Tectonic Plates:
The surface of the Earth's crust is split into large sections called tectonic plates. There are 7 main plates, and there are oceanic plates and continental plates. These plates float on the mantel and move at about 10 cm/year.

Plate Boundaries:
1. Convergent Boundary - a boundary when 2 plates collide and push together.
    -2 continental plates collide = mountain building (Himalayas)
    -1 continental and 1 oceanic collide = subduction zone - the ocean plate goes under the continent plate, can sometimes cause volcanoes on the surface (west coast of Canada & the US)

2. Divergent Boundary - A boundary where 2 plates pull apart. The mid-atlantic ridge is a boundary where 2 oceanic plates are pulling apart. Convection currents in the mantle cause the movement. The mantle comes up, cools and forms new rock, it keeps spreading out and is called "Seafloor spreading". Very volcanically active!!

3. Transform Boundary - A boundary where 2 plates slide past each other. These cause a lot of earthquakes.

Volcanoes:
Types:
-Shield Volcanoes - Gentle eruptions, lower pressure, thin lava that travels far. They look like soft rounded domes.
-Stratovolcanoes - high pressure, large eruptions, the thick lava cools on the sides of the volcano building it larger and larger. *Pyroclastic flows - hot ash, gas and rock.
-Cinder cones - very steep, conical volcanoes, medium pressure, a lot of ash and smoke

-Lava domes - small volcanoes forming inside craters

Earthquakes:

When tectonic plates slide past each other (like at a transform boundary), sometimes they get stuck, build up pressure and eventually slip free. An earthquake is the force of this pressure being released.

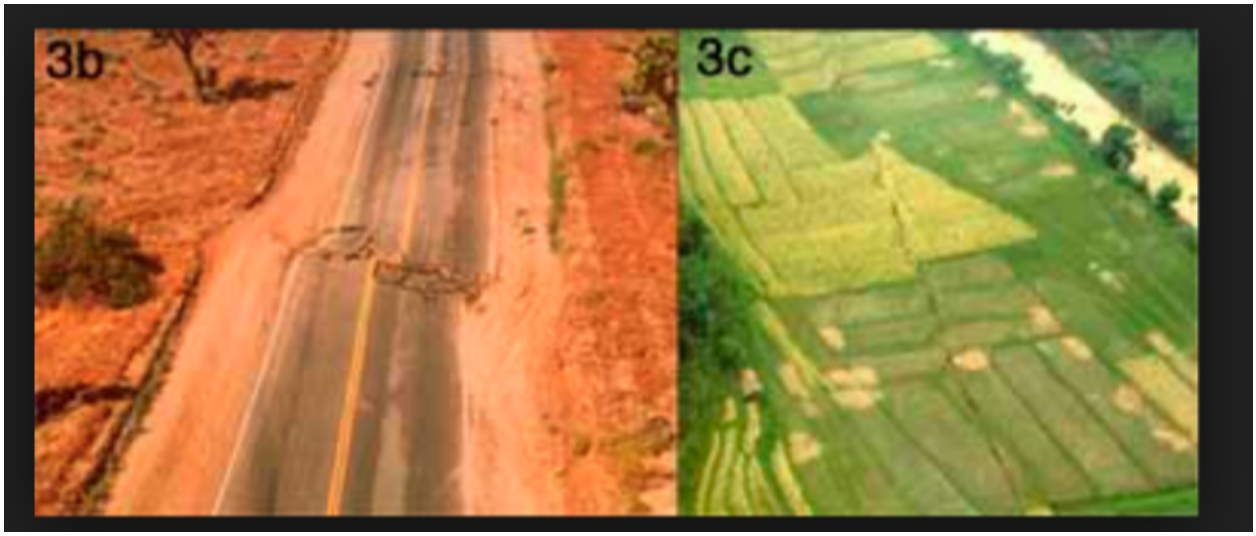
-The site of the earthquake underground is called the hypocentre. On the surface it's called the epicentre.
-The force travels in waves out from the centre
-Measured with a seismograph - it makes a seismogram (print out)
-Measured on the "Moment Magnitude Scale" - 7.0+ are considered very damaging

Impact on the land:

Cracks - these radiate out from epicentre, often wavelike

Uplift - large earthquakes cause uplift - one side of the land rises up, the other drops (leaves a cliff-like edge)

Offset - the land shifts opposite directions on the sides of the fault



<u>Landslides:</u>

-Landslides happen when something weakens the bottom layer or layers of a slope. Eventually these layers can't hold up the weight of the upper layers and the slope collapses.

-Things that weaken the slope:

- Water (Rain, floods, rivers, streams)
- Wind
- Human development (Construction, roads, mining)
- Ice breaks

-Evidence left behind:

- After a landslide there will be a bare cliff (no trees or vegetation). There will be a slanted deposit of till (broken rock and dirt) at the bottom of the slope. The cliff is often a semi-circle, shape (caved into the cliff edge)

Weathering & Erosion:

1.<u>Weathering</u>: the breaking down or wearing away of rock.

- Mechanical weathering happens when rock is broken apart by physical forces, such as water or wind.
  ex. River wearing away bank, rain and wind wearing away hoodoos
- Chemical Weathering happens when water and oxygen react with the minerals in rocks to produce new minerals.
  ex. Limestone dissolving with acidic rain, high iron rocks rusting
- Biological Weathering is the wearing away of rocks by living things.
  ex. Tree roots breaking through rocks

2. <u>Erosion</u>: The moving away of the particles broken off through wreathing.
ex. River, wind, etc.

3. <u>Deposition</u>: The settling of particles in a new location.
ex. Silt settling in the bottom of a lake.

Glaciers

Large sheets of ice that spread and recede across the landscape.

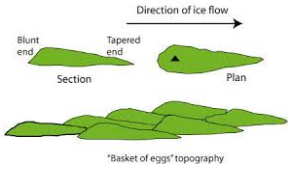
Evidence they leave behind:

- **Striations:** Scratches and gouges left by glaciers

- Finger lakes - large gouges that filled with water and eroded

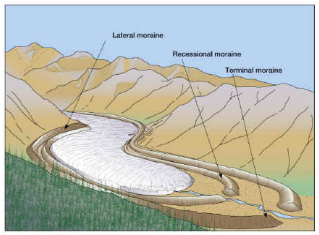
- Kettle lakes - a chunk of ice breaks off the glacier, gets buried by till and soil, melts later and forms round lakes

- Drumlins - teardrop shaped hills made by glaciers (a group is called “a basket of eggs”)

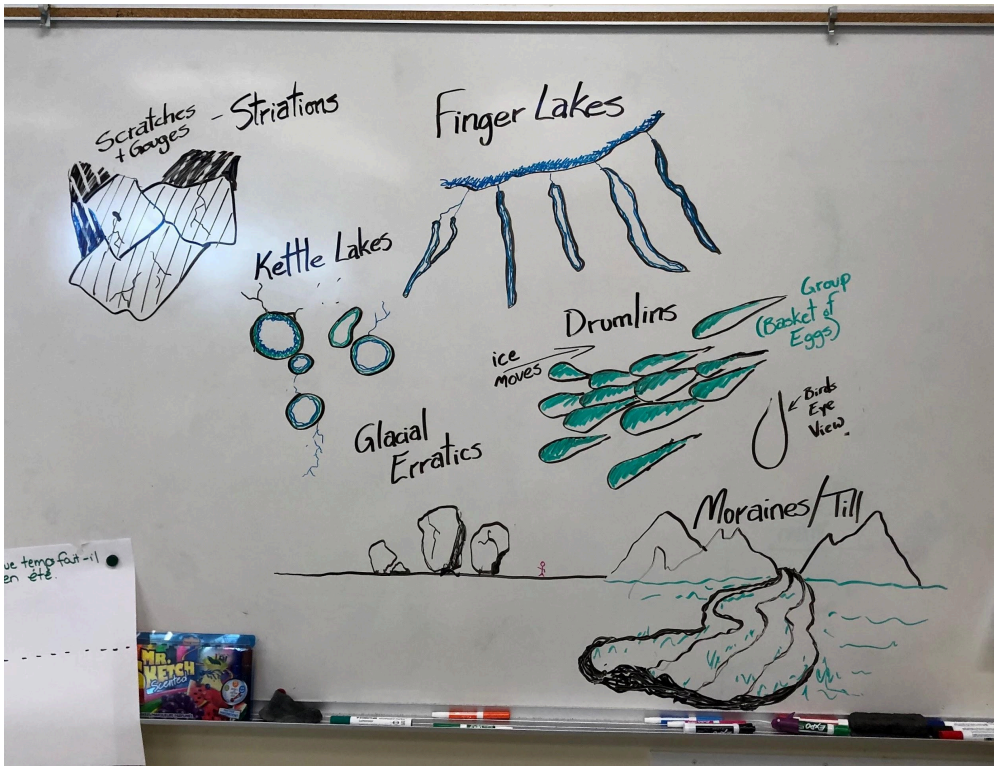


- Glacial Erratics -Large boulders, or fields of boulders, left when glaciers recede (melt)

- Moraines/Till - Piles of till left where it built up at the front and sides of a moving glacier (pushing your foot through dirt example)



- Glaciers carve large u-shaped valleys in the mountains



Rock Cycle

Sedimentary: Wind and water erode existing rocks. The particles/grains are carried away (by river, wind, etc) and settle in large bodies of water (lakes, oceans). They build up in layers and compress into rock. *Sometimes, organic material (plants, animals) get compressed in the layers too.

Characteristics:

- Rough (sandpaper)
- Dull - dull colours and not shiny
- Dense/heavy
- Made of tiny grains or pebbles
- Some are more fragile
- Layers
- The only rocks with fossils

Metamorphic: Form with heat and pressure. The rocks deep in the earth's crust, or along plate boundaries, get heated enough to soften (but not melt!). They are squeezed by pressure. The crystals flatten and align. (Cooked and smooshed!)

Characteristics:

- Often quite shiny (at least have a sheen)
- Quite heavy/dense
- Jagged, can be rough
- Variety of colours
- Small, flat crystals

Igneous: Form when existing rocks are fully melted and then cool and harden.

- Shared Characteristics
  - less dense than metamorphic
  - rough
  -never have fossils

Extrusive Igneous	Intrusive Igneous
Lava cools quickly on the earth's surface. -no visible crystals -all one colour -some are very light and have air bubbles -some are more solid -rough	Magma cools slowly beneath the surface -see the different crystals/minerals -shiny -speckled look -crystals are large (not flat)

Classifying Minerals:

Rocks are made up of natural minerals

Some minerals are pure elements (eg. Copper, Sulphur, Gold) and some are compound mixes (eg. Quartz, Feldspar)

Ways of Classifying:

1. Hardness: How hard or easy it is to scratch the surface of a mineral.

The Mohs Hardness Scale		
Mineral	**Mineral hardness**	**Hardness of common objects**
talc	1 softest	soft pencil point (1.5)
gypsum	2	fingernail (2.5)
calcite	3	piece of copper (3.5)
fluorite	4	iron nail (4.5)
apatite	5	glass (5.5)
feldspar	6	steel file (6.5)
quartz	7	porcelain tile (7)
topaz	8	flint sandpaper (7.5)
corundum	9	emery paper (9.0)
diamond	10 hardest	carborundum sandpaper (9.5)

   Frederick Mohs made a scale for measuring the hardness of minerals.

2. Crystal Systems: Most minerals form one of 6 common crystal shapes. - These are different styles of prisms.

Table 5.2 The Six Major Crystal Systems

Mineral Examples		Systems	
	halite		cubic
	wulfenite		tetragonal
	corundum		hexagonal
	topaz		orthorhombic
	gypsum		monoclinic
	albite		triclinic

3. Lustre: How shiny a mineral is. It can range from dull to metallic lustre. If it shines like metal it has a metallic lustre. If it is shiny, but not as much as metal, it has a non-metallic lustre (can describe with words like “glassy”, “sheen”, “pearl”)

4. Colour: Minerals come in a variety of colours! Colour is a clue to the type of mineral, but you usually need more information to be certain.

5. Streak: Any mineral with a hardness less than porcelain (7) will leave a streak line on a tile. Some minerals the streak matches their colour, some minerals leave a different coloured streak.
   (ex. Gold = gold streak, Pyrite (gold colour) = greenish black streak)

6. Cleavage & Fracture: The way a mineral breaks
   a. Cleavage: splits perfectly along a certain line (clean break) (ex. Leaves smooth faces, predictable, not jagged)

b. Fracture: jagged irregular breaks (sharp, random)

7. Transparency: How see through the mineral is. Goes from Transparent - Translucent - Cloudy - Opaque

Lustre	Cleavage	Fracture
Dull (Earthy) Chalky Greasy (Waxy) Pearly Glassy Metallic	Basal (layers) Cubic Rhombohedral (diagonal) Crystal-Structure	Jagged Splintered Conchoidal (semi-circular)