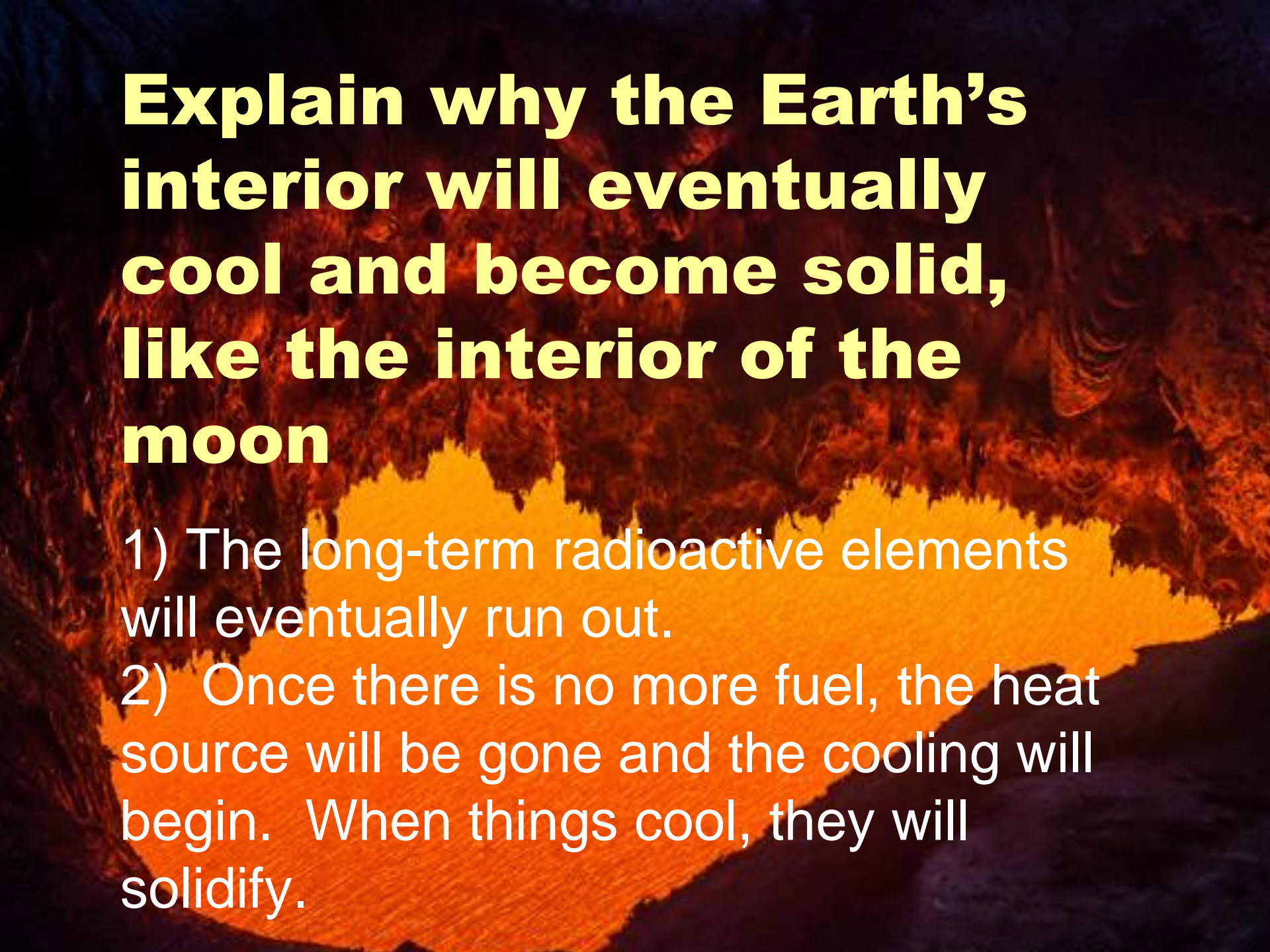
- **1. Drilling**
- 2. Volcanic Activity**
- 3. Laboratory experiments**
- 4. Meteorites**
- 5. Seismic Wave studies**

# Three sources of internal heat generation

A cross-section of the Earth's interior, showing a glowing orange and yellow core surrounded by a darker, textured mantle. The core is the brightest part, with a yellowish-orange hue, while the mantle is a darker, reddish-brown color with a more textured appearance. The overall image has a dark, almost black background, making the glowing interior stand out.

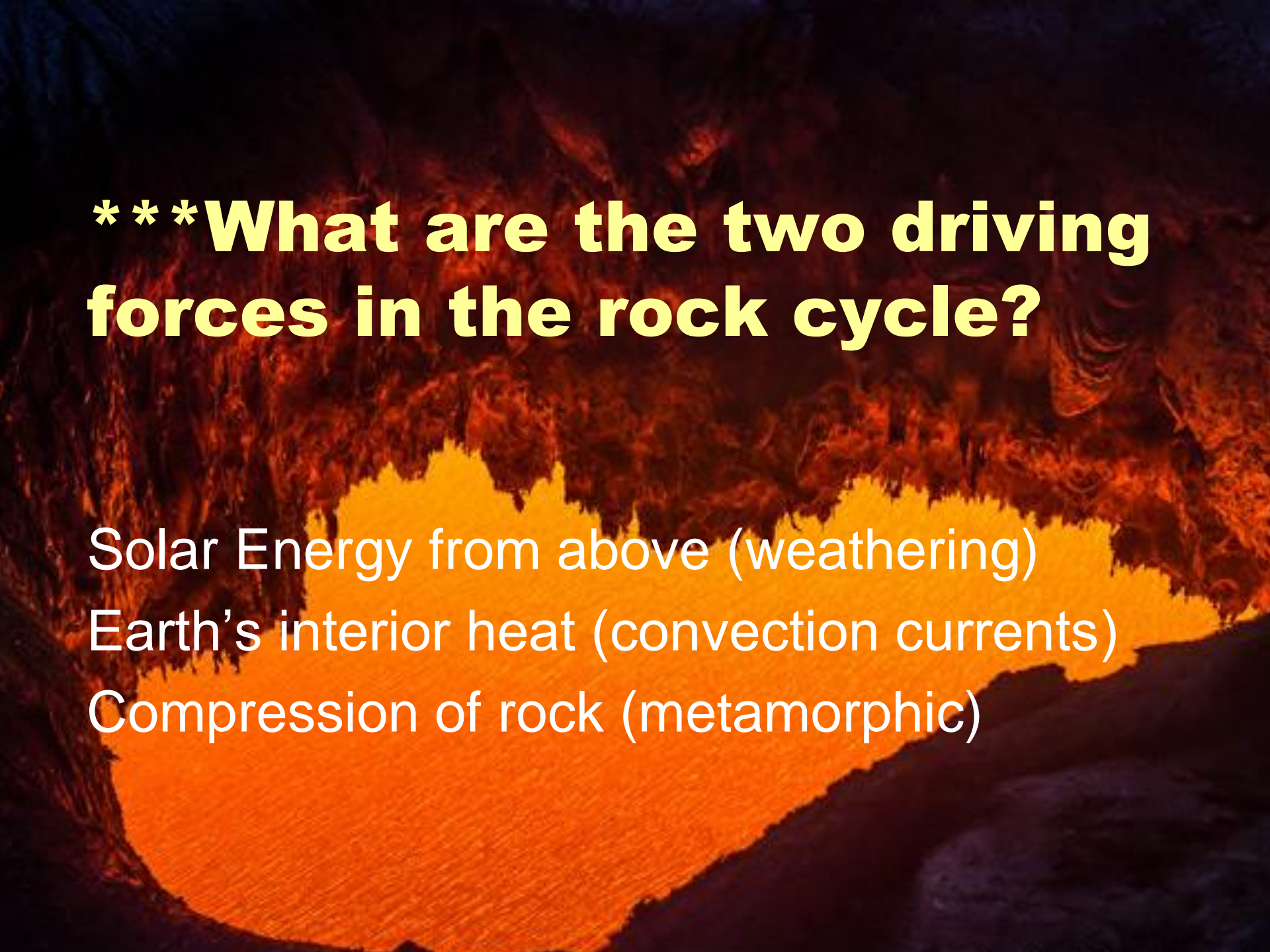
- Kinetic energy from impacts
- Compression
- The decay of radioactive elements





# **Explain why the Earth's interior will eventually cool and become solid, like the interior of the moon**

- 1) The long-term radioactive elements will eventually run out.
- 2) Once there is no more fuel, the heat source will be gone and the cooling will begin. When things cool, they will solidify.



**\*\*\*What are the two driving forces in the rock cycle?**

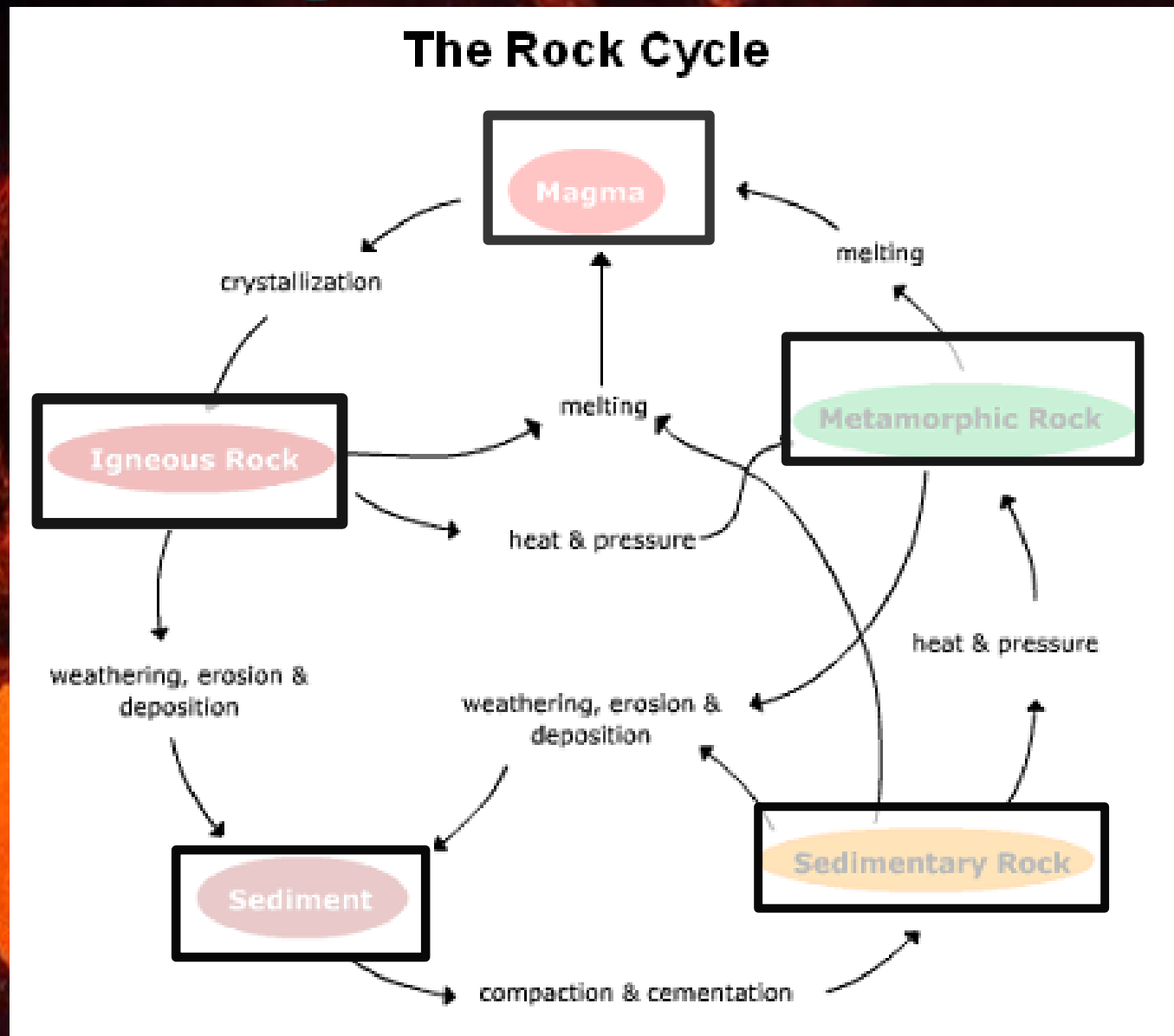
Solar Energy from above (weathering)

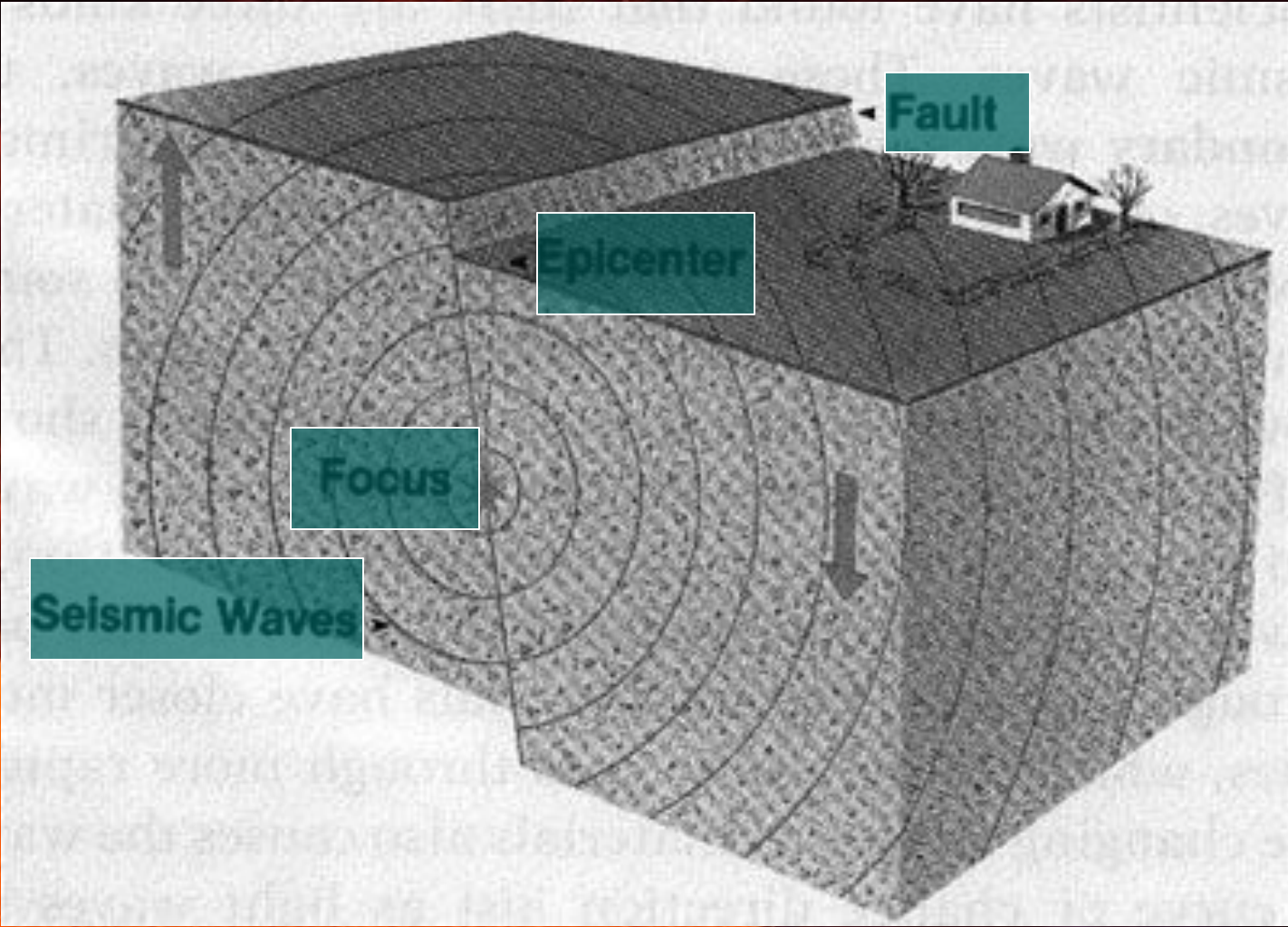
Earth's interior heat (convection currents)

Compression of rock (metamorphic)



# Rock Cycle Fill in







# What are the benefits of Volcanoes?

- Minerals (gold, copper, lead)
- Continental Earth (80%)
- Produce fertile soils
- Geothermal Energy source

# How do we know what the centre of the Earth is like today? (5)

- 1. Drilling
- 2. Volcanic Activity
- 3. Laboratory experiments
- 4. Meteorites
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# What are the deepest depths we've gone into the Earth?

**Mining – the deepest mine is 3.9 kms and located in South Africa**

**Deepest well: Soviet – 12 km deep**

**–5 yrs, 7 km; 9 yrs, 5 km; then it got stuck**

**–Temperature 190oC at that depth**

# The scientific study of earthquakes

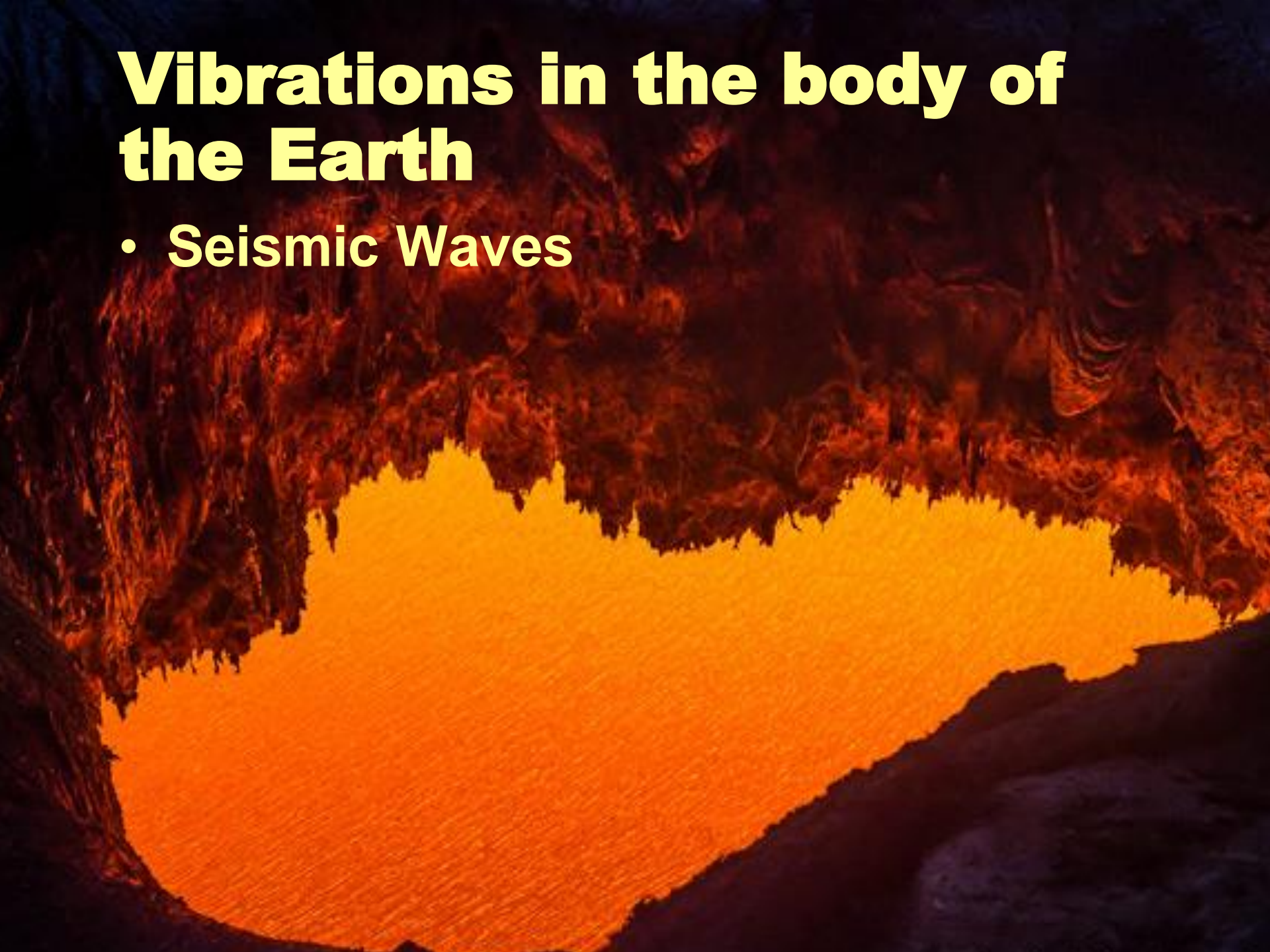


- **Seismology**
  - The key to understanding the Earth's interior



# Vibrations in the body of the Earth

- Seismic Waves



# How are Seismic Waves generated?



## – Naturally

- Earthquakes
- Volcanoes
- Impacts

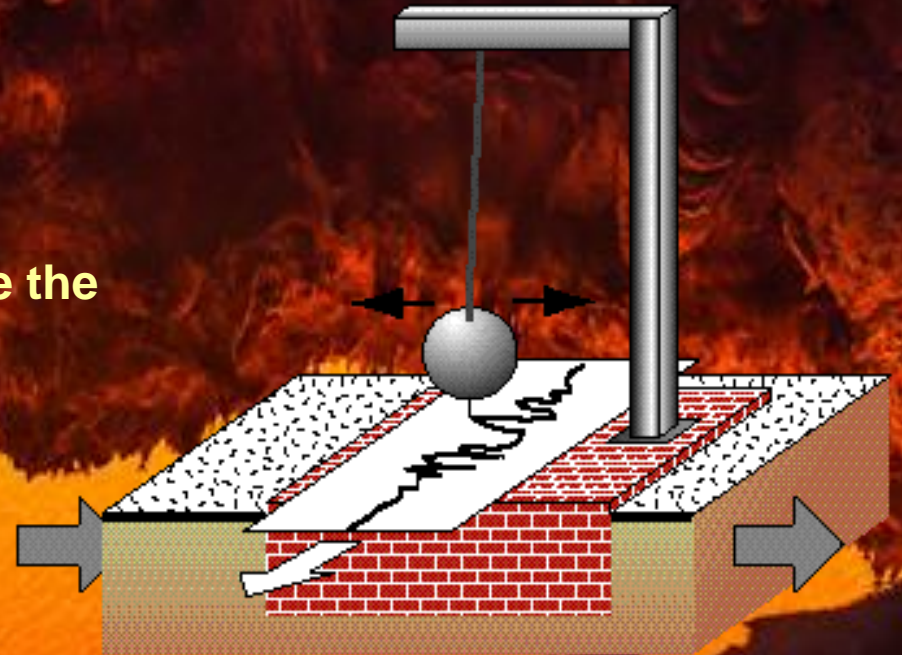
## – Artificially

- Explosions
- Mechanical devices



# How do we measure seismic activity?

- **Seismograph**
  - Used to locate earthquake
  - Networks of seismograph stations are used to determine the location of the earthquake



# Release of stress build up along a fault

Earthquake





# Slipping and moving of rocks along a fault

- Earthquake



# The origin of seismic waves



- Focus



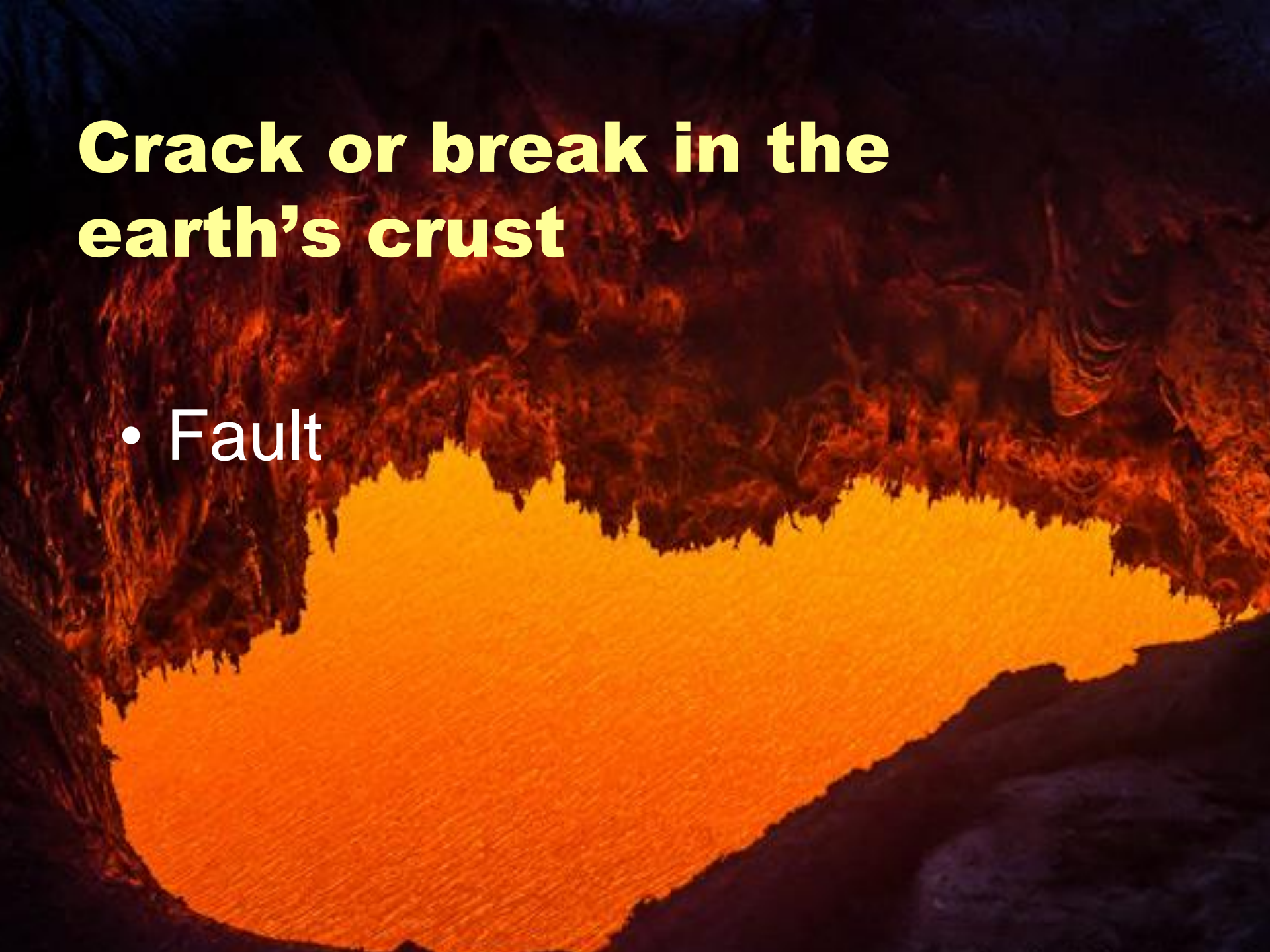


**The point on the earth's surface directly above the focus**

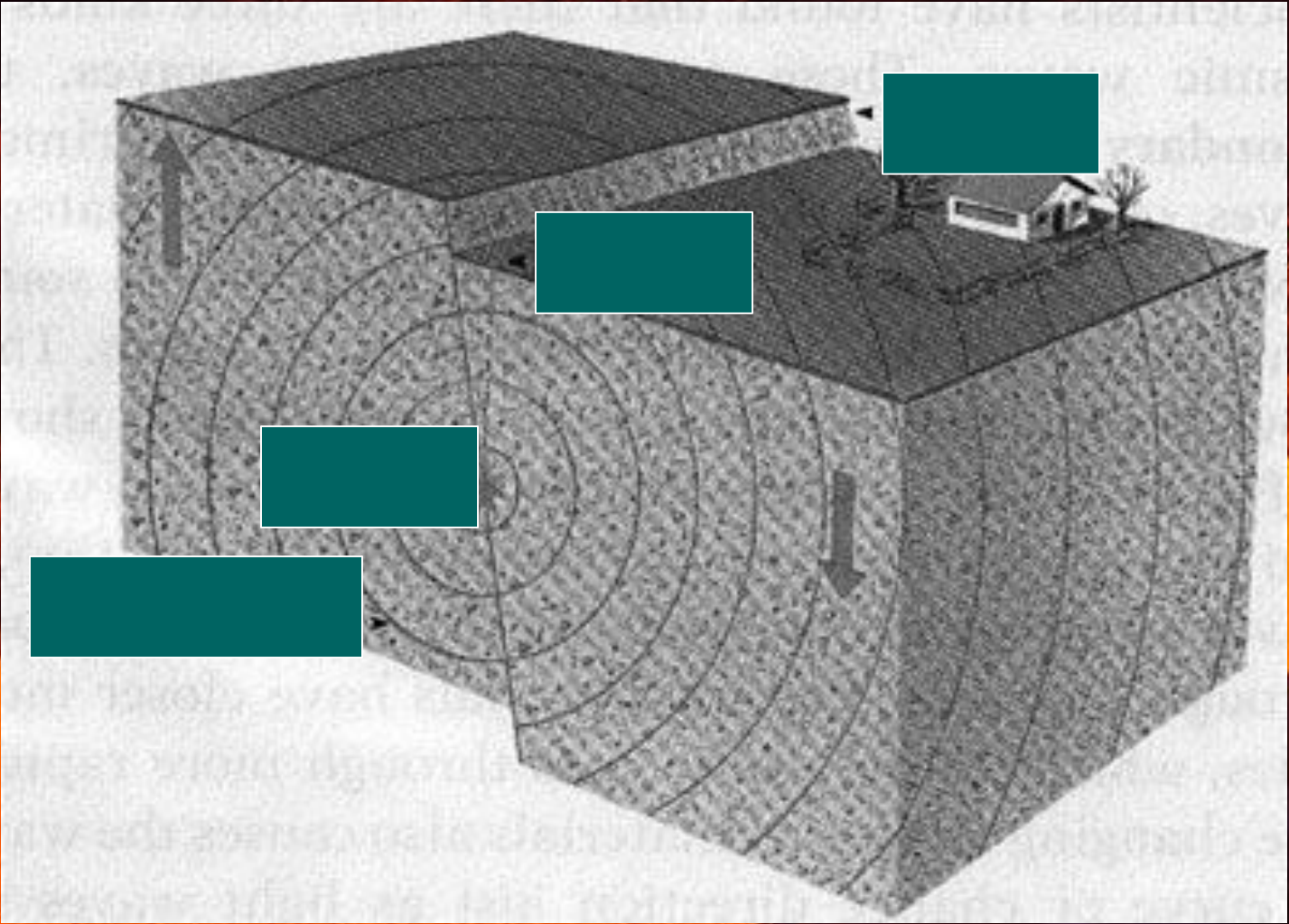
- Epicenter

# Crack or break in the earth's crust

- Fault





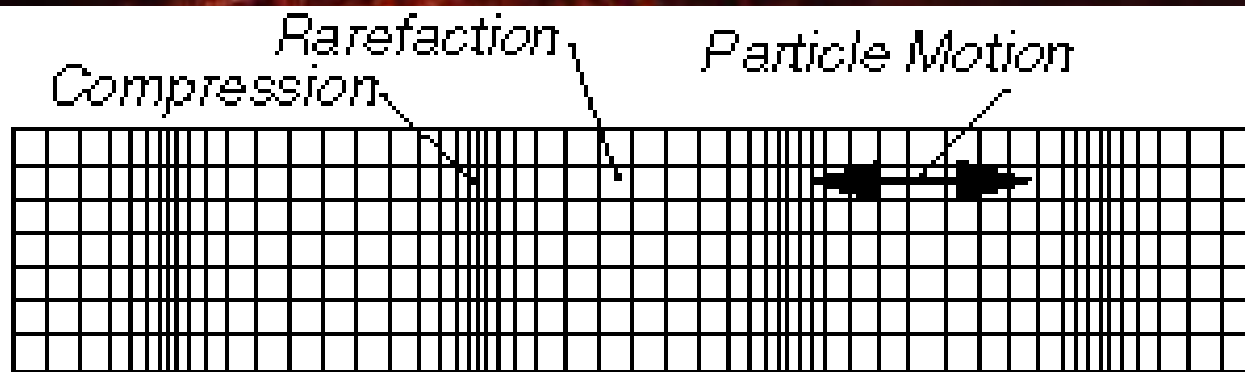


# **3 Main Types of waves released by Earthquakes**

- 1. P-waves (Primary / Compression waves)**
- 2. S-waves (Secondary / Side-to-side waves)**
  - Slower wave
- 3. L-waves (Long waves or Love Waves)**

Surface waves that cause horizontal shearing of the ground. Travel on the surface of the earth and shake rocks sideways as they move across the surface

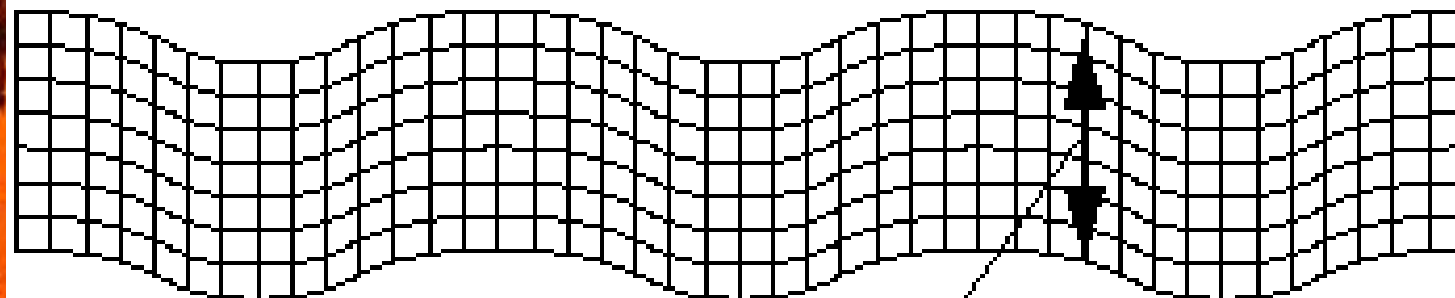




## Compressional or P Wave

Travel Direction  $\longrightarrow$

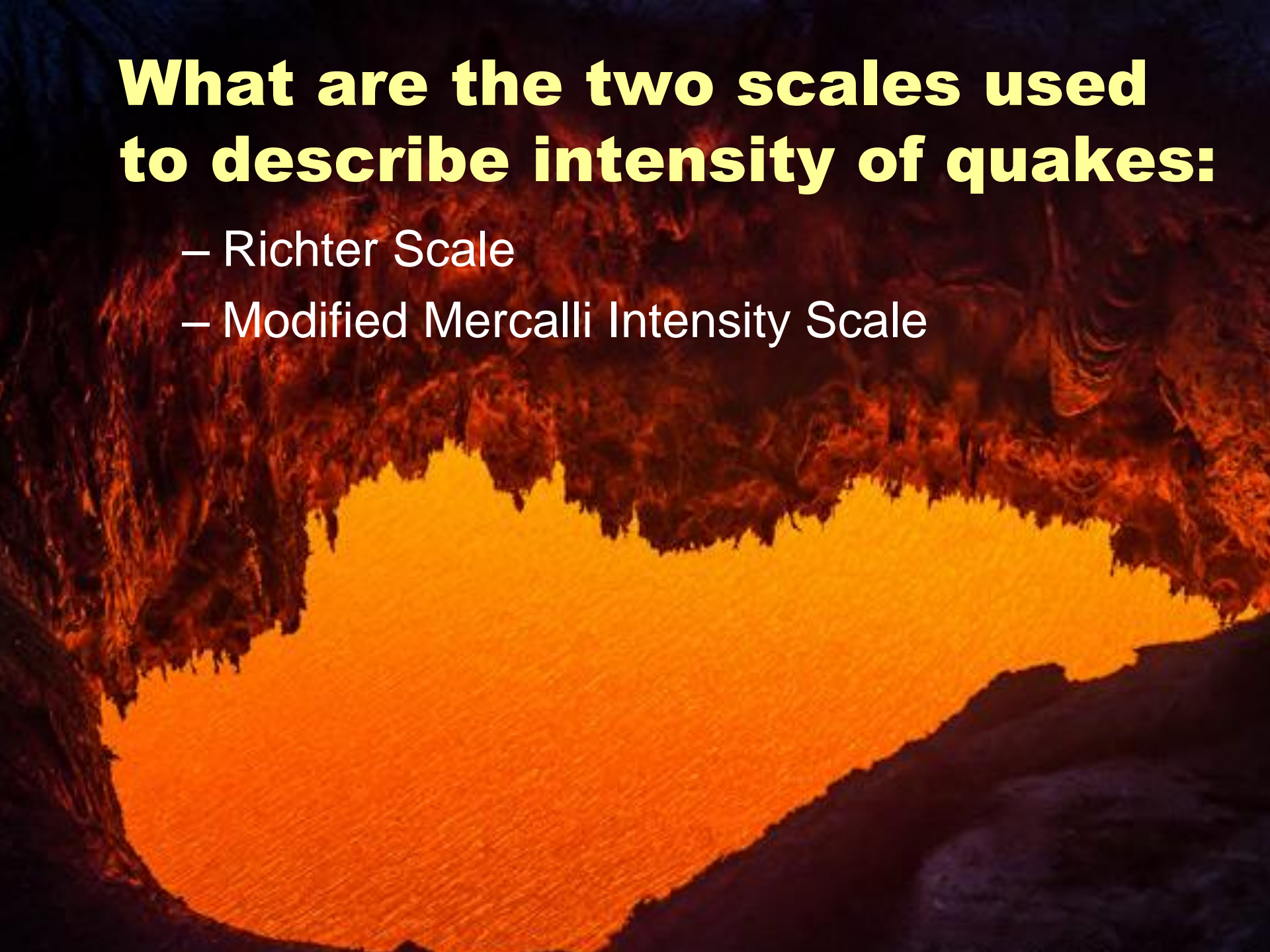
## Shear or S Wave



Particle Motion

# What are the two scales used to describe intensity of quakes:

- Richter Scale
- Modified Mercalli Intensity Scale





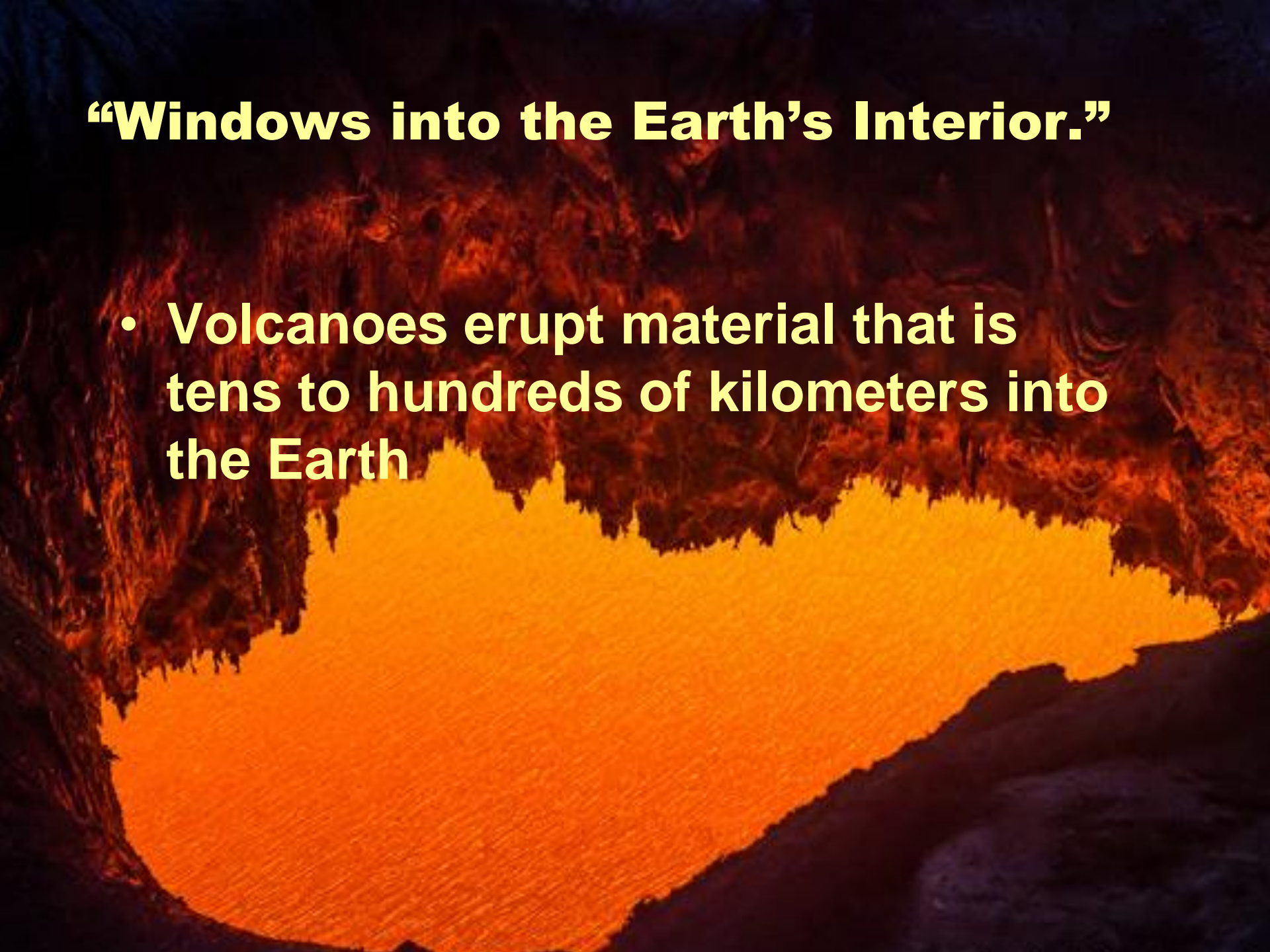
# Which scale includes damage?

- Mercalli Intensity Scale



# **“Windows into the Earth’s Interior.”**

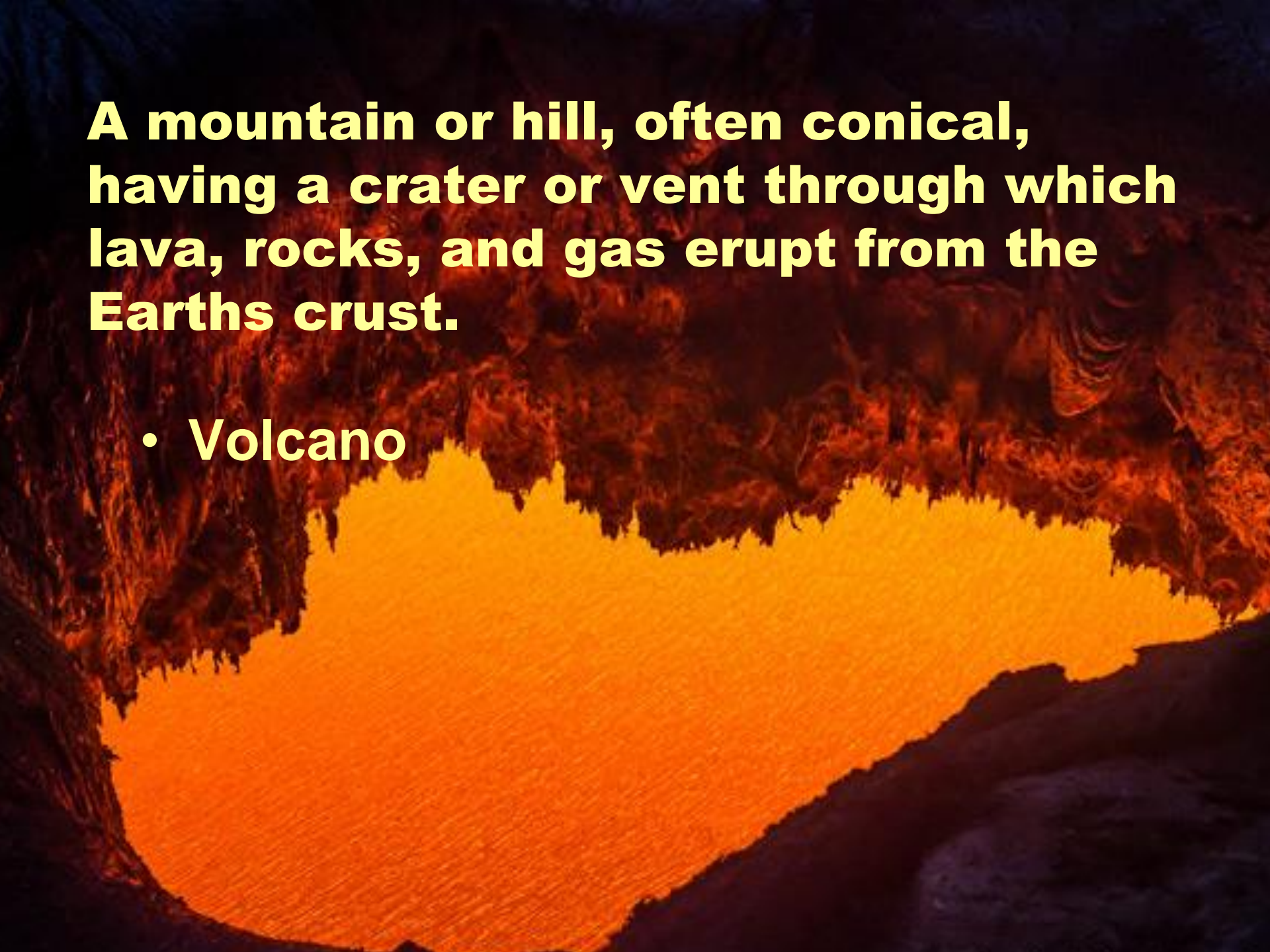
- **Volcanoes erupt material that is tens to hundreds of kilometers into the Earth**





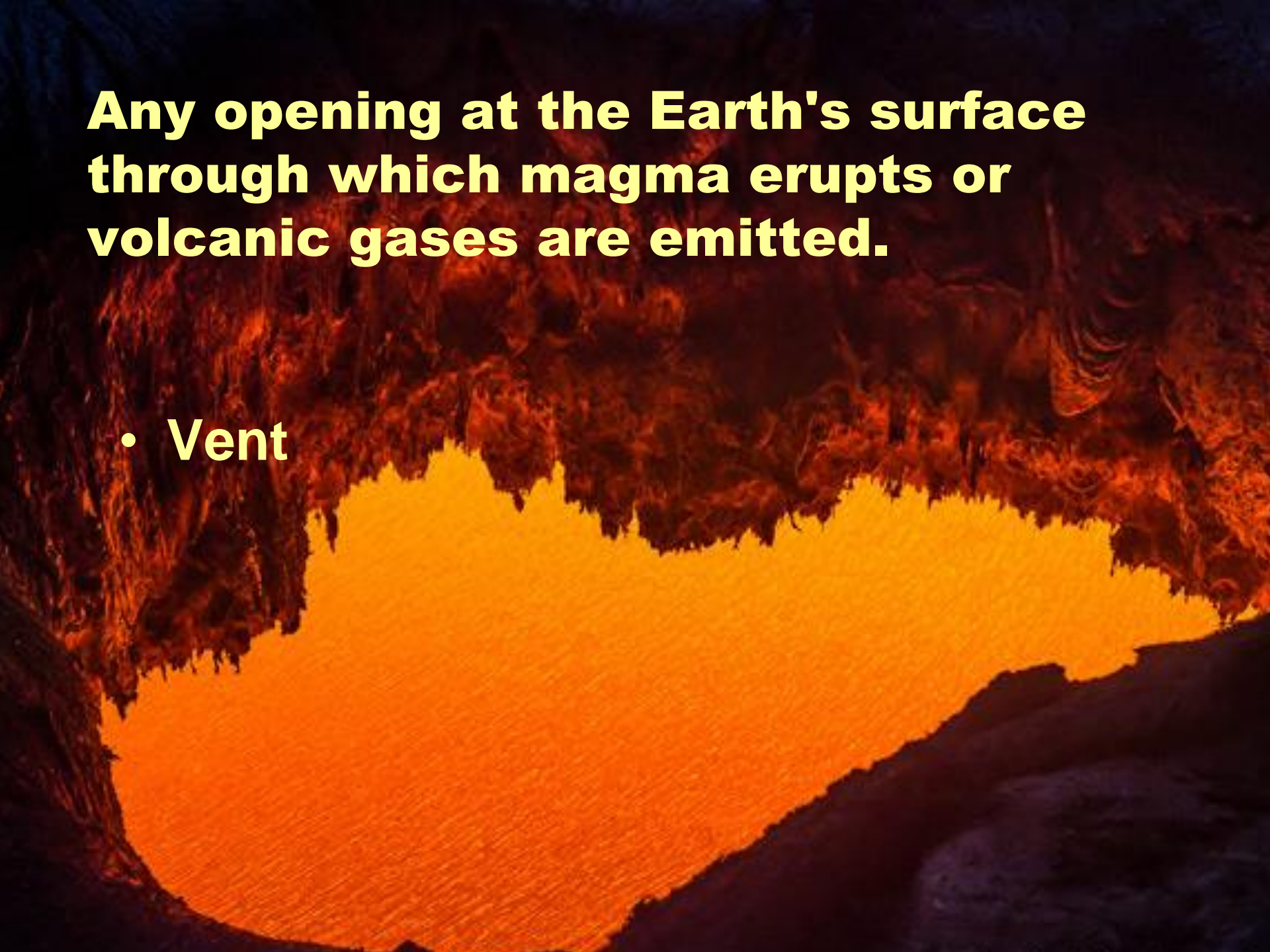
**A mountain or hill, often conical, having a crater or vent through which lava, rocks, and gas erupt from the Earth's crust.**

- **Volcano**



**Any opening at the Earth's surface through which magma erupts or volcanic gases are emitted.**

- **Vent**





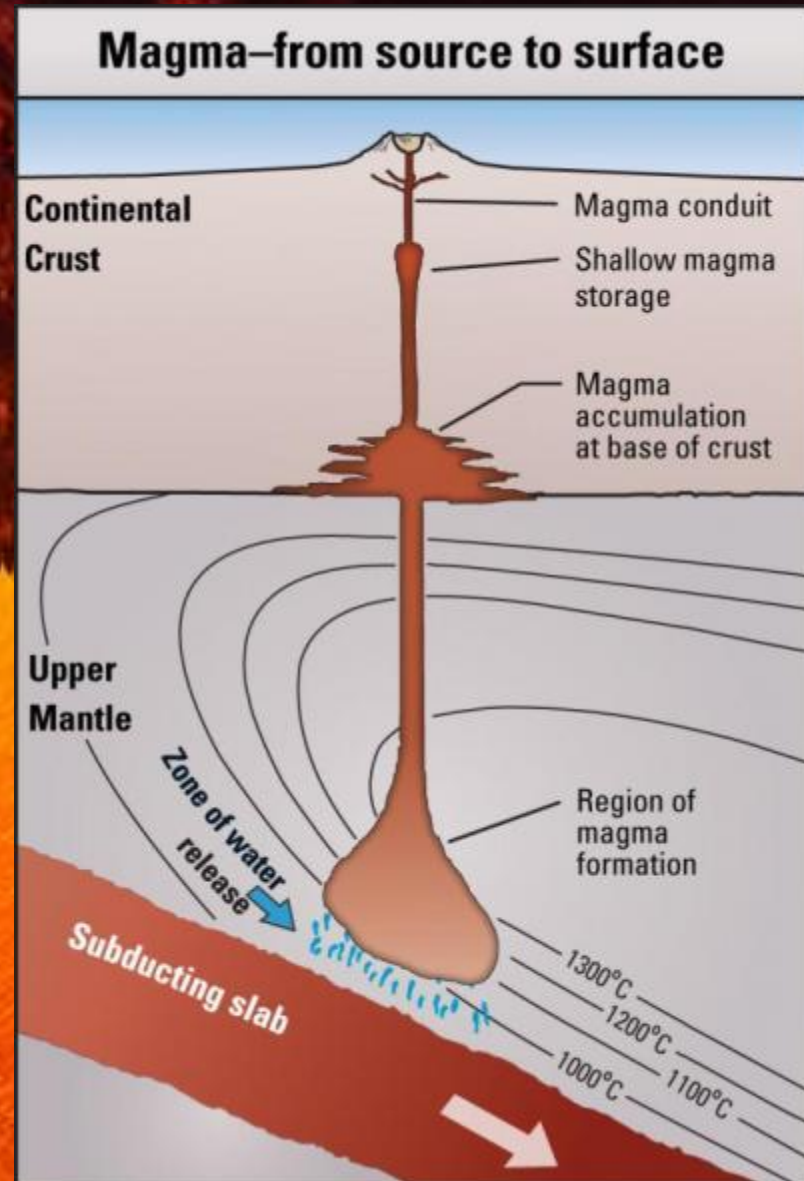
**The ascending, vertical part of the mass of erupting debris and volcanic gas that rises directly above a volcanic vent.**

- **Eruption Cloud**



# Molten rock beneath the surface of the Earth.

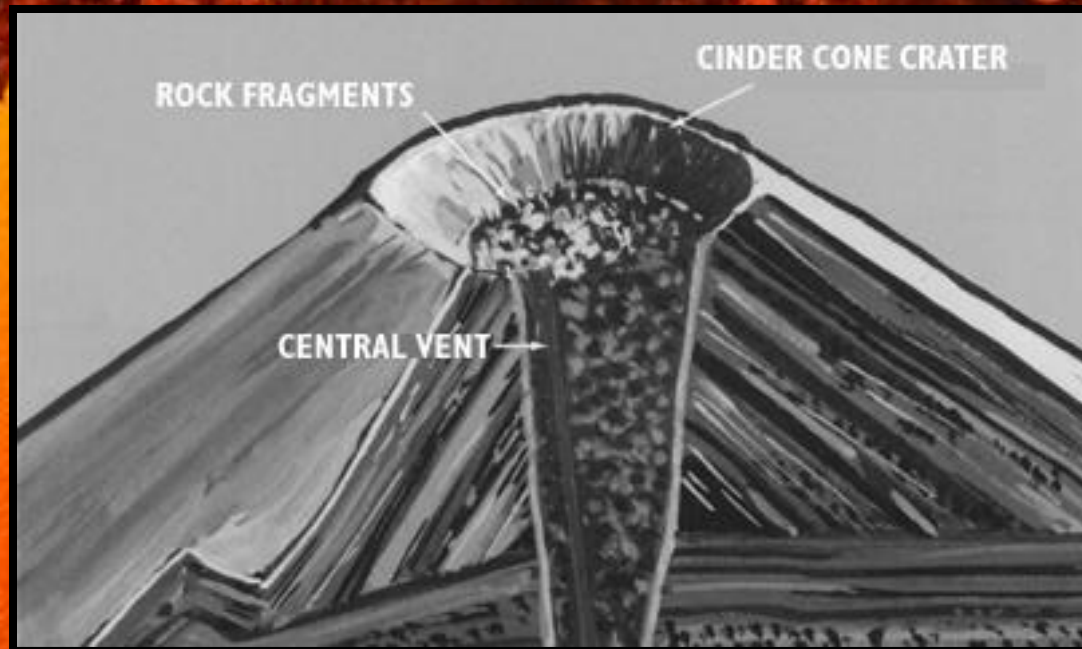
- Magma





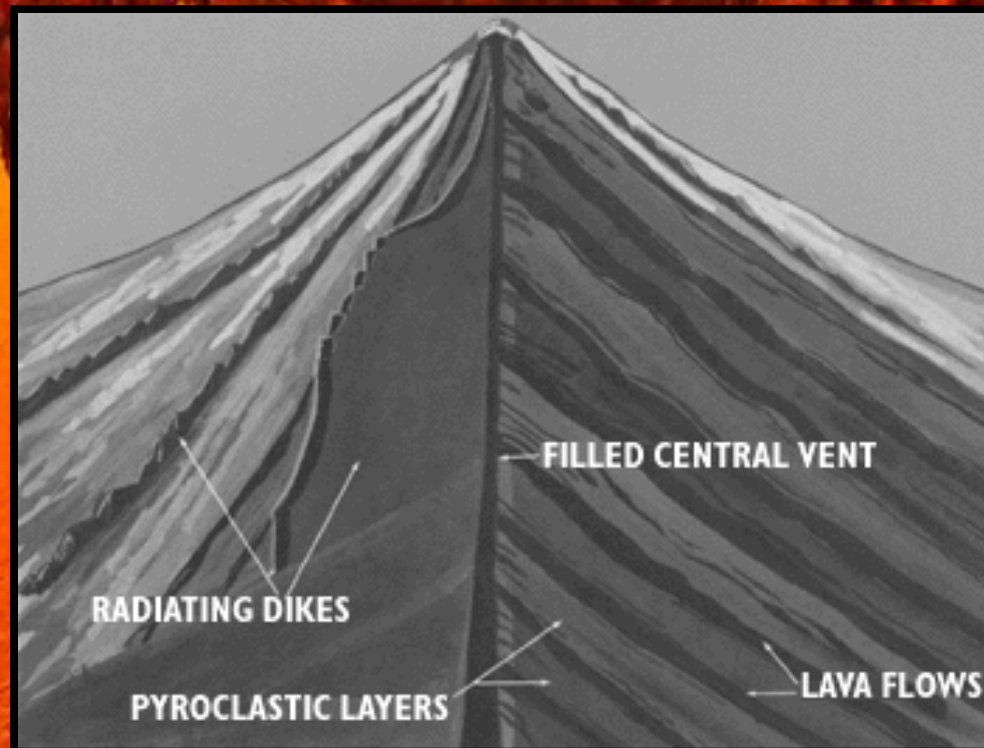
# Types of Volcanoes

- Type 1 – Cinder Cones



# Types of Volcanoes

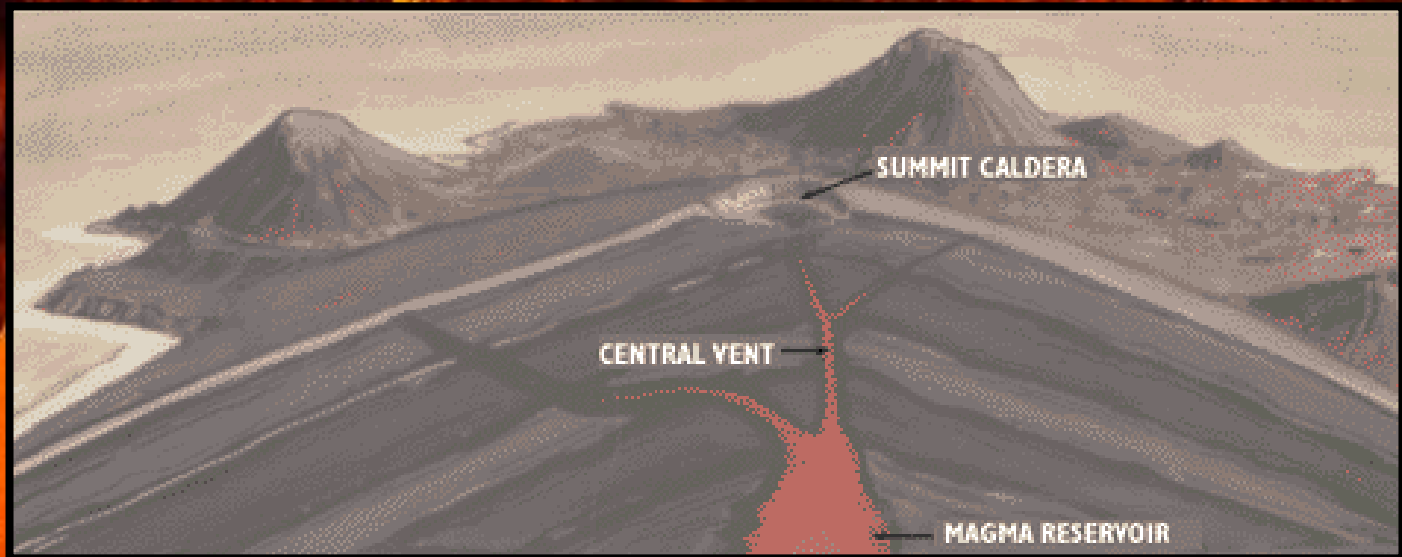
- Type 2 - Composite Volcanoes





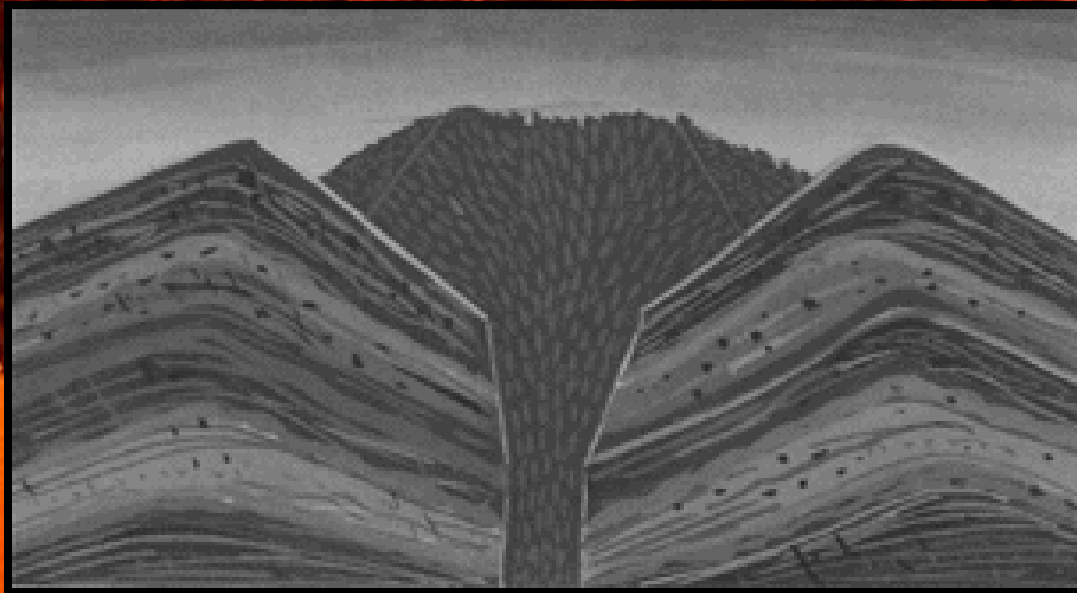
# Types of Volcanoes

- Type 3 – Shield Volcanoes



# Types of Volcanoes

- **Type 4 – Lava Domed**





# What are the benefits of Volcanoes?

- Minerals (gold, copper, lead)
- Continental Earth (80%)
- Produce fertile soils
- Geothermal Energy source

# **Why is it important to know that our earth is hot from a geographical perspective?**

- Interior heat powers convection current of the asthenosphere which in turn allows the lithosphere to move (plates moving)
  - Result:
    - formation of mountain ranges
    - deep sea trenches
    - Volcanic belts
    - Earthquake zones
- May be linked to long-term climatic changes



# **Label the parts of the Earth from the top down**

**Atmosphere**

**(Continental and Oceanic) Crust**

**(Upper and Lower) Mantle**

**Outer Core**

**Inner Core**



# What are fossil fuels?

- a natural fuel such as coal or gas, formed in the geological past from the remains of living organisms



# What makes the burning of fossil fuels harmful to the atmosphere?

- Fossil fuels originate from dead and decayed living matter. The carbon emitted from oil and gas is much more intensified when it is burned unlike natural processes which take much longer to emit carbon back into the atmosphere

# **Describe Carbon Tax and the intent of it**

**Carbon tax is a tax placed on businesses that burn fossil fuels and emit carbon dioxide into the atmosphere**

**This tax is intended to reduce the consumption of non-renewable resources and reduce carbon emissions that contribute to climate change**



# Three sources of internal heat generation

A cross-section of the Earth's interior, showing a glowing orange and yellow core surrounded by a darker, textured mantle. The core is the brightest part, while the mantle is a darker, more textured orange. The outer edge of the Earth is dark blue/black.

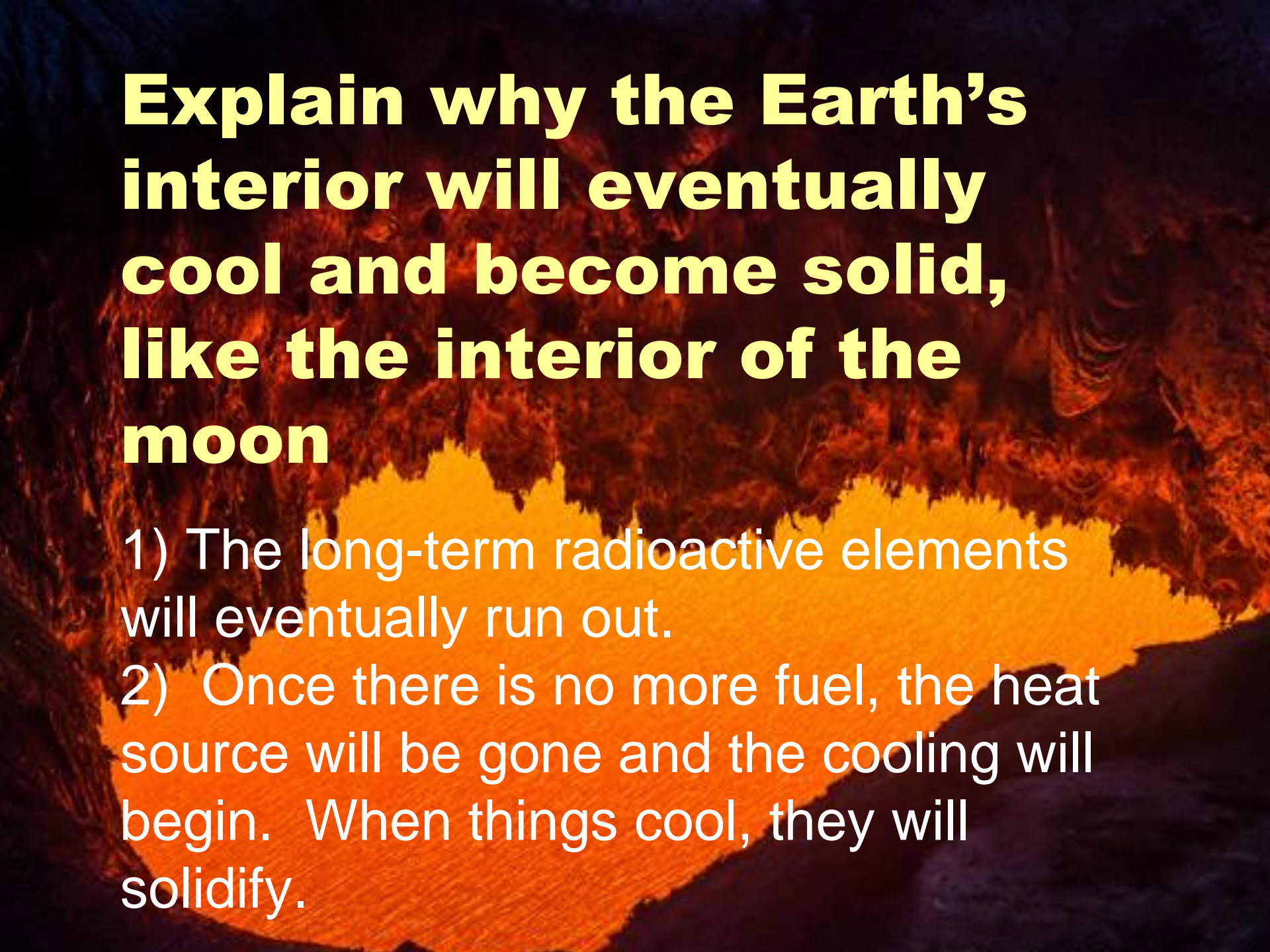
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# **Long term radioactive elements believed to still be decaying today?**

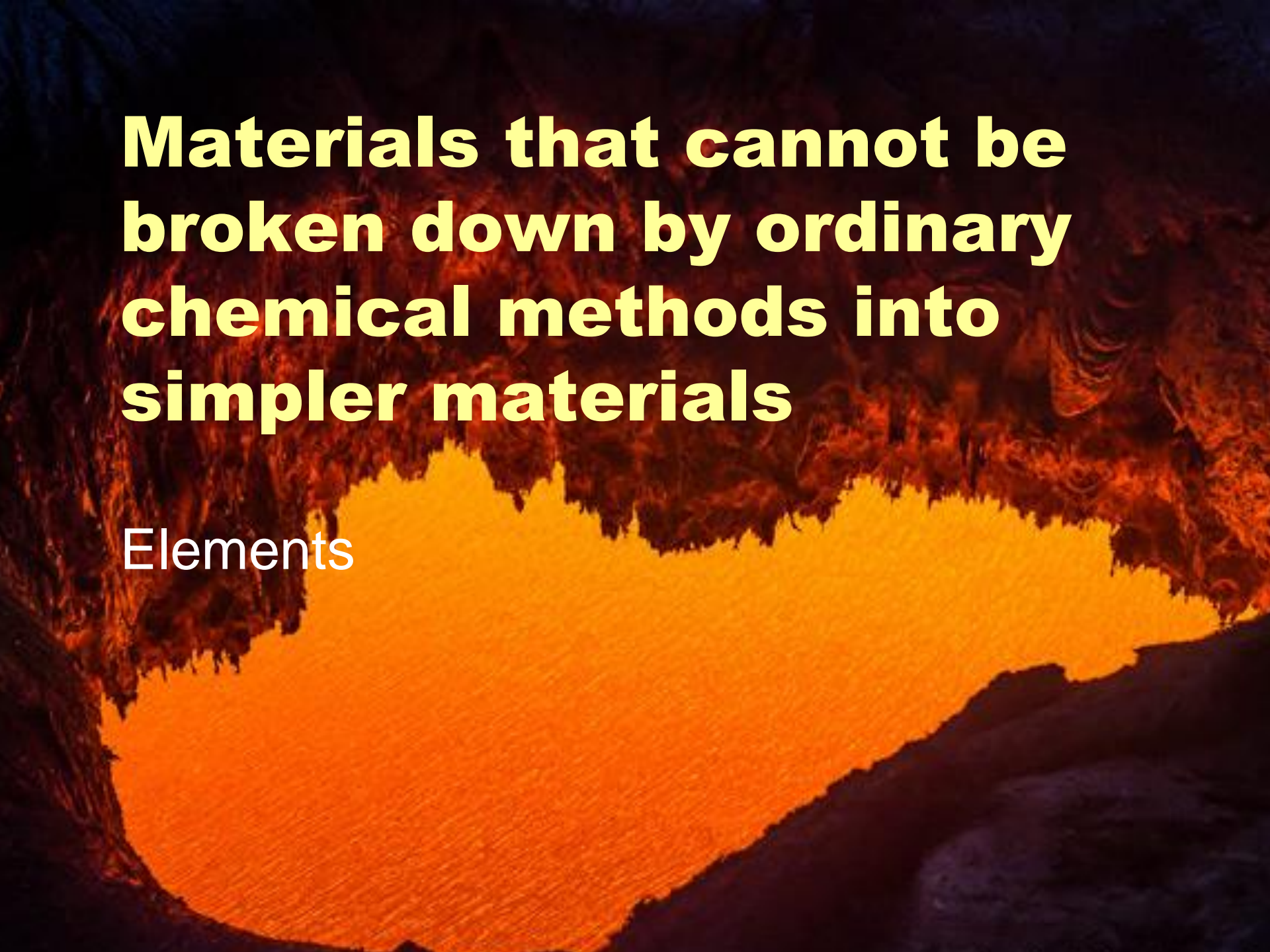
- Uranium 238
- Uranium 235
- Thorium 232
- Potassium 40





# **Explain why the Earth's interior will eventually cool and become solid, like the interior of the moon**

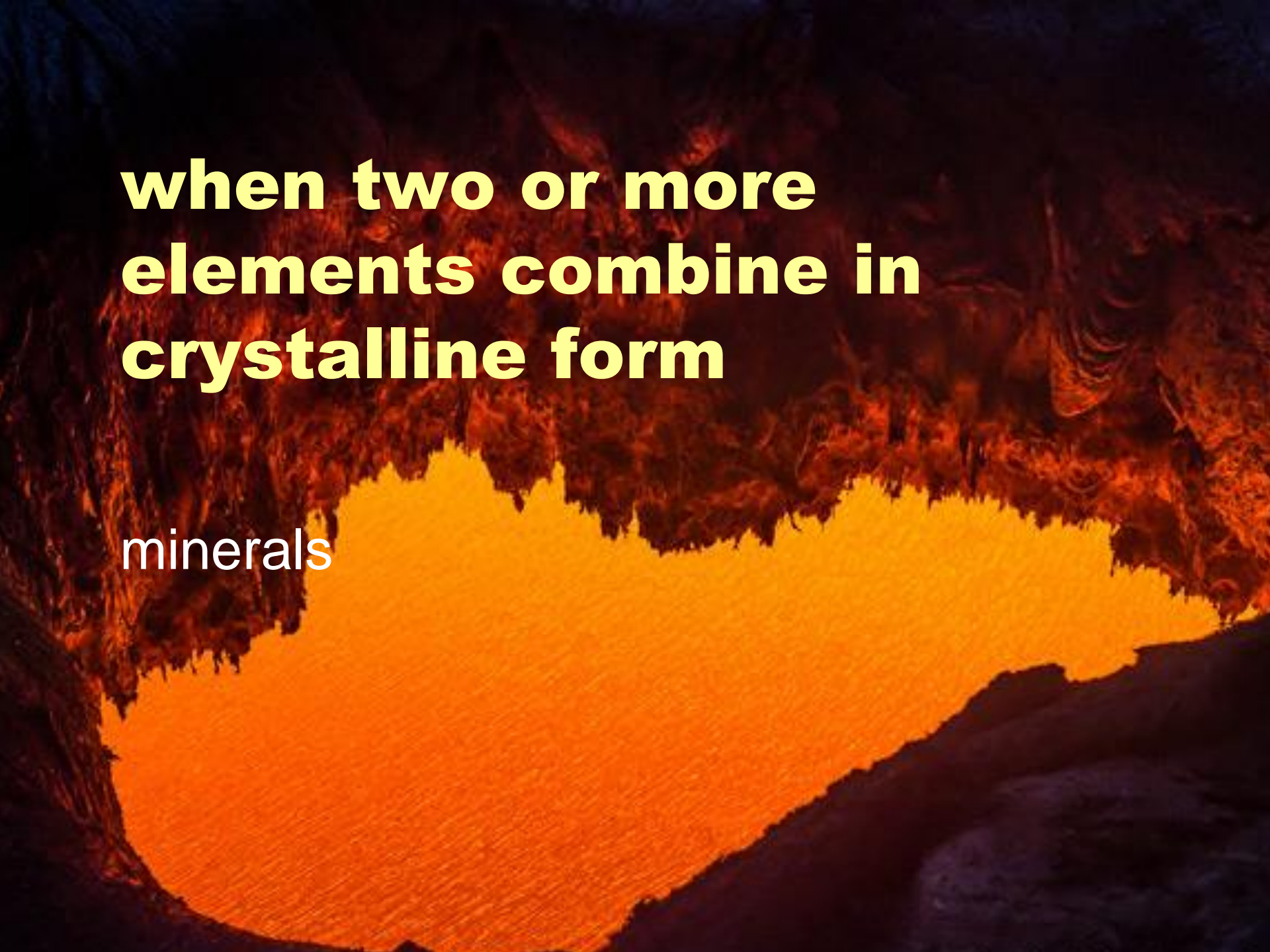
- 1) The long-term radioactive elements will eventually run out.
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**Materials that cannot be broken down by ordinary chemical methods into simpler materials**

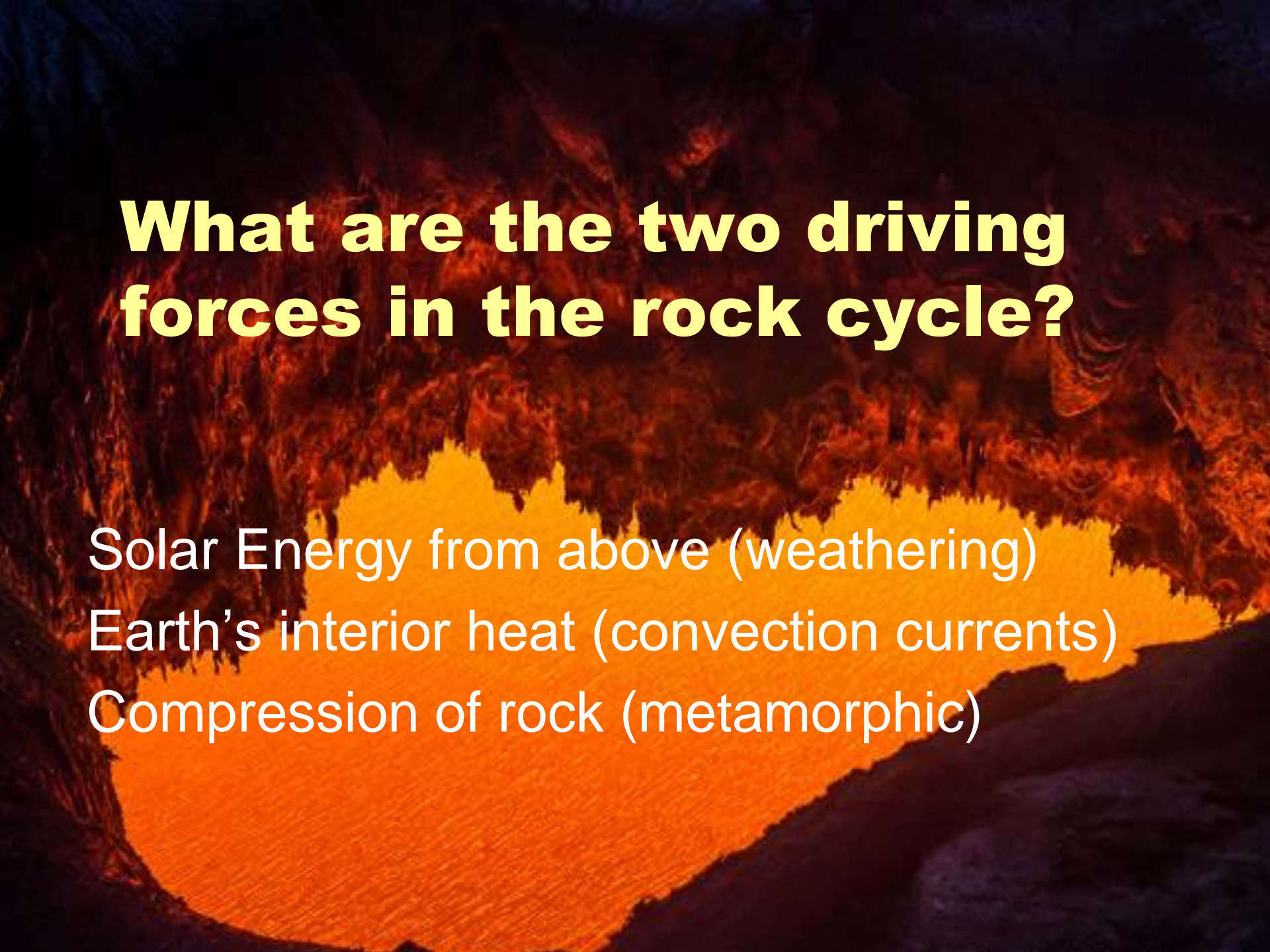
Elements





**when two or more  
elements combine in  
crystalline form**

minerals



# **What are the two driving forces in the rock cycle?**

Solar Energy from above (weathering)

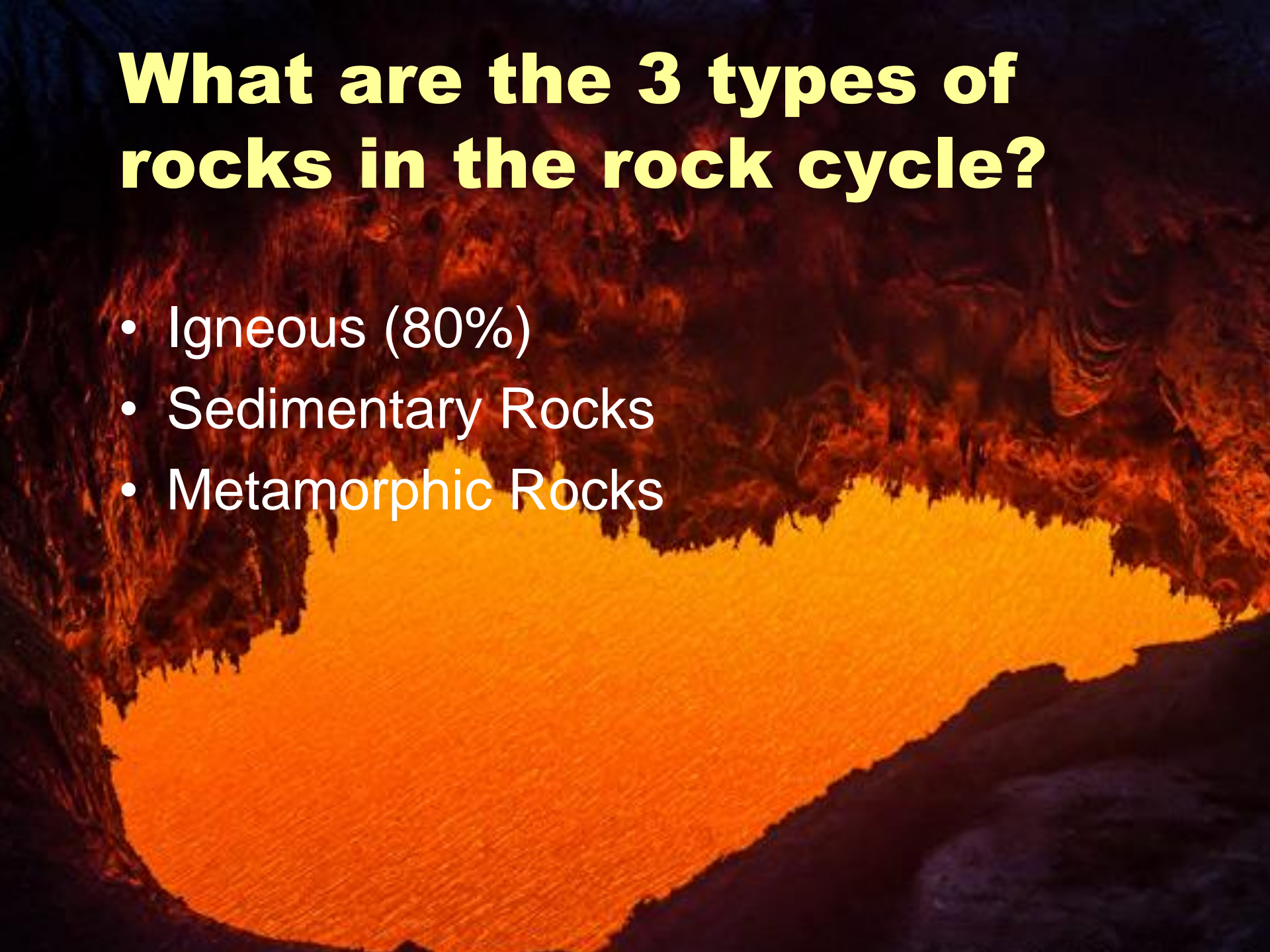
Earth's interior heat (convection currents)

Compression of rock (metamorphic)

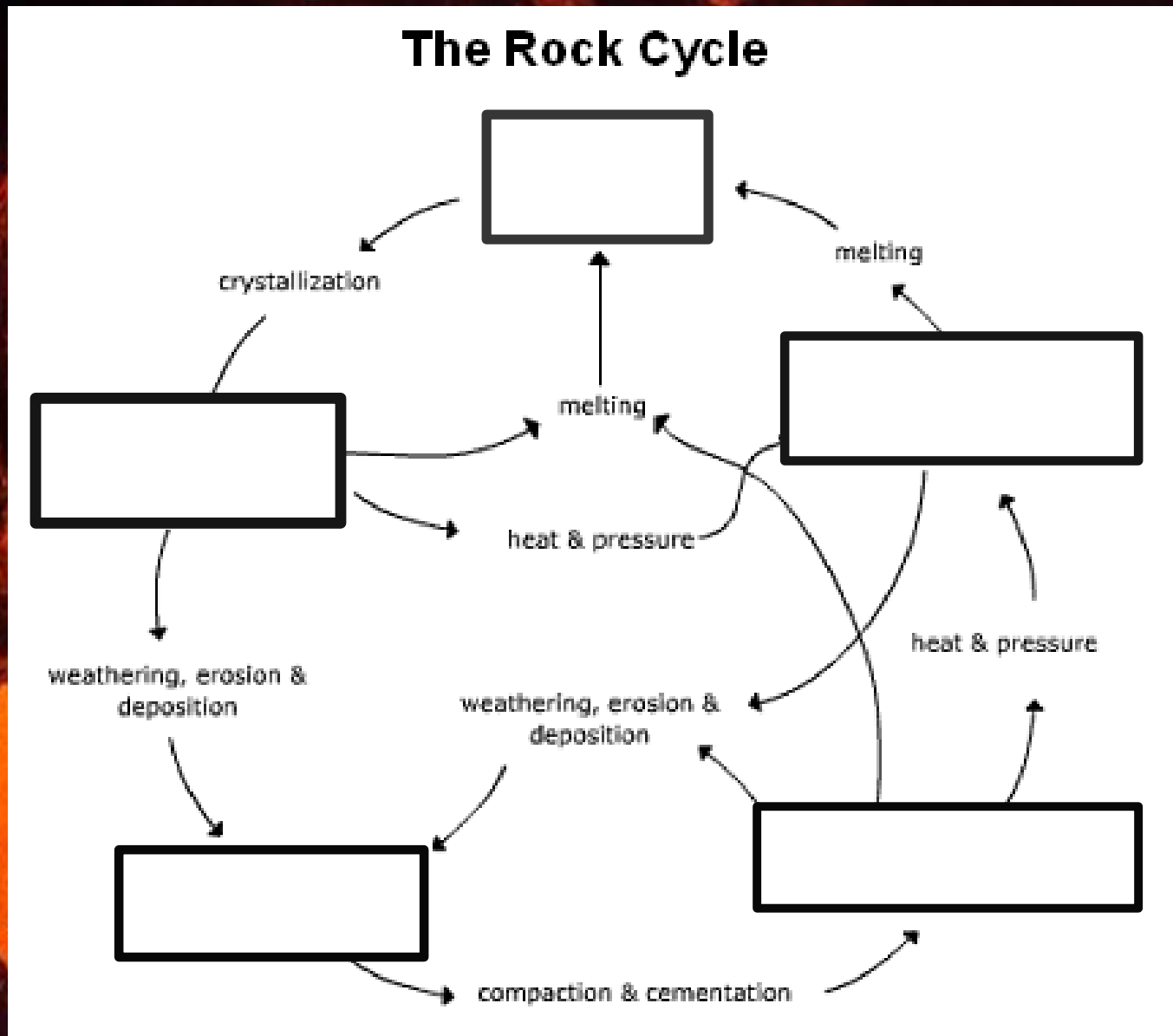


# What are the 3 types of rocks in the rock cycle?

- Igneous (80%)
- Sedimentary Rocks
- Metamorphic Rocks



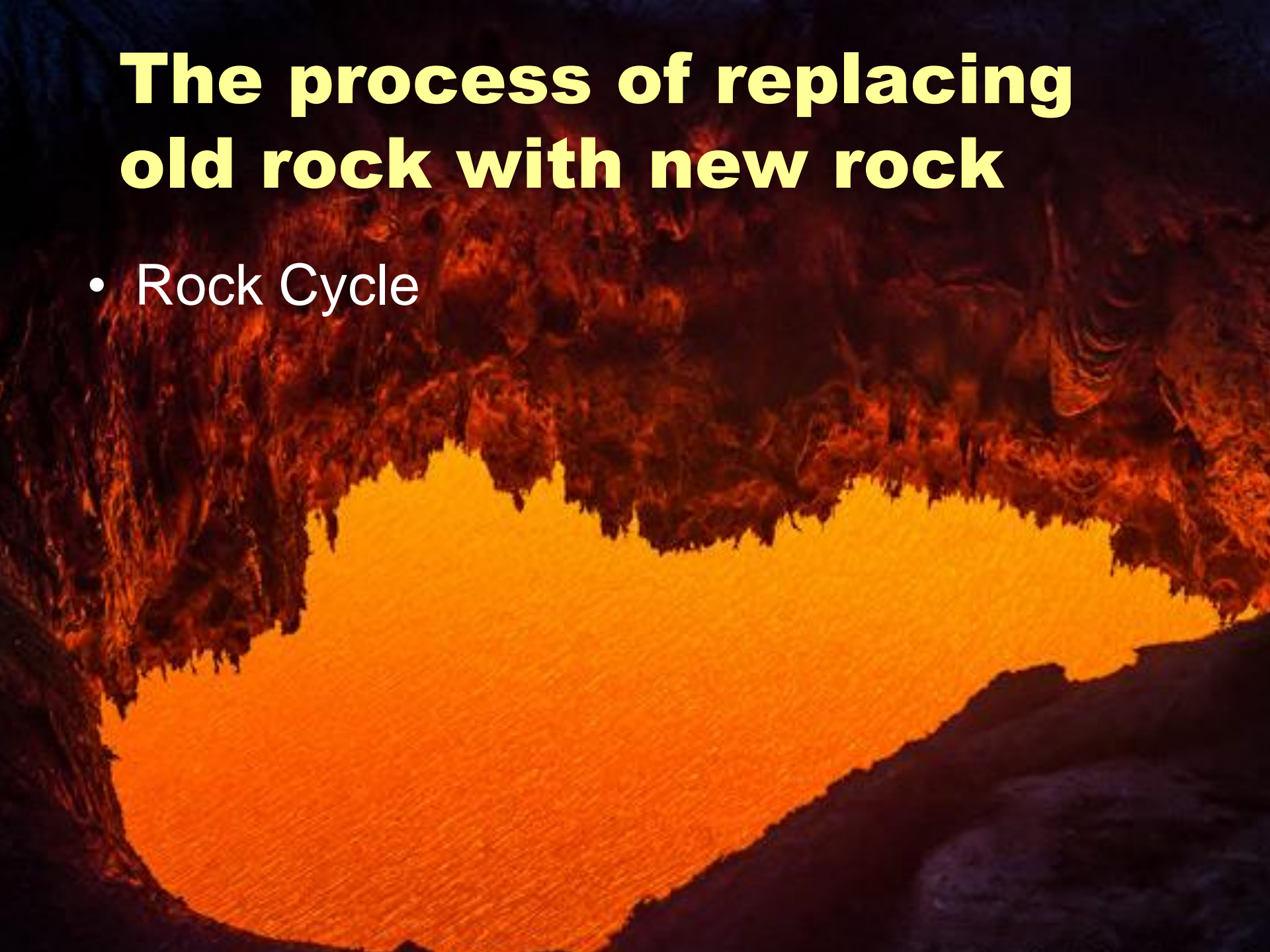
# Rock Cycle Fill in





# The process of replacing old rock with new rock

- Rock Cycle

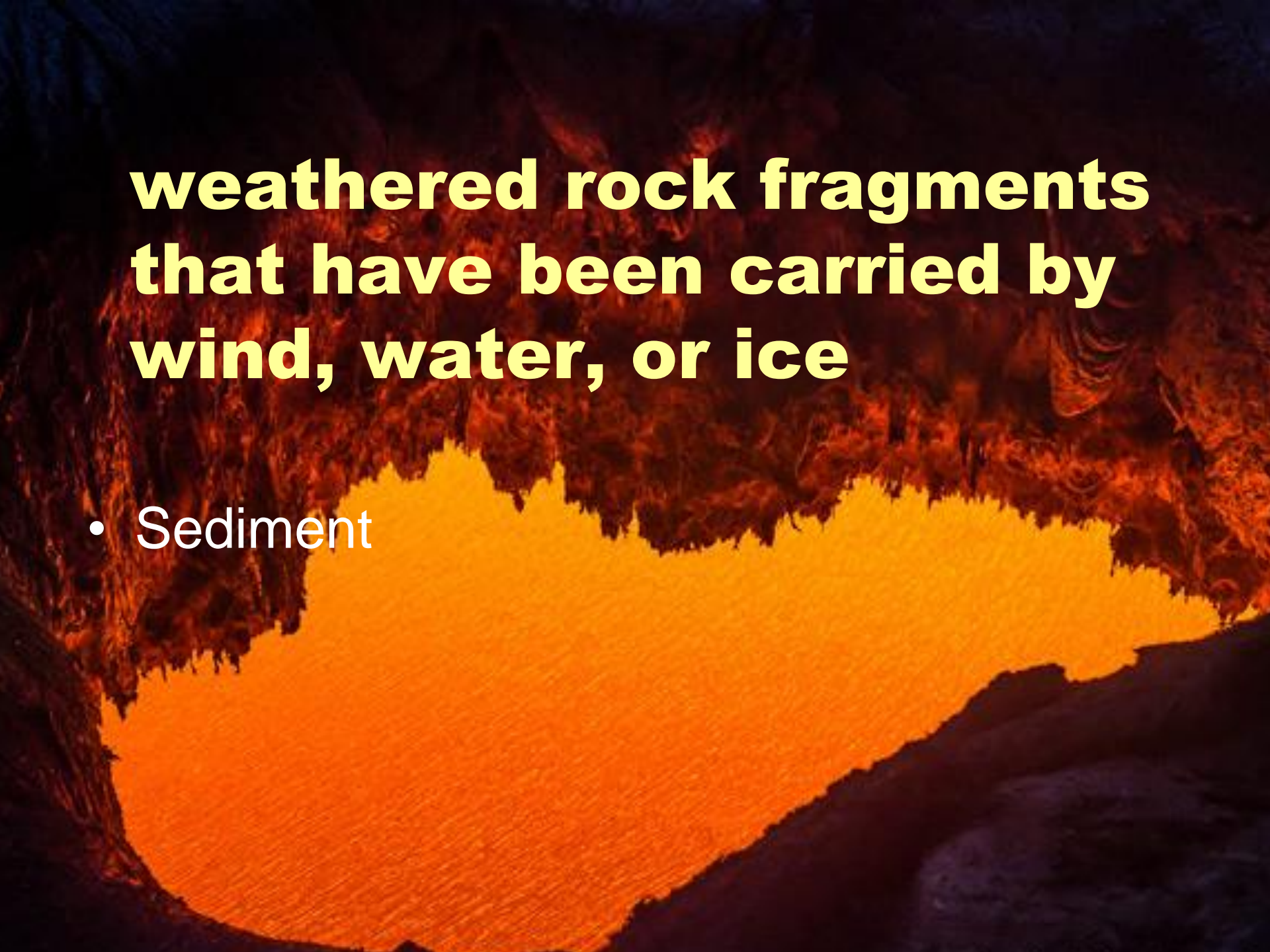




# **The disintegration and decomposition of rocks and minerals by natural processes**

- weathering



An aerial photograph of a river delta system. The river channels are visible as dark, winding lines. A large, irregularly shaped area in the center and lower-left of the delta is highlighted with a bright orange color, representing sediment. The surrounding land is a mix of dark green and brown, indicating different types of vegetation or terrain.

**weathered rock fragments  
that have been carried by  
wind, water, or ice**

- Sediment



# **Inorganic sediments are referred to as:**

- clastic



**Process that turns  
sediments into sedimentary  
rock, usually through  
cementation and / or  
compaction and hardening**

- Lithification

# Shale is an example of this type of rock

- Sedimentary Rocks
- Shale is a fine-grained sedimentary rock that forms from the compaction of silt and clay-size mineral particles that we commonly call "mud."







**To change from one form to another**

- Metamorphism

**a rearrangement of  
minerals or crystals in  
response to heat and  
pressure**

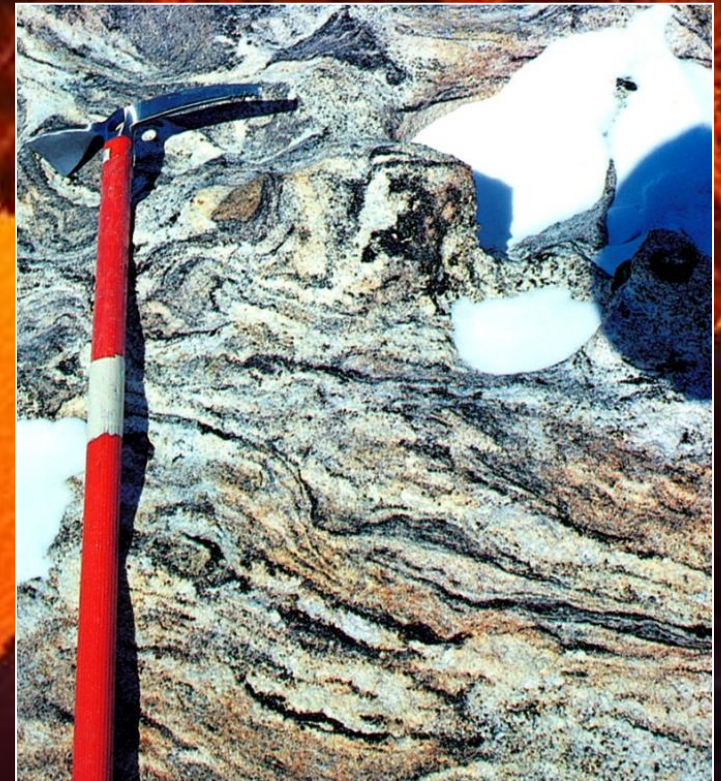
- Banding





# Gneiss is an example of this type of rock

- Metamorphic Rocks
- Bent (deformed) layers







**form from molten rock  
which has cooled**

- Igneous rocks



# Granite is an example of this type of rock



- Igneous Rocks
- Granite, basalt, and obsidian are examples of igneous rocks. Granite rocks are igneous rocks which were formed by slowly cooling pockets of magma that were trapped beneath the earth's surface