Our Changing Landforms

Weathering

Erosion

Wind, Water, Ice, and Gravity

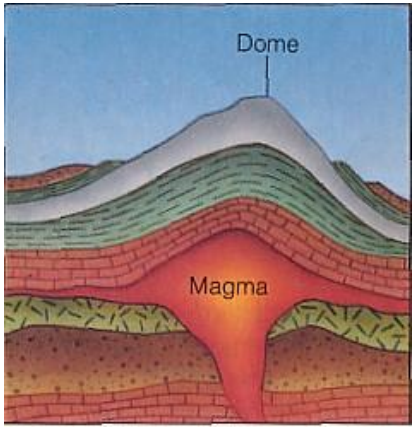
Form Sand Dunes, Canyons, and Deltas

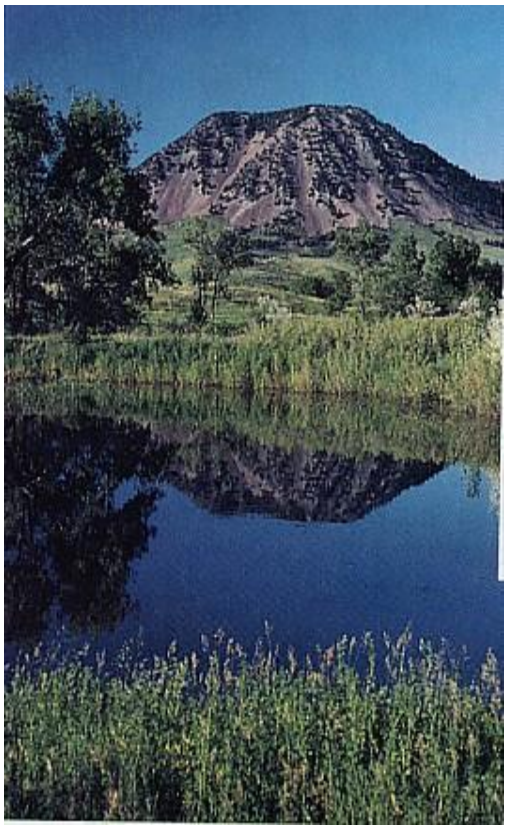
Deposition

Landforms Change Over Time

Two main ways landforms change are Uplifting and Erosion

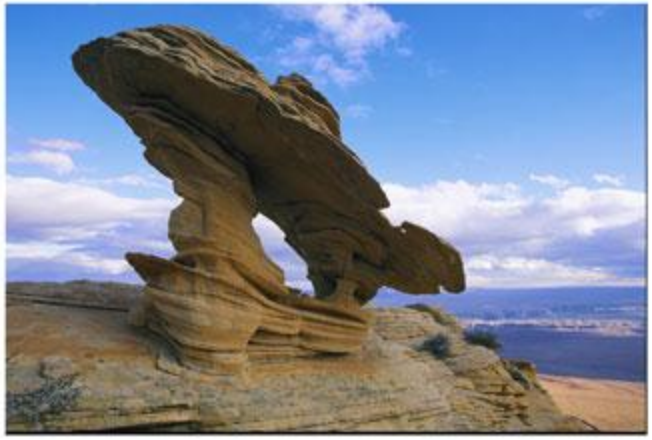
Uplifting – is due to changes inside the Earth



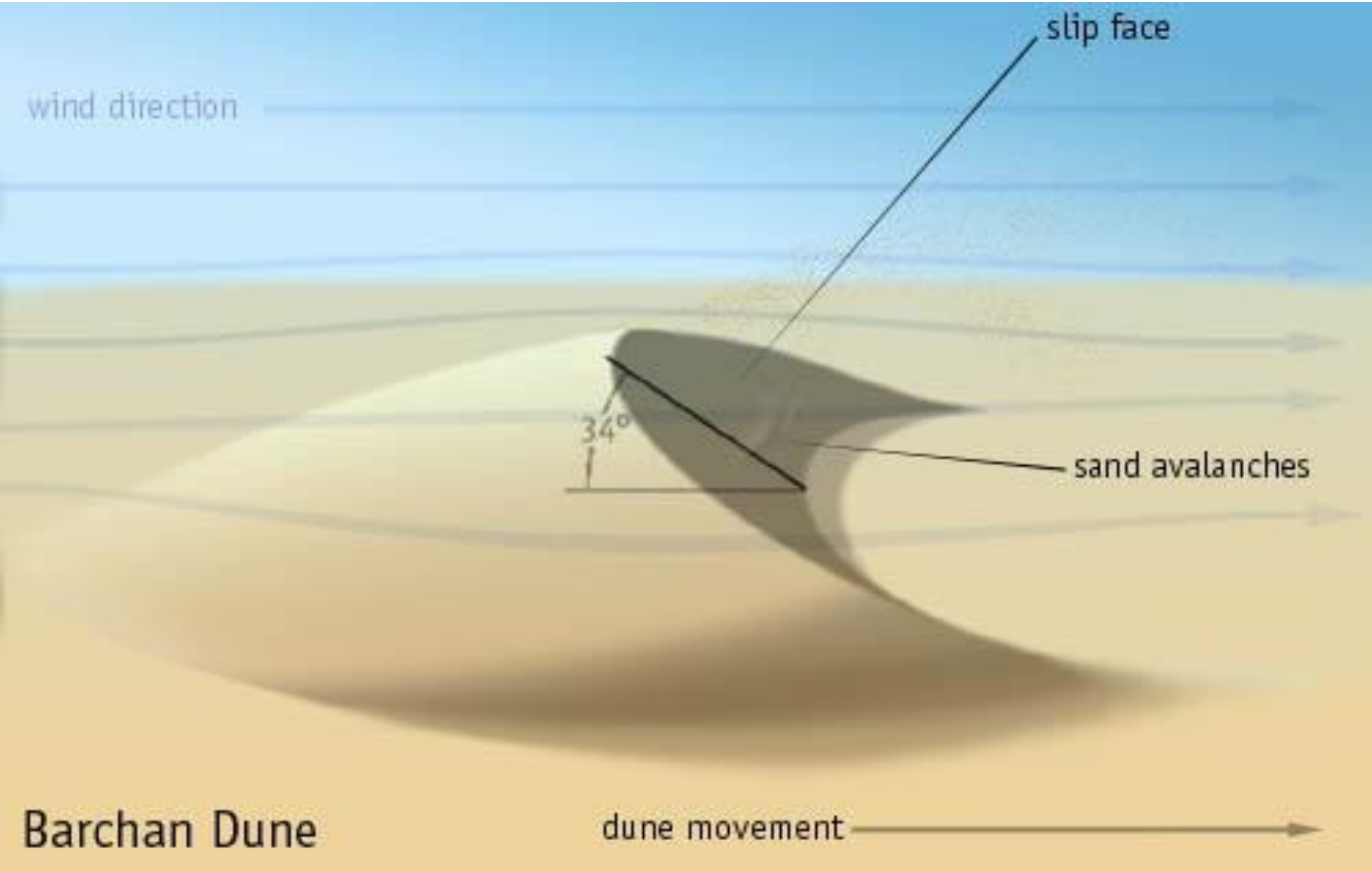


Erosion – Changes due to wind, water, ice, and gravity

Wind
Weathering – Erosion - Deposition



Sand dunes shaped by the wind

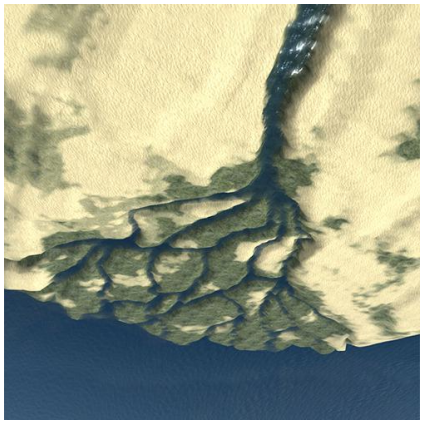


Erosion

Deposition

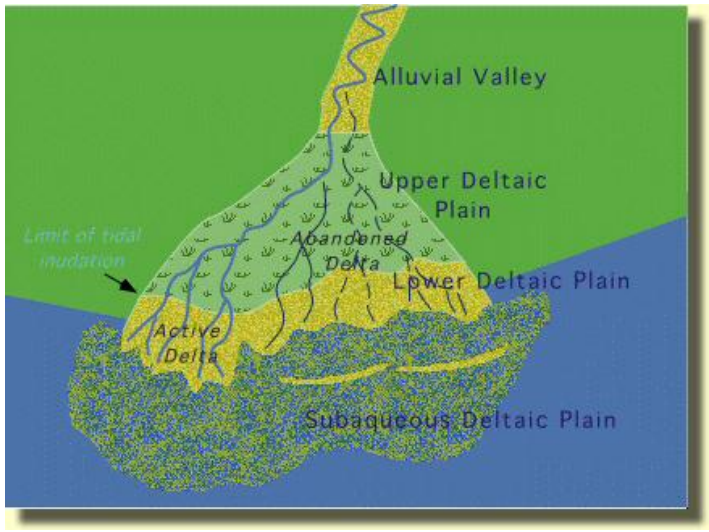
Water
Weathering – Erosion – Deposition

Deltas formed from deposition at river's end

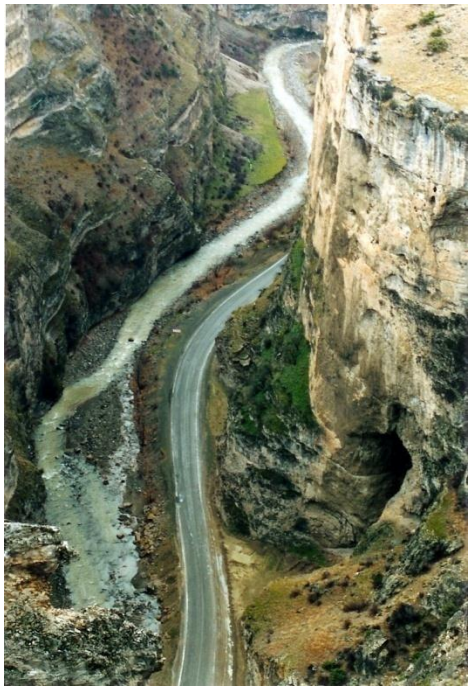


A delta is a landform that is formed at the mouth of a river where that river flows into an ocean, sea, estuary, lake, reservoir, flat arid area, or another river. Deltas are formed from the deposition of the sediment carried by the river as the flow leaves the mouth of the river. Over long periods of time, this deposition builds the characteristic geographic pattern of a river delta.

Deposition Annimation



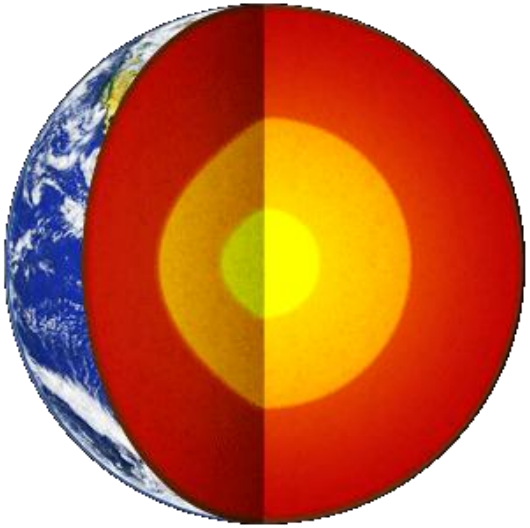
Canyons are formed from rivers

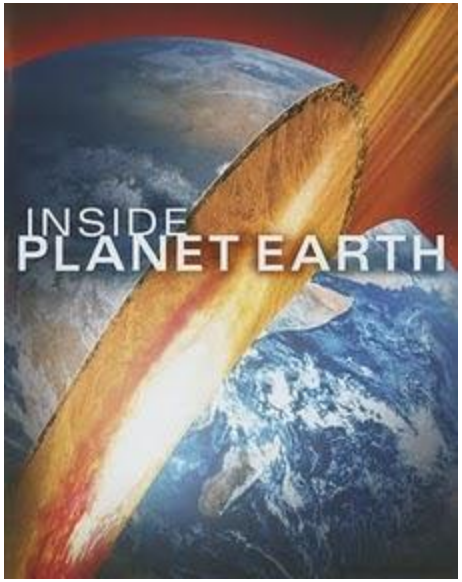


Ice
Weathering – Erosion - Deposition

Valleys formed by glaciers

Earth – 3rd Rock from the sun



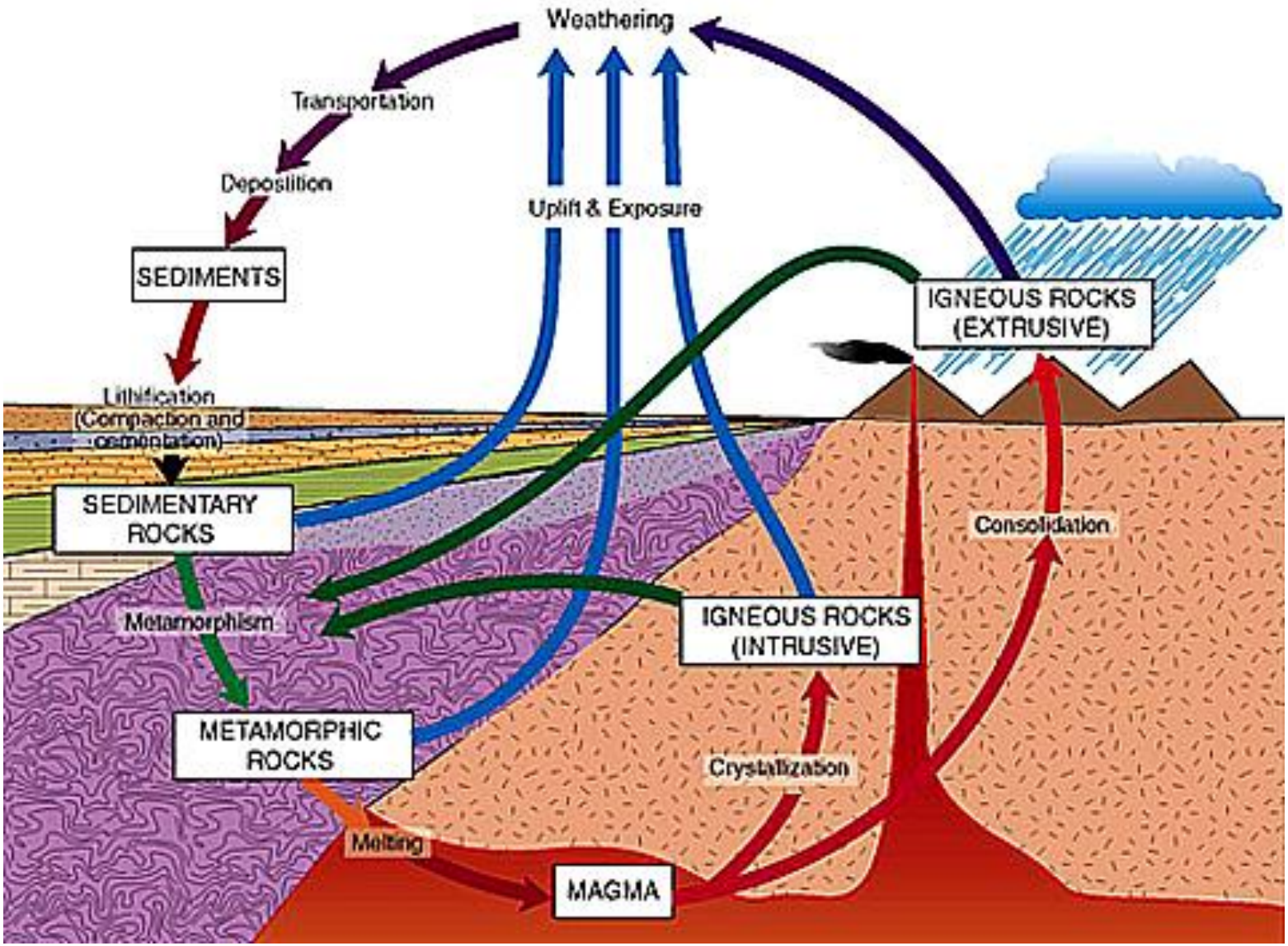


←Forces Inside the Earth – cause changes to the surface.

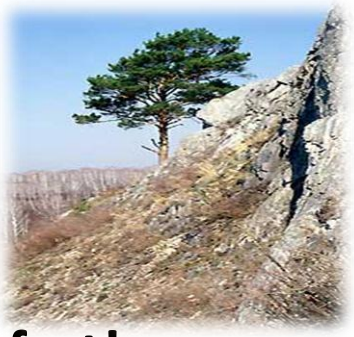
Forces on the Earth's surface (W. E. D.) Cause changes to the rocks on the surface of the Earth. →


STOP

Rocks Change in the Rock Cycle



Weathering



Oh no! I'm breaking up...

That's right, it doesn't look good - I'm weathering away fast!

All rocks on the Earth's surface weather - though some weather faster than others. Three different forces work together to break up rocks into smaller pieces.

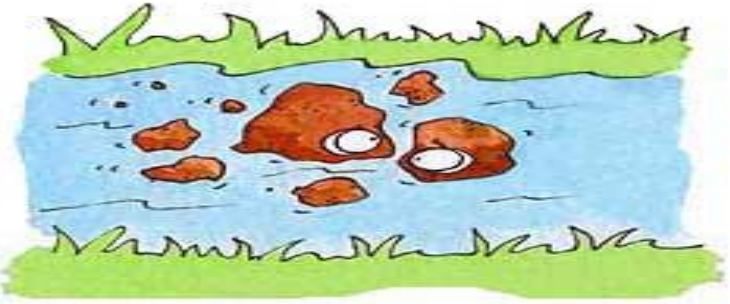
1. Physical weathering - cycles of hot and cold temperatures make rocks expand and contract, and rain may freeze and expand in cracks in the rock. These processes eventually lead to rocks cracking and breaking up.

2. Chemical weathering - different chemicals can dissolve rock, helping to break it up; even water can dissolve some rocks. Polluted 'acid rain' causes chemical weathering.

After hundreds of years I have broken down into a pile of rubble, gravel and sand. What's in store for me next?

http://www.oum.ox.ac.uk/thezone/rocks/cycle/stage1.htm

Erosion



I'm being swept off my feet!
Yep - now that I have weathered into small pieces, it is easy for me to be moved around.

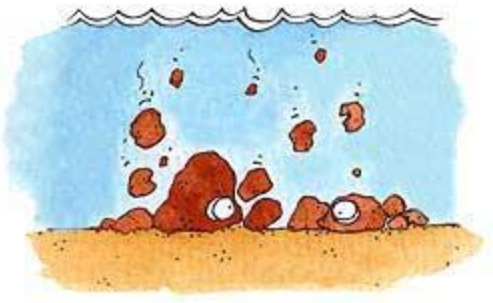
As rocks weather, they are broken up into small, easily transportable pieces or particles.

The movement of these particles is called erosion. There are four major ways erosion can occur:

1. **By gravity - broken pieces of rock fall to the ground, and roll or slide down slopes.**
2. **By water - rivers and streams can transport all sizes of particles.**
3. **By wind - small grains of sand can be picked up and moved by the wind in dust storms.**
4. **By ice - ice rivers, called glaciers, can transport very large pieces of stone.**

I'm still being picked up and transported by a river. What happens next?

Deposition

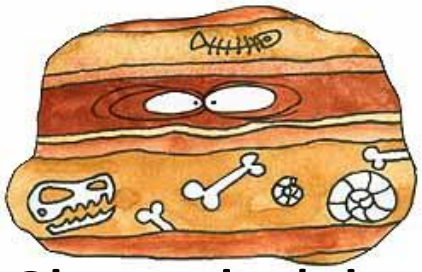


I've got a sinking feeling...
The river that has carried me along has now reached the sea - I think I'm being dumped.

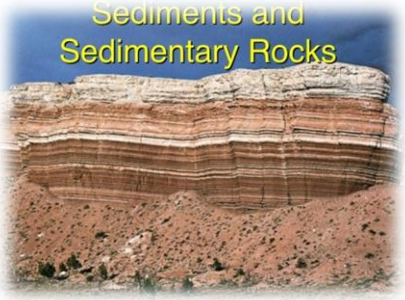
Particles of rock cannot be transported forever. Rivers reach the sea, the wind stops blowing and glaciers melt - they dump the load of particles they were carrying. This process is called deposition.

During deposition particles of rock are laid down in layers. Heavier particles are normally dumped first and then covered by finer material. Layers of sediment build up over time. These layers form a sedimentary sequence.

I have sunk to the bottom of the sea floor - buried by particles falling from above. What's in store for me next?



Sediments make Sedimentary Rock



Oh no, what's happening now?
This might not be so bad after all - I'm feeling whole again.

As the layers of sediment build up, the pressure on the lower layers increases. The layers are squeezed together and any water mixed in with the sediments is forced out. This process is called compaction.

At the same time the particles of sediment begin to stick to each other - they are cemented together by clay, or by minerals like silica or calcite.

After compaction and cementation the sedimentary sequence has changed into a sedimentary rock. Sedimentary rocks like sandstone, shale and limestone differ from other rocks in that they:

1. Are formed from layers of sediment built up over many years.

2. Are grains of sediment cemented together by various minerals.

3. May contain *fossils* - remains of plants and animals that were caught up in the sediment.

4. Sediments formed with dead / decaying plants and animals may turn to *fossil fuels* when HEAT and PRESSURE from the Earth are added

Well I'm feeling much better now that I can call myself a sedimentary rock. What next? There's a choice this time - up or down, you decide!

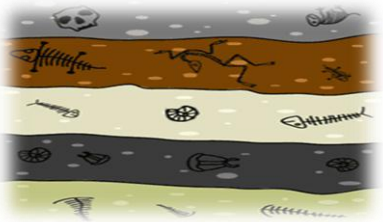
ROCKS AND LAYERS

Most of the rocks exposed at the surface of Earth are ***sedimentary***--formed from particles of older rocks that have been broken apart by water or wind.

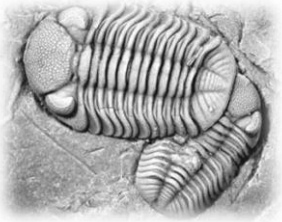
These sedimentary particles may bury living and dead animals and plants on the lake or sea bottom.

The sediments at the bottom of the pile become rock.

The animal skeletons and plant pieces can become fossils.



Fossils and Rock Record



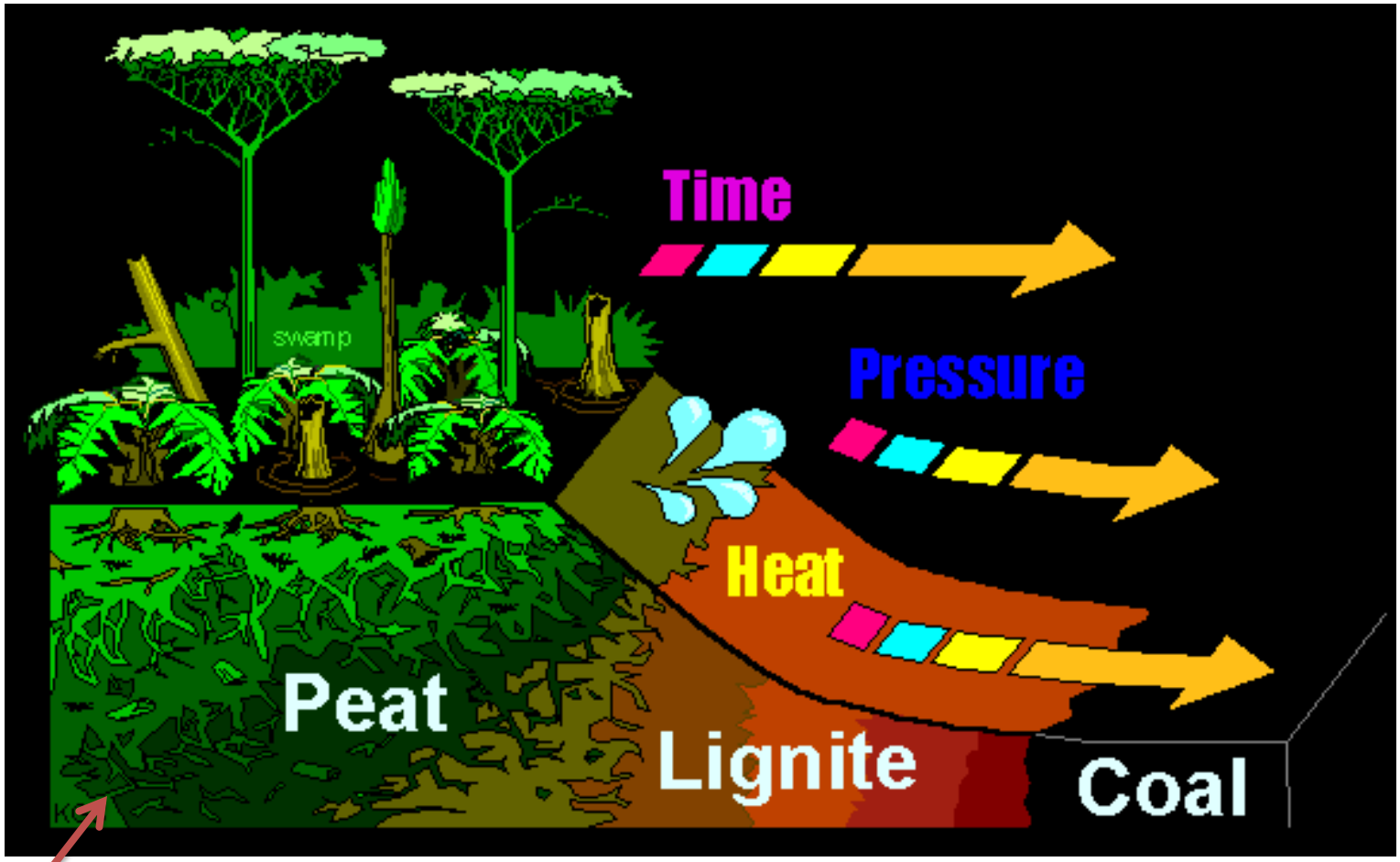
Each layer of sedimentary rock is a record (story) of the past

Some layers have fossils in them.

Scientist can look at the fossils and the rock they were found in, and learn . . .

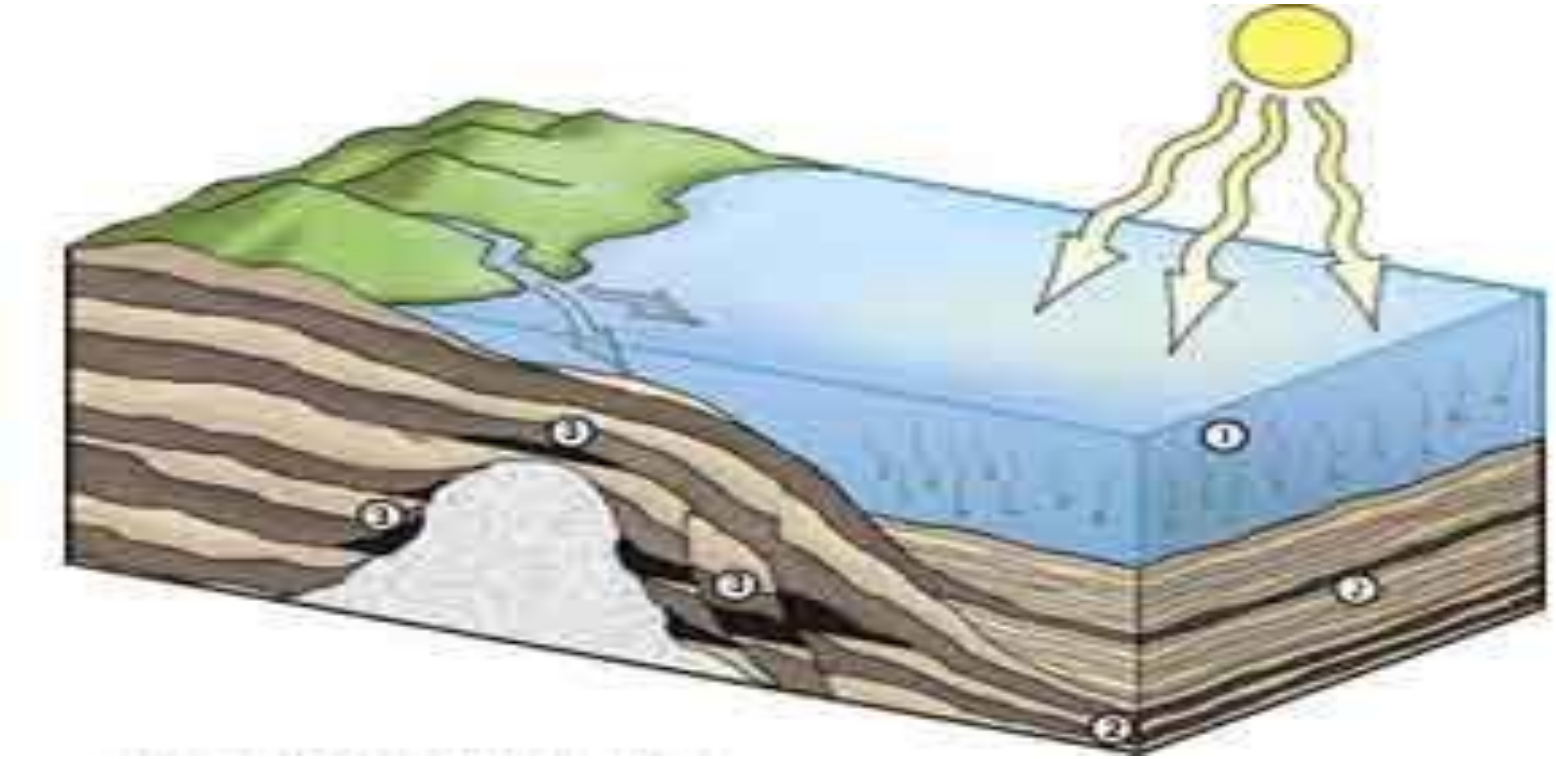
- How old is that fossil?
- What kinds of lived in this place long ago?
- Was there a lake, river, or ocean here?

Fossil Fuels / Coal



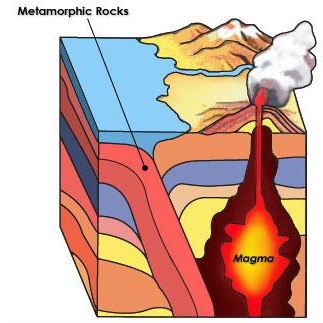
Dead plants and animals in a swamp form layers of sediment.

Fossil Fuels



Tiny plants and animals died and fell to the sea floor
(1). Here they were buried under sediment and other rock
(2). The rock squeezed the plants and animals and the energy in their bodies could not escape.
(3). The carbon eventually turned into oil under great pressure and heat.
(4). As the earth changed and moved and folded, pockets where oil and natural gas can be found were formed

Metamorphic Rock



The pressure's mounting...
I'm getting all hot under the collar now that the pressure is on.

Deep within the Earth's crust rocks can be put under huge pressures and temperatures are very high. These conditions can cause the minerals in the rock to change. This process is called metamorphism.

All rocks can be metamorphosed, and there are many different types of metamorphic rock. Limestone can change into marble, shale and mudstones into slate, and igneous rocks like granite can turn into gneiss. The extent to which the rocks are changed depends on:

1. Whether they are exposed to heat, pressure or both.

2. Whether they are forced to change shape.

3. The time they are exposed to these conditions.

Now that I am a metamorphic rock I've had to make a few changes. What now? Oh dear, not another a choice!

Melting … Into the Earth … Igneous Rock

It's getting very hot down here!
Oh no - I'm melting, I'm melting...

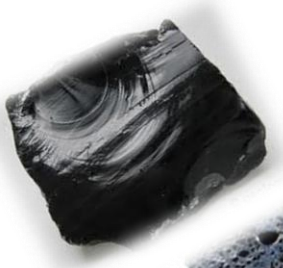
It can get quite hot deep in the Earth's crust. In fact, it can get so hot that the rocks that make up the crust can actually begin to melt.

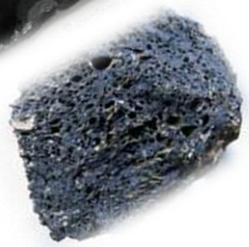
This molten material is called magma. It is less dense than the surrounding rock so it tends to move upwards through the crust.

Magma also comes from material below the Earth's crust - the mantle. This new material rises up from the mantle and adds to the magma produced from the molten crust.

It's looking quite bad for me at the moment, I'm melting - what happens now?

Cool off fast or Cool off slow Igneous Choices





This is my chance...
I'm free!

Sometimes magma can force itself through a crack or fault in the rock at the Earth's surface. It pours out over the Earth's surface in a volcanic eruption. This process is called extrusion.

The rocks that form from extruded magma are called extrusive igneous rocks. Basalt and pumice are extrusive igneous rocks. The type of rock that forms depends on the magma it came from, but generally extrusive igneous rocks:

1. Are very fine grained - magma cools very quickly when it erupts onto the Earth's surface and the crystals in the rock don't have much time to grow.

2. May contain gas bubbles.

I'm cooling down...
But I think I'll take my time about it...

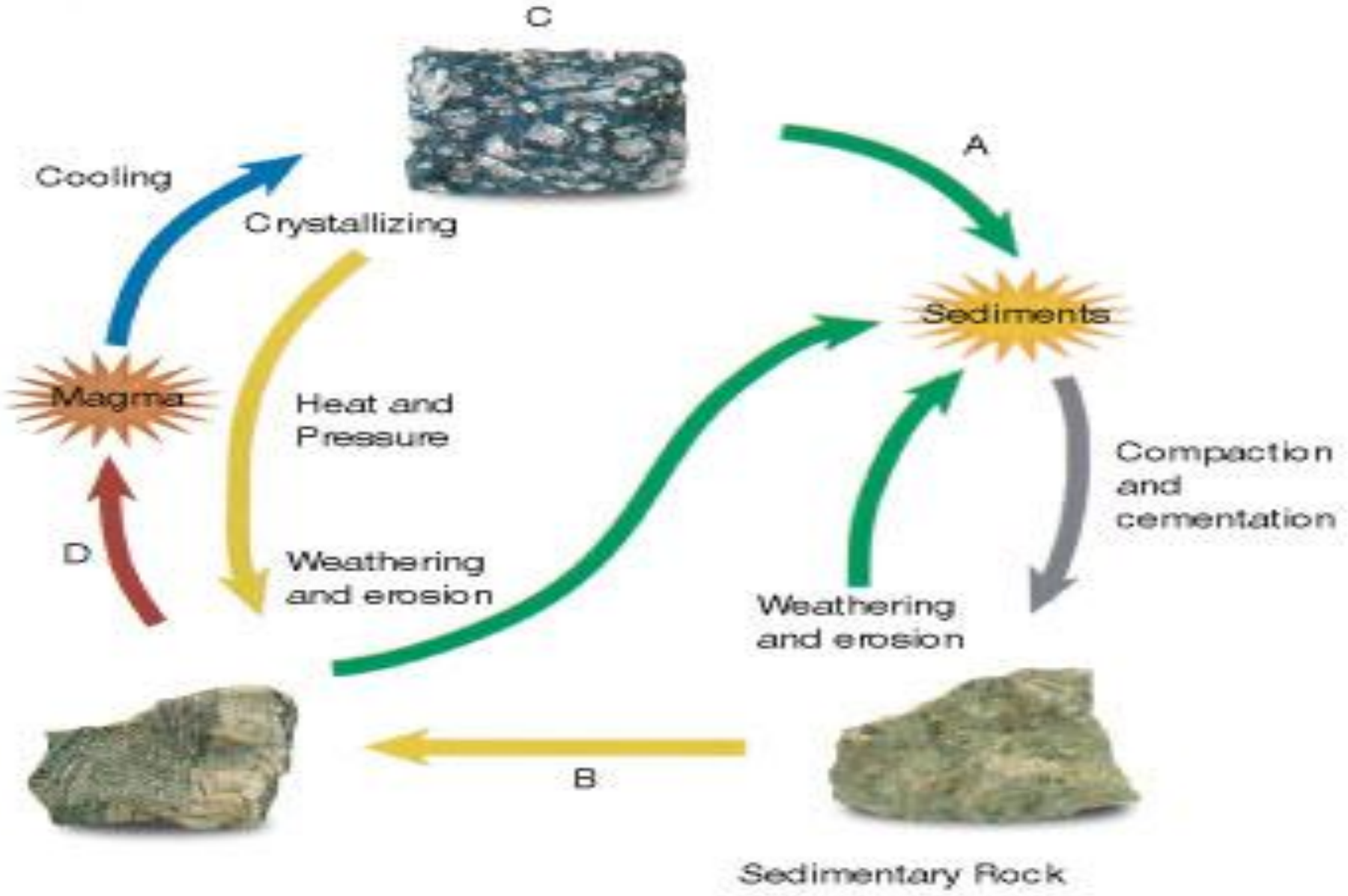
Molten rock can sometimes form huge reservoirs called magma chambers within the Earth's crust. Left undisturbed over many hundreds of thousands of years this magma will cool and crystallise to form intrusive igneous rocks.

Intrusive igneous rocks like granite and gabbro have some things in common. They:

1. Are large grained - magma cools very slowly beneath the Earth's surface so the crystals in the rock have a long time to grow.

2. Are made up of angular interlocking crystals.

Rock Cycle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Cooling
Crystallizing
A
Sediments
Magma
Heat and
Pressure
Compaction
and
cementation
D
Weathering
and erosion
Weathering
and erosion
B
Sedimentary Rock