**Endogenous Processes**

Since the origin of the earth, exogenous and endogenous forces have been in conflict. Exogenous forces break up the rocks in the earth’s crust. Endogenous forces rise up or form new features. The landforms that shape the earth’s crust are thus the result of endogenous forces.

Endogenous forces are active internally. That is, they’re active beneath the crust. And they constantly make the crust move. Mountains or volcanoes are created. Earthquakes occur. Whole continents may be shifted.

These actives affect the entire surface of the earth. The entire surface includes features both on the continents and ocean bottoms; the hills, mountains, valleys; and plains we see on the continents are also on the ocean floor.

In fact, it is deeper within the earth (even below the oceans) where the clue to endogenous activities lies. It is these internal processes and they occur that we will study in this lesson.

**Link:**  [http://en.wikipedia.org/wiki/Endogenous#Geology](http://en.wikipedia.org/wiki/Endogenous#Geology)

**Summary:**

1. Endogenous Forces affect continents and the ocean floor.
2. Endogenous Forces make the crust move.
3. Endogenous Forces are active under the crust.
4. Endogenous Forces raise up or form new features.
5. Endogenous processes are in conflict with exogenous processes.

Endogenous forces DO NOT break up the earth’s crust. They actually build up the crust. Endogenous forces are NOT active externally. They are active internally. Endogenous forces affect both the continents and the oceans. Endogenous forces beneath the crust DO cause movement on the crust.
Plate Tectonics

Tectonics is the study of the internal processes that cause changes in the crust, in other words, tectonics is the study of the endogenous processes

Plate Tectonics is a specific theory of tectonics

Plate tectonics is a geological theory that assumes that underneath the continents and ocean floors are masses of rock called plates. The earth has ten major plates, all rigid, solidifies rock, they interlock, or fit together, as the pieces of a jigsaw puzzle do

Plates seem to “float” or slide around on top of the magma. This occurs below the crust. Plates are always in motion. You might think of them as ships moving on a sea of hot, molten magma. Of course, they move very say, A few centimeters or so a year.

Remember: The crust above the plates may be a continent (continental crust) or an ocean floor (oceanic crust)

As the plates move, they carry the continents and ocean floors with them.

LINK: http://en.wikipedia.org/wiki/Plate_tectonics

Summary

Tectonics (the study of internal processes that change the crust)

Plate Tectonics
Plates are rigid rock masses that support the crust. There are about ten major plates on earth.
Part of a plate can lie under a continent and part under the ocean.
The plates interlock.
They float or slide around on top of the molten magma

RIGID best describes plates.
PLATE TECTONICS best describes the special theory that assumes the existence of large masses of rock beneath the crust.
Plates are sandwiched BETWEEN the crust and the magma.
Plates are made up of SOLIDIFIED ROCK.
MAGMA is found deeper in our planet than the crust or the plates.
Deformation: Diastrophism

The crust deforms when plates move. As the plates lose and gain material, the crust changes shape and adjust. We can talk about two major types of deformation. That is, two types of changes can occur in the crust.

The two main types of deformation are: Diastrophism and Volcanism

Diastrophism refers to movements of the crust that cause rocks to fold or to fault (crack). What does this mean to us? For one thing, it can mean the difference between living in an earthquake zone, as people in San Francisco do, and living near a beautiful, large mountain range, as people in Denver, Colorado, do. Let’s look at diastrophism more closely.

Diastrophism
Two things may happen to the crust when plates move: folding and faulting.

Folding:
When plates move, they sometimes collide. Or one plate slides under another. When one of these happens, the rock layers above the plates fold. That is, they bend or flex. (To visualize this, think of pushing two sheets of paper together.)

Mountains often form from folding. In fact, most of the great mountain ranges of the world were formed from folding. This includes the Rockies in the western United States and the Himalayas in Asia.

Faulting:
Faulting takes place when one plate slips or slides past another plate. When they do, they cause the rock layers above to fracture (break). These breaks are called faults.

As the plates move past each other, they release great amount of energy. This energy produces vibrations, or shock wave. The shock waves radiate from the fault in all directions (similar to the ripples that form when you throw a rock into the water). We don’t always feel vibrations at the surface. When we do, we call them earthquakes.

Link:  http://en.wikipedia.org/wiki/Faulting
Tsunamis: Earthquakes can occur anywhere on the earth. Often, though, they occur at the edges of the plates. Remember, plates are found beneath continents and beneath ocean floors.

When there is movement beneath the ocean floor, the water above it is disturbed. A great wave starts traveling across the water; we call this a tsunami or a tidal wave. The word “tsunami” comes from Japanese.

This wave contains large volumes of water and moves very quickly. It can travel at a speed from 350 to 500 miles an hour. It may be only several feet high when it begins out in the ocean. As it reaches shallower water, it piles up on itself and can become more than 40 feet tall.

Tsunamis: Tsunamis (or tidal waves) can be very destructive. They can wipe out whole villages and towns. The effect of tidal waves in an ocean is similar to water sloshing in a bathtub. Once set in motion, the water slops at the edge of the tub for several minutes. Then the energy from the wave motion is finally used up. The same is true of tidal waves. Second and third waves may follow. These pulses of energy may be as destructive as the first wave.

Link: http://en.wikipedia.org/wiki/Tsunamis
Link: http://dsc.discovery.com/convergence/tsunami/globaleffects.html

Summary:

**Diastrophism** (a type of deformation) is the movement of the plates and the crust that causes rocks to **fold** (bend). Movement of the **plates** causes a **fold** by the collision of at least 2 plates where one slides or under another. Movement of the **crust** will cause a **fault** (fracture). The fault causes **shock waves** to be formed generating **earthquakes** on land and **tsunamis** in the sea when the sea floor develops these faults.

<table>
<thead>
<tr>
<th>Collision</th>
<th>Plate activity that causes folding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tsunami</td>
<td>Tidal Wave</td>
</tr>
<tr>
<td>Fault</td>
<td>Break or fracture in the rock</td>
</tr>
<tr>
<td>Folding</td>
<td>Bending of flexing of the rock layers</td>
</tr>
<tr>
<td>Sliding</td>
<td>Plate activity that causes faulting</td>
</tr>
<tr>
<td>Shock Waves</td>
<td>Vibrations</td>
</tr>
</tbody>
</table>
Volcanism: The Second Type of Deformation

Magma can do more than form igneous and metamorphic rock. Magma moves as well. Its movement causes changes (deformation) of the earth’s crust. The movement of magma is called **volcanism**.

Volcanism can be either: Extrusive or Intrusive. These are also the two types of igneous rocks.

**Extrusive Volcanism**
This occurs when the hot, molten magma reaches the earth’s surface. It travels up through faults in the crust. When a fault allows magma to reach the surface, the fault is then called a volcano.

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**Name changes**
Remember these differences:

<table>
<thead>
<tr>
<th>Begin with</th>
<th>What happens:</th>
<th>New name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fault</td>
<td>A fault (break in the crust lets magma escape to the surface</td>
<td>a volcano</td>
</tr>
<tr>
<td>Magma</td>
<td>magma (hot, Molten liquid reaches the surface, loses some gases, gains other materials on the way.)</td>
<td>lava</td>
</tr>
</tbody>
</table>

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Link: [http://en.wikipedia.org/wiki/Magma](http://en.wikipedia.org/wiki/Magma)
Intrusive Volcanism
Much of the magma does not reach the surface of the crust. It does not go through the crust and does not become a landform. It seeps into the crust between rock layers, the pressure from the magma causes the rock layers above it to up heave, or slowly rise,

Someday the magma may cool and eventually reach the surface. The processes of weathering and erosion may eventually wear the rock layers away. If the magma does not cool, earth movements may cause a fault to occur and allow magma to seep or erupt to the surface. Thus volcanoes would be formed.

Where Does All The Magma Go?

As Magma
1. It may stay within the crust and seep between rock layers.
2. It may erupt underwater (a submarine eruption).

As lava:
3. It may slowly flow to the surface and seep out. It may, over some time, form what’s called a shield volcano.
4. It may rapidly and violently flow to the surface and throw lava and rock about in a cone shape.
Dormant volcanoes
Volcanoes that are still erupting lava are said to be active. Volcanoes that no longer erupt are dormant.

They may not always stay dormant, however. They may return to life sometime in the future. Even if they never erupt again, they may cause other activities. These activities or processes are associated with volcanic activity.

For example, geysers and hot springs are water that has come into contact with magma below the crust. They’re often found in regions that were once sites of active volcanoes.

Summary
Volcanism is change in the crust caused by moving magma.

Extrusive:
  Magma reaches the surface forming ACTIVE Volcanoes
Intrusive:
Magma stays in the crust, but may get through later.

Active volcanoes stop erupting and become dormant. Faults let magma through to form volcanoes. Magma reaches the surface and becomes lava.

After magma has surfaced on the crust, we call it lava.
Intrusive volcanoes can be described as lava seeping between the rock layers of the crust. Remember, lava is magma without the gases but it has gained other substances. A fault where magma has flowed out of it is called a volcano.