

EARTH MODEL

A **MODEL** is a visual representation of a concept, principle or idea.

A geological model of the Earth as a globe/ball gives us an idea of the Earth's interior composition.

The layers within this globe include:

Inner core – very hot solid iron and nickel under extreme pressure

Outer core – molten rock as the inner core is under less pressure

Lithosphere made up of:

Mantle –solid rock near the crust and molten rock below it

Crust – solid rock covering all the other layers

A **geologist** studies the EARTH.

EARTHQUAKES

EARTHQUAKES are vibrations within the Earth's crust caused by the release of energy when rock in the crust suddenly shifts position.

The origin of the earthquake occurs at the **focus**. The **epicentre** is on the surface at the point directly above the focus.

Vibrations travel in **seismic waves** (primary and secondary) through the crust from the epicentre.

The **intensity** or ground motion of an earthquake is measured by the **Richter scale** 0-10. **Magnitude** indicates increasing intensity on the scale by factors of 10.

VOLCANOES

A **VOLCANO** is an opening in the Earth's crust allowing solid and molten rock (magma or lava), gas, and dust to escape.

The opening of the volcano is called the **vent**. When the vent is covered, volcanoes can be **dormant** for a long time.

An **eruption** occurs when enough pressure builds up to open the vent and allow material from below the crust to escape.

The band of volcanoes around the rim of the Pacific Ocean is called the **RING of FIRE**.

WEATHERING

MECHANICAL weathering occurs when rock is broken or worn away by the physical action of water or the wind.

CHEMICAL weathering: occurs when water and oxygen react with minerals in the rock to produce new minerals.

BIOLOGICAL weathering: is the wearing away of rocks by living things, such as the roots of plants.

EROSION and SEDIMENTATION

The wearing away of the land by the action of flowing water is called **EROSION**. As water flows it carries a load of silt, sand, mud and gravel (called sediment). Sediments are deposited (**DEPOSITION**) as the water slows. This **SEDIMENTATION** creates landforms (fluvial) on the flood plain.

Sudden action of flowing water can create **LANDSLIDES**.

GLACIERS (moving snow and ice) can also carve the landscape creating landforms as it advances or retreats. Landforms or actions can include; drumlins, eskers, moraines, lakes, erratic and bedrock abrasions.

ROCKS & MINERALS

The naturally occurring solid materials that make up rocks are called **MINERALS**. All **ROCKS** are made of one or more minerals.

PROPERTIES are use to identify minerals that make up rocks. Properties include: color, lustre, streak, cleavage and fracture, and hardness (using Moh's hardness scale).

To identify a rock you first need to know what minerals it contains and how the rock was formed.

Once the rock has been identified, it's properties can indicate how it can be used, or valued.

ROCK CLASSIFICATION

IGNEOUS: rocks form from hot, molten rock called magma (lava). If it cools and hardens below the surface, it is called **intrusive**. If it cools and hardens on the surface it is called **extrusive**.

SEDIMENTARY: are rocks that are formed by layers of salts, minerals or organic material under pressure.

METAMORPHIC: are rocks that have been changed by intense heat or pressure deep below the Earth's surface.

GEOLOGICAL TERMS

Each of these terms are used throughout the Unit on Geology. Do you know what each term means?

Geology
Geologist
Seismograph
Seismogram
Volcanologist
Surveyor's level
Rock Hound
Remote sensing
Geophysicist
Geophysical prospecting
Geochemical prospecting
Exploration
Paleontologist
Ornithologist

THE ROCK CYCLE

There is no specific order that determines how rocks are formed – it depends on the physical environment where rock is found.

Rocks can be heated, melt to form magma and then form igneous rock, which can then be broken down into sedimentary or changed into metamorphic rock.

The **ROCK CYCLE** is a model that helps us visualize how these changes can occur. As is the case with any cycle, there is no beginning and there is no end, as the process of rock building continues endlessly.

THEORY of CONTINENTAL DRIFT

Alfred Wegener proposed that all the continents on the Earth were together forming a super-continent called 'PANGAEA'.

The theory of CONTINENTAL DRIFT suggests that this massive continent broke apart and the continents drifted to their present positions.

The evidence to support this theory included:

- Glossopteris fossils
- Glacial deposits
- Folded mountains
- Coal deposits

THEORY of PLATE TECTONICS

Volcano and Earthquake activity and inactivity around the world, ocean floor spreading and moving into trenches near the edges of continents helped scientists to develop the theory of PLATE TECTONICS.

This theory suggests that the lithosphere is broken up into large chunks called plates. These plates are being moved by the magma convection currents in the mantle.

Where plates meet (converging boundary), separate (diverging boundary) or slide past each other (transform) certain geological events occur which create or destroy land.

MOUNTAIN BUILDING

A mountain is a part of the Earth's surface that is higher than the land around it.

A mountain range (cordillera) is a series of connected mountains.

Mountains are formed as a result of the interactions between, and forces created by, tectonic plates.

Most mountains are formed by a combination of folding and faulting.

FOLDING and FAULTING

Folding
syncline (downfold)



anticline (upfold) ↑

Faulting – when a tectonic plate cracks, movement on either side of the crack can occur.

Thrust Fault mountains are formed when one plate is forced up and over another plate.

Fault Block mountains are formed when plates stretch and tilt, allowing older rock to be placed above younger rock.

FOSSILS

FOSSILS are traces, or evidence of living things from the past preserved in sedimentary rocks.

Fossils are formed as a result of being buried by layers of sediment over a long period of time.

Petrifaction occurs when water penetrates bones dissolving the calcium carbonate leaving only silica.

Residue forming the outline of the organism preserved in rock is called carbonaceous film

FOSSILS

Original remains can be preserved intact, if the original organism is found in peat bogs, tar or amber.

Trace fossils are evidence of animal activity (footprints, burrows, trails), not actual remains.

Fossils can be formed by the mould or cast process. MOULD is the depression the animal or plant makes and the CAST is what fills in the depression.

Index fossils help to indicate the relative age of the rock the plant or animal is discovered in.

LOCATING FOSSILS

The relative age of different layers of rock is inferred by geologists using the PRINCIPLE of SUPERPOSITION.

ROCK STRATA are formations outlined in layers with the most recent (youngest) on top.

GEOLOGICAL COLUMNS help paleontologists infer the age of the fossils they find.

FOSSIL BEDS

Fossil beds are locations where many fossils are found.

BURGESS SHALE Fossil Beds have rich desposits of soft bodied organisms.

BADLANDS of DRUMHELLER have rich desposits of dinosaur bones.

Many of these fossil remains and replica recreations can be found in the Royal Tyrell Museum of Palentology in Drumheller, Alberta.

GEOLOGICAL TIME SCALE

Time periods called ERAS, based on sequence of rock strata and fossil identification, help scientists organize and represent the history of the Earth.

PRECAMBRIAN (formation of Earth, simple organisms)

PALEOZOIC (reptiles, amphibians, insects, land plants, fish with jaws)

MESOZOIC (dinosaurs, flowering plants, birds and mammals)

CENOZOIC (modern species, mammals advance, grasses, humans)