ROCKS

- Rocks of which earths crust is composed, are aggregates of minerals of more or less constant composition

Two types of rock forming minerals

- Primary / Essential minerals
- Secondary / Accessory minerals
- Structure – Means the arrangement or intimate mutual relationship of grains, which depends upon the degree of crystallinity, shape of crystals and size of mineral grains, large scale feature
- Texture – Denotes the intimate mutual relationship of the mineral grains, small scale feature

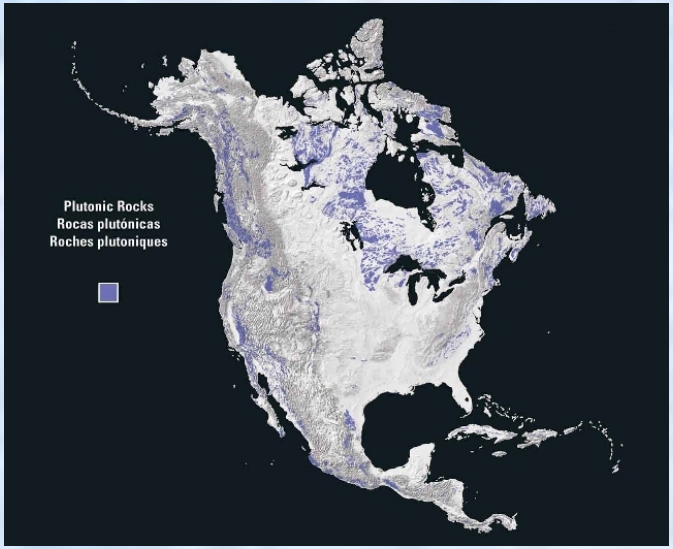
CLASSIFICATION OF ROCKS

- Igneous rocks – formed by the crystallization of magma
- Sedimentary rocks – formed by the destruction of earlier formed rocks
- Metamorphic rocks – When igneous and sedimentary rocks undergo certain changes by the help of high temperature and pressure

Depending on the condition, in which magma solidifies, igneous rocks are divided into three groups –

Plutonic rocks (Intrusive or deep seated)

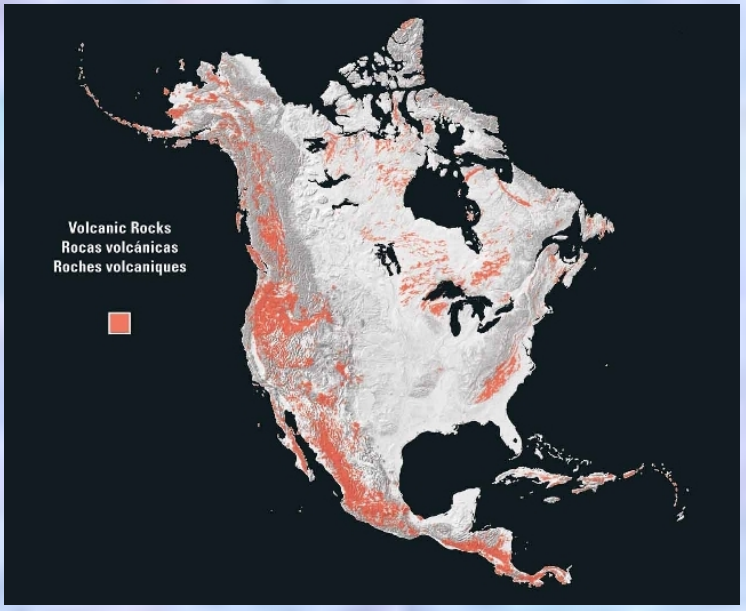
Intrusive igneous rocks are formed from magma that cools and solidifies within the earth



Hypabyssal rocks

Volcanic rocks (extrusive)

Extrusive igneous rocks are formed at the Earth's surface as a result of the partial melting of rocks within the mantle and crust.



Forms –

- Batholith
- Concordant sills
- Lacolith
- Lopolith
- Dyke

Batholith – They are greatest bodies of igneous rocks known. They are generally of concordant habit though disconcordant nature is also exhibited. Their roof is irregular dome shaped and their lateral walls steeply inclined and relatively smooth. The composition is usually granitic or granodioritic.

Sill – Relatively thin tabular sheets

Of magma which have penetrated

Along approximately horizontal

Bedding planes. They show nearly

Parallel, upper and lower margins

for considerable distance

Half Dome, a granite monolith in Yosemite National Park

and part of the Sierra Nevada batholith

Dyke – Result from intrusion of magma into more or less vertical fissures which cut across the bedding or other structures of the invaded rocks

A sill partially exposed during the ice ages

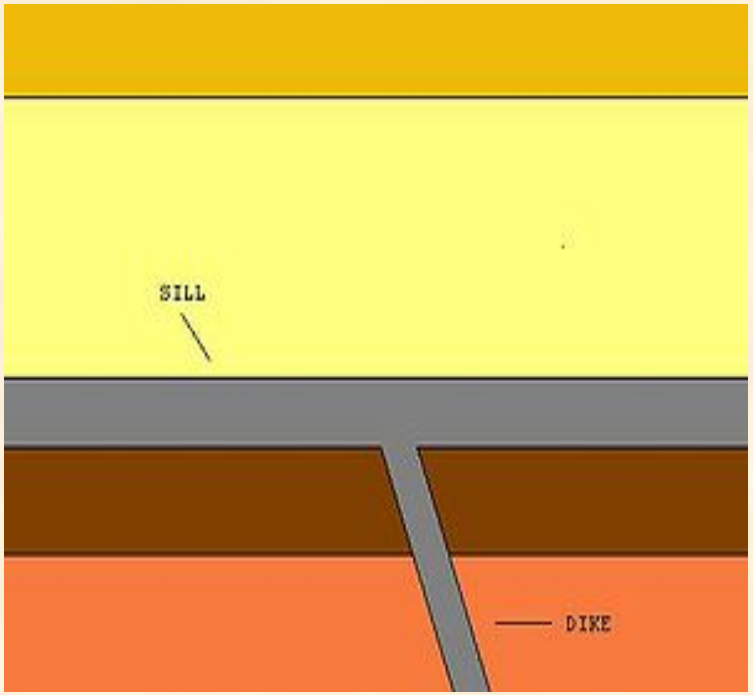


Illustration showing the difference between a dike and a sill.

Lacolith – It is formed when a magma of considerable viscosity injected into stratified rocks does not spread very far but tends to heap itself up about the orifice of eruption. Thus a bun shaped mass of igneous rocks is formed which has a flat base and a domed top

Lopolith – These bare massive intrusions of basic rocks which are concordant, have a lenticular shape and are like a basin

MINERALOGICAL COMPOSITION OF INTRUSIVE AND EXTRUSIVE ROCKS

- Acidic rocks with 65 – 75 % of silica, Intermediate rocks with 55 -65% of silica, Basic rocks with 45 – 55% of silica and Ultra basic rocks with less than 45% of silica
- In deep seated layers of earth, magma solidifies slowly as the temperature and pressure gradually drops. This results in the formation of rocks with holocrystalline structure but the grains are coarse, it is coarse grained in texture
- When magma comes out to the earths surface in the form 0of lava, temperature and pressure drops sharply resulting in the formation of holohyline structure. If crystals are fine that can be studied under microscope, it is aphanitic in structure
- Colour of rock is determined by light and dark silicates

Leucocratic, Mesocratic, Melanocratic and Hypermelanic

A SIMPLE CLASSIFICATION OF IGNEOUS ROCKS

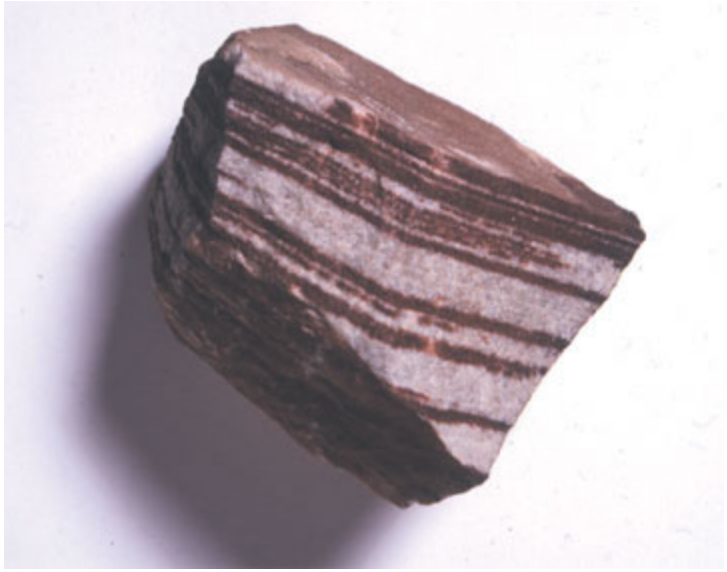
Origin	Texture	Contains Orthoclase Quartz	Contains Orthoclase	Contains Feldspar Biotite Hornblende	Contains Feldspar Augite	Contains No Feldspar Biotite Hornblende Augite
VOLCANIC	Glassy or Fragmental (Felsic)	Rhyolite Obsidian Pumice	Trachyte Tuff Volcanic Breccia	Andesite Dacite	Basalt Tepherite Trachyte	Limburgite
HYPABYSSAL	Porphyritic	Granite or Rhyolite Porphyry	Syenite or Trachyte Porphry	Diorite or Andesite Poprphry	Gabbro or Basalt Porphry	Limbergite or Peridotite Porphry
PLUTONIC	Holocrystalline in structure Fine, medium coarse grained in texture	Granite Aplite Pegmatite and Others Usually Coloured	Syenite Family Light Coloured	Diorite Family Usually dark	Gabbro Family coloured	Peridotite Family rocks

SEDIMENTARY ROCKS

Sedimentary rocks are those rocks which are formed on the surface of earth as a result of action of water, air and organic masses. Many sedimentary rocks are stratified. The formation of the layer is connected with the condition of sedimentation. The layers are distinguished from each other by the composition, the size, colour and structure. In some cases, all these features exit simultaneously i.e. the composition, size of grains, colour and density of one layer differ from those of another.

There are sedimentary rocks in which no stratification is observed, for example, limestone deposited in the se3a as a result of the powerful activity of reef building corals and plants. Another common characteristics of many sedimentary rocks is the rounded nature of the fragments and particles which constitute them.

The sedimentary rocks often contain fossils, whereas igneous and metamorphic rocks do not contain them.



Sandstone

Shale

A SIMPLE CLASSIFICATION OF SEDIMENTARY ROCKS

ORIGIN	NAME OF ROCK	COMPOSITION
MECHANICALLY FORMED ROCKS	CONGLOMERATE →	Gravel With Rounded Pebbles
	SANDSTONE →	Sand And Feldspar Grains
	SHALE →	Silt or Clay Particles
	BRECCIA →	Angular Fragments with Cement
	ARAKOSE →	Sand grains, Quartz, Feldspars
CHEMICALLY FORMED ROCKS	LIMESTONE →	Precipitated Ca CO_3
	TRAVERTINE →	Sometimes with $MgCO_3$
	SALT →	Sodium Chloride
	GYPSUM →	Calcium Sulphate
	BOG – IRON ORE →	Precipitated Iron Compounds
ORGANICALLY FORMED ROCKS	LIMESTONE →	Calcium Carbonate, Animal Remains
	COAL →	Plant Remains

METAMORPHIC ROCKS

Metamorphism refers to any change in mineral composition, structure or texture of an igneous or a sedimentary rock whereby the original rock character is notably altered. Rocks which have been so formed are called Metamorphic rocks.

The most important agents which bring metamorphism are heat, pressure and other chemical reactions. When heat is the dominating factor in changing the rocks, it is said to be THERMAL METAMORPHISM. When lateral pressure brings change in the rock, it is said to be DYNAMIC METAMORPHISM. On the other hand when there is downward or transverse pressure aided by water, it is said to be STATIC METAMORPHISM. When heat and pressure both cooperate in bringing about metamorphism, the process is called as DYNMO-THERMAL METAMORPHISM. When metamorphism is only of local importance, it is called LOCAL METAMORPHISM otherwise REGIONAL METAMORPHISM

Phyllite

Marble

There are three zones of metamorphism:

1. Epizone – Metamorphism near the earths surface
2. Mesozone – Metamorphism in the intermediate part of earths interior
3. Katazone – Metamorphism deep in the earth

Schist

Slate

Metamorphic rocks are coarse grained with marked development of foliation, which distinguish them from igneous and sedimentary rocks. Another characteristics feature of the metamorphic rocks is the presence of minerals such as Kyanite, Andalusite, Silliminite, Zoisite, Wollastonite, Staurolite, Chebasite etc. which are neither found in igneous nor in sedimentary rocks.

Quartzite

A SIMPLE CLASSIFICATION OF METAMORPHIC ROCKS

METAMORPHOSED IGNEOUS ROCKS	a) Foliated – Granite Gneissess or Orthogenesis and Schists Also called as Orthoschist b) Non Foliated – Serpentine and Altered Lava
METAMORPHOSED SEDIMENTARY ROCKS	a) Foliated – Slate, Mica Schist Also called Para Schist and Mica Gneiss also called Para Gneiss, Amphiboles b) Non Foliated – Quartzite, Marble and Anthracite coal