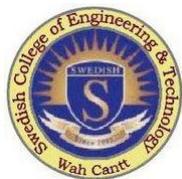


Lecture # 01

PETROLOGY (1)



DEPARTMENT OF CIVIL ENGINEERING
SWEDISH COLLEGE OF ENGINEERING & TECHNOLOGY, WAH CANTT

Instructor: Engr. Imran Mehmood
Date: 9th December, 2011

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PETROLOGY

The branch of Geology that deals with the study of rocks, with a particular stress on their mode of formation, composition and uses of for all types of engineering works.

Rock is an aggregate of mineral constituents, which form the earth's crust.

The term "Rocks" is something hard and resistant.

May be hard like Granite, or soft like Clay.

All stones are rocks, but at the same time, all the rocks are not necessarily stones.

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TYPES OF ROCKS



Depending on the mode of formation, composition and uses rocks may be classified as:

- Igneous Rocks
- Sedimentary Rocks
- Metamorphic Rocks

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IGNEOUS ROCKS

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IGNEOUS ROCKS

All the rocks, which are formed directly by the solidification of "Magma or Lava" on the Earth's surface or below it are called "IGNEOUS ROCKS"



Chapter 4 Opener
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MAGMA & LAVA

The molten material/liquid rock existing below earth surface is **MAGMA**, when forced out on the surface, called **LAVA**

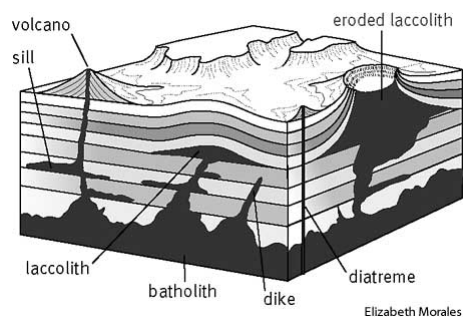
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Classification

(Igneous Rocks)

On the basis of solidification of magma, igneous rocks are classified as:

- PLUTONIC Rocks
- HYPABYSSAL Rocks
- VOLCANIC Rocks



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Classification (igneous rocks)

- PLUTONIC ROCKS

These are formed after the solidification of magma, under the earth's crust and cool very slowly, thus these are coarsely crystalline rocks. Crystals can be distinguished with the naked eye. These are also called intrusive rocks.

- HYPABYSSAL ROCKS

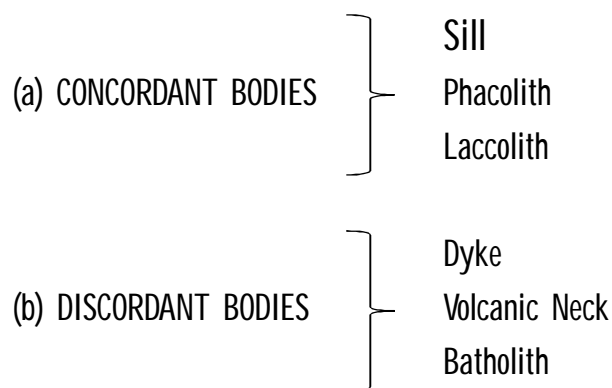
These rocks are formed when magma solidifies in the form of a thin sheets or wall-like structure in the earth's crust at a short distance. Magma cools slowly therefore, these are crystalline rocks, but the crystals are small in size

- VOLCANIC ROCKS

The rocks formed on the surface of earth are called volcanic rocks. Volcanic rocks are also called extrusive rocks, cools very rapidly therefore these are fine grained rocks.

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Forms of IGNEOUS ROCKS



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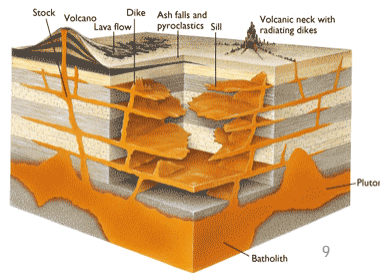
Forms of IGNEOUS ROCKS

CONCORDANT BODIES

Intrusions, which are influenced by the structural features of the rocks and consolidated there, are called concordant bodies. Sometimes during the upward motion of magma, it doesn't possess enough energy to push, drag or cut through the existing rocks, through which it is injected. In such cases the magma solidifies in the cavities and planes of weakness of the existing rocks.

■ SILL

When magma is pushed into the bedding planes of the existing rocks and solidifies there in the form of thin sheet, is called "SILL". Its thickness is generally less than its width & length. e.g simple sill, multiple sill & composite sill.



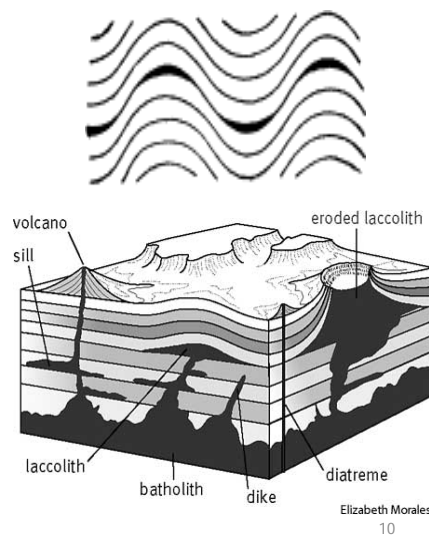
Forms of IGNEOUS ROCKS

■ PHACOLITH

When the magma is pushed into the crests and troughs of a fold, in the existing rocks, and solidifies there in the available cavities without exerting much pressure to make space for itself, is called a Phacolith.

■ LACCOLITH

When magma is pushed into the bedding planes, sometimes it forces up the layers of crest. The magma then solidifies in the cavity and forms a laccolith with flat base and concave top.



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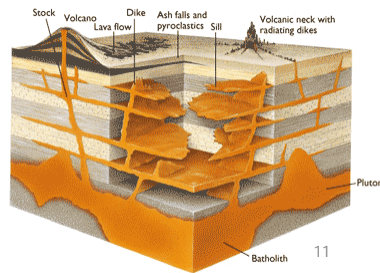
Forms of IGNEOUS ROCKS

DISCORDANT BODIES

Intrusions which are not influenced by the structural features of the rocks and solidifies after disturbing the rocks are called Discordant Bodies. Magma during its upward motion, due to huge energy push, drag or cut the existing rock through which it is injected.

▪ DYKE

When magma is pushed into the vertical cracks of the existing rocks and solidifies there in the form of thin wall-like structure, is called "SILL". Have variation in their thickness, length & height depending on the nature of magma force. e-g simple sill, multiple sill & composite sill.



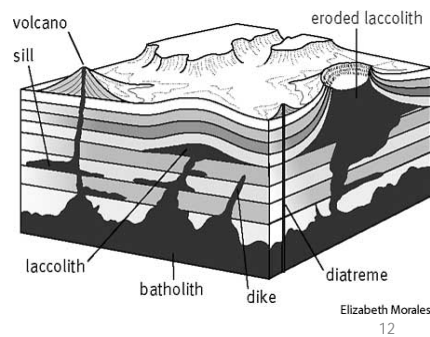
Forms of IGNEOUS ROCKS

▪ VOLCANIC NECK

Magma is forced into the holes of existent in-active volcanoes and solidifies there in the form of circular pipe, intrusion is called Volcanic Neck.

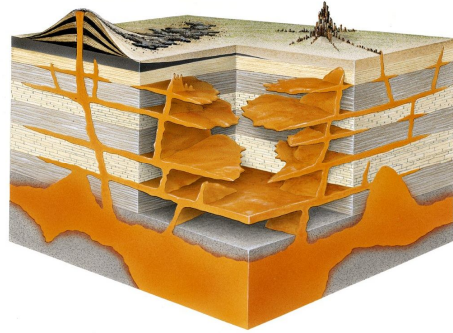
▪ BATHOLITH

When magma moving under high pressure, forces up the layers to form an arch-like structure, and solidifies there slowly in the cavity, such an intrusion is known as Batholiths. Minimum outcrop is 100 sq. km

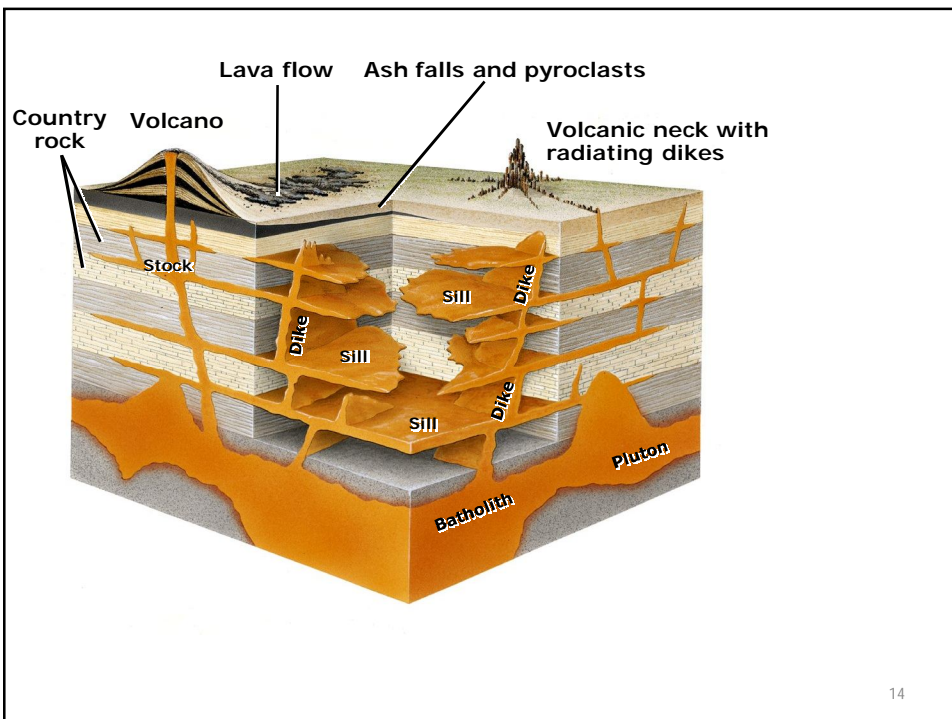


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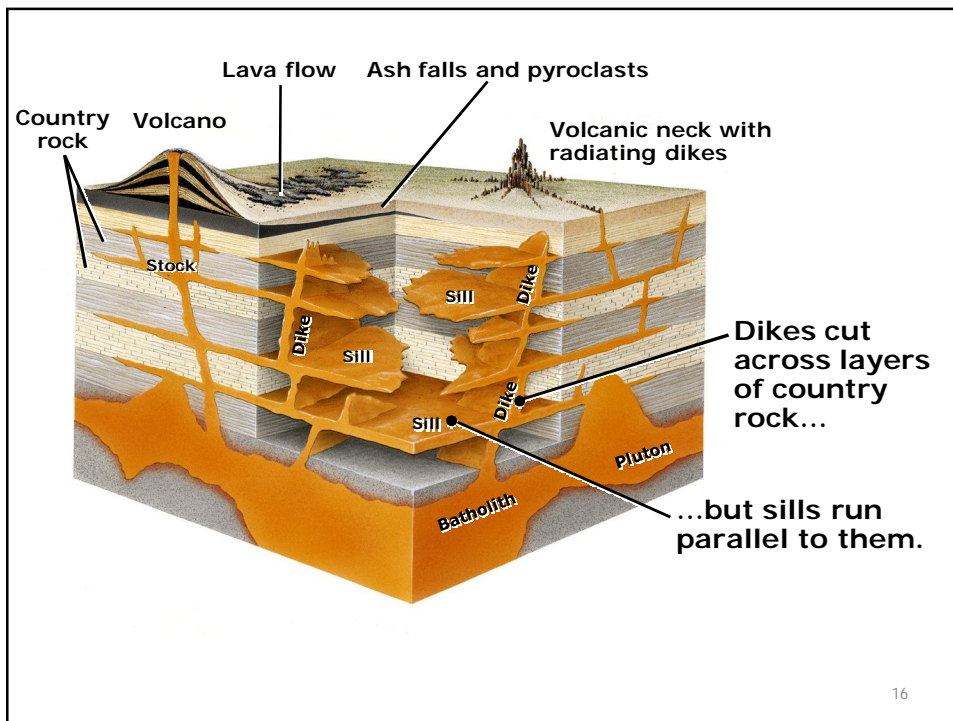
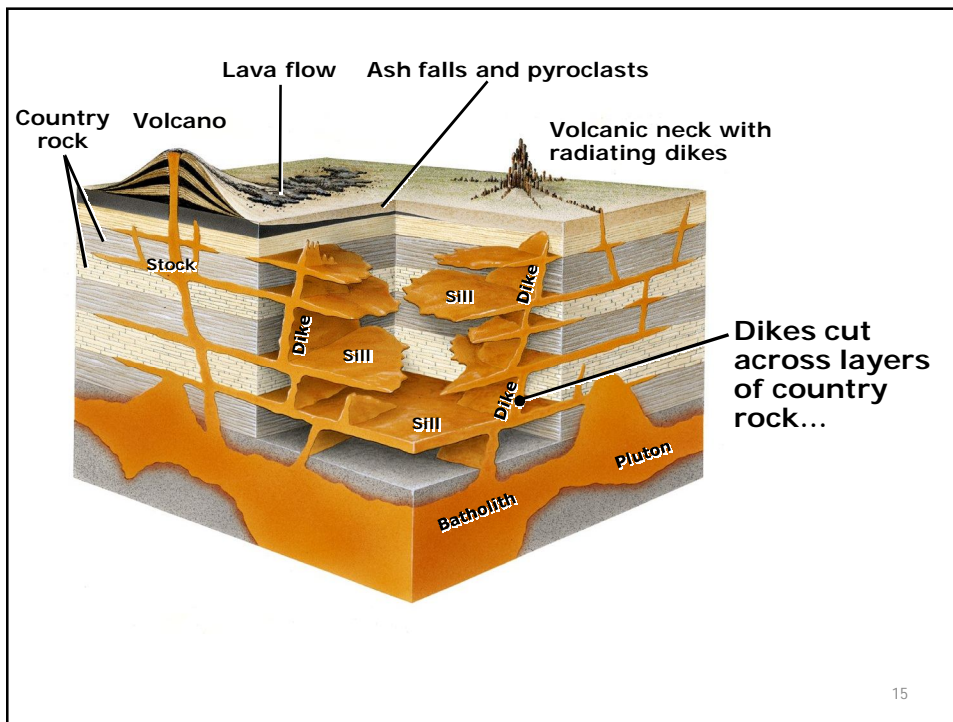
Forms of IGNEOUS ROCKS

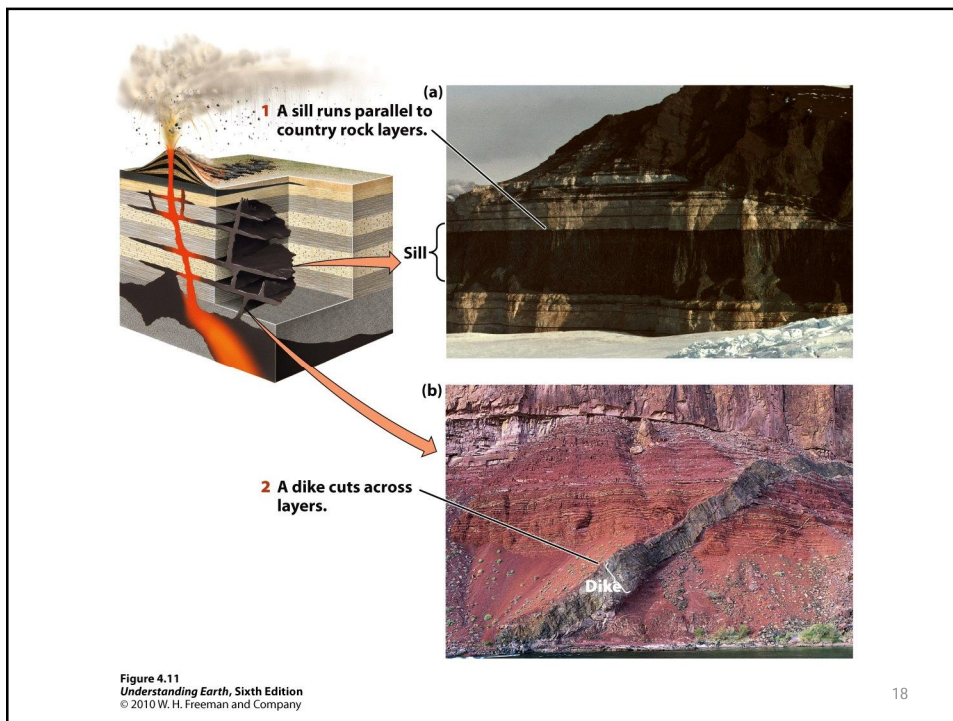
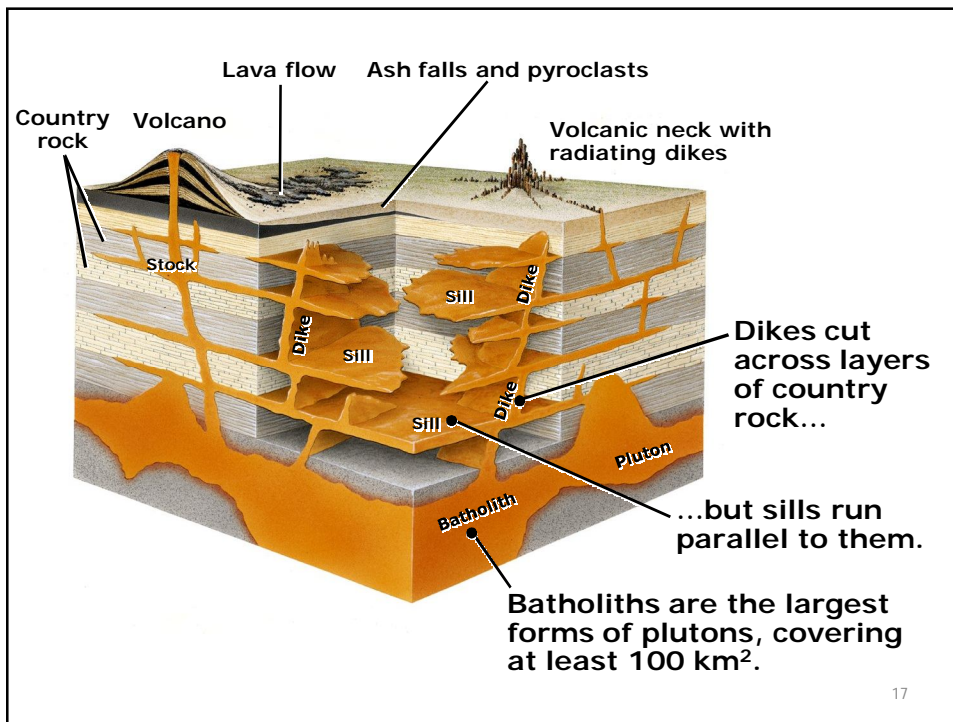


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Structure of Igneous Rocks

- FLOW STRUCTURE

Sometimes the lava, during its flow, solidifies on the already solidified layers of igneous rocks more or less in parallel layers. Such a structure is Flow Structure.

- VESICULAR STRUCTURE

When the lava having a large quantity of gases, during eruption it undergoes the solidification process, the gases leaves behind cavities in the cooling lava. Its Vesicular Structure.

- PILLOW STRUCTURE

Sometimes, Upper layer solidifies while lower layer still has the flowing properties, underlying layer breaks the above layer and solidifies over the solidified layer and forms a Pillow Structure.

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Engineering Properties

- Plutonic rocks have high crushing & shearing strengths, are considered as satisfactory rocks for all types of engineering purposes.
- Dark Color rocks are largely used as road metals and concrete aggregates. e-g Basalts
- Almost all igneous rocks are considered safe to be used as foundation rocks, roofs of tunnels.



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