DSPMU UNIVERSITY, RANCHI.
DEPARTMENT OF GEOLOGY

B.Sc. SEMESTER-IV **DATE-23/04/2020**

INTRODUCTION TO METAMORPHIC TEXTURES

Texture refers to the sizes and shapes of grains, the relationships between neighboring grains, and the orientation of grains within a rock. They are small scale features in a rock that are penetrative, which means that the texture occurs virtually throughout the rock bodies at microscopic scale. Texture of metamorphic rocks depends on the shape of the minerals, their modes of growth and mutual arrangement. In naming of metamorphic rocks on the basis of texture the term "Blastic" or "Blasto" is used as a suffix or prefix in order to distinguish them from those of igneous origin. Original textural or structural features which persist after metamorphism are extremely important in indicating the original nature of a rock. Textures which were present in the parent rock and have been retained by the rock despite metamorphic changes in other aspects are said to be relics /relict and are called **palimpset textures,** such as-

a) **Blastoporphyritic texture -** if original porphyritic texture of igneous rock still preserved after metamorphism.(Figure 1- Blastoporphyritic texture in metabasalt showing plagioclase and amphibole phenocrysts, pyroxene is completely replaced by clusters of amphibole.)

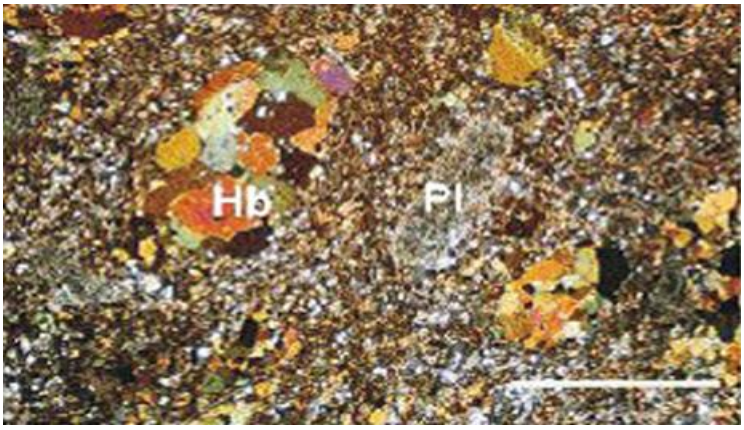

Figure 1

b) **Blastopsammitic texture-** if original texture of sedimentary rocks (such as bedding, ripples etc.) are still preserved after metamorphism. (Figure 2-The original bedding of quartz sandstone well preserved in the quartzite is commonly outlined by bands of differing grain size).

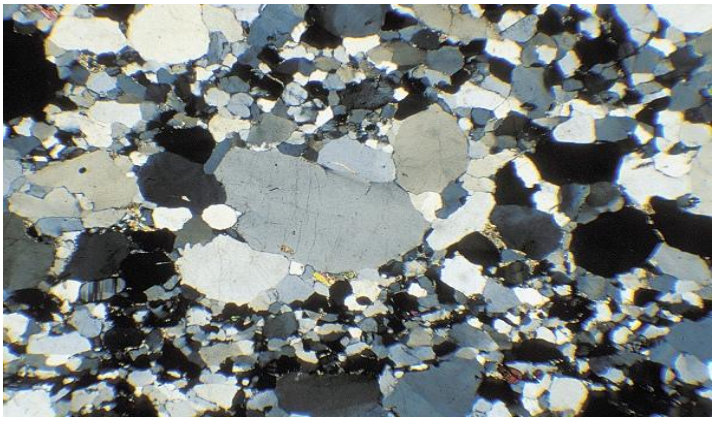
Figure 2

The minerals formed as a result of metamorphism may show well developed faces thereby exhibiting texture called Idioblastic, whereas texture formed by formation of minerals that do not have well developed faces is called Xenoblastic texture.

Idioblastic texture - Crystals having well developed crystallographic faces (the metamorphic equivalent of euhedral). (Figure 3- A crystal of staurolite in a relatively finer groundmass)

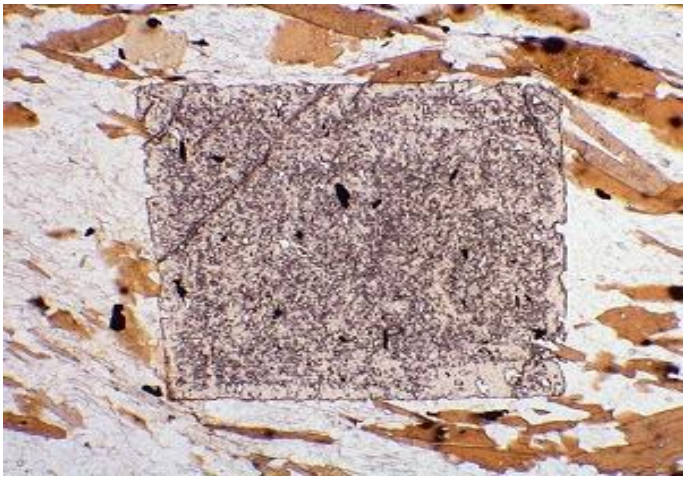
Figure 3

Xenoblastic texture – If the crystals formed are not bounded by well developed crystallographic faces (the metamorphic equivalent of anhedral). (Figure 4 - A crystal of garnet in a relatively finer groundmass)

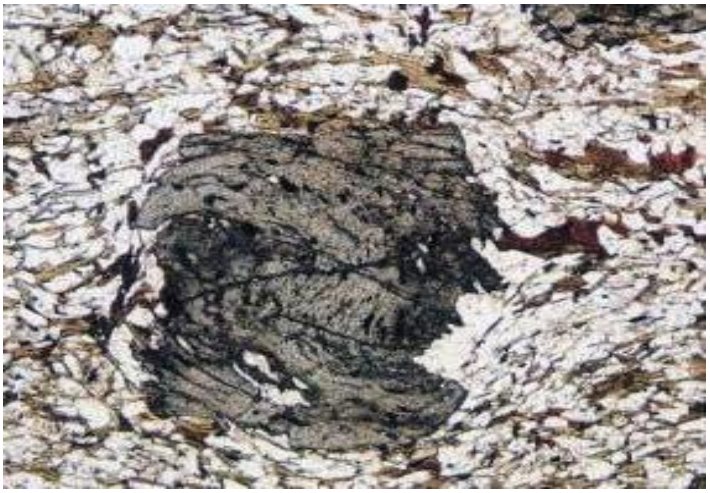
Figure 4

The texture produced by metamorphic recrystallization of minerals is referred to as **crystalloblastic texture.** Crystalloblastic textures are of the following types-

a) **Porphyroblastic texture** - Large crystals (porphyroblasts) grown in a finer-grained groundmass. The finer-grained material will show signs of having been spread apart to make room for the later formed porphyroblast. (Figure 5- Porphyroblastic garnet)

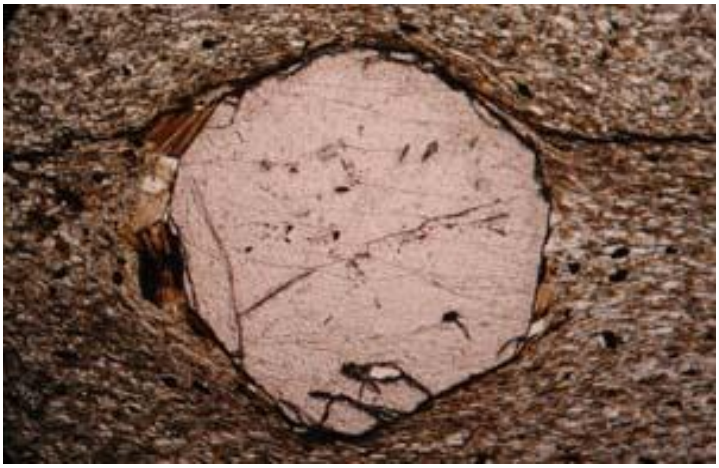
Figure 5

b) Poikiloblastic texture - Large crystals (poikiloblasts) hosting finer-grained mineral by replacement. Commonly the poikiloblasts will contain inclusions of the incompletely replaced finer-grained material. (Figure 6- Poikiloblastic staurolite)

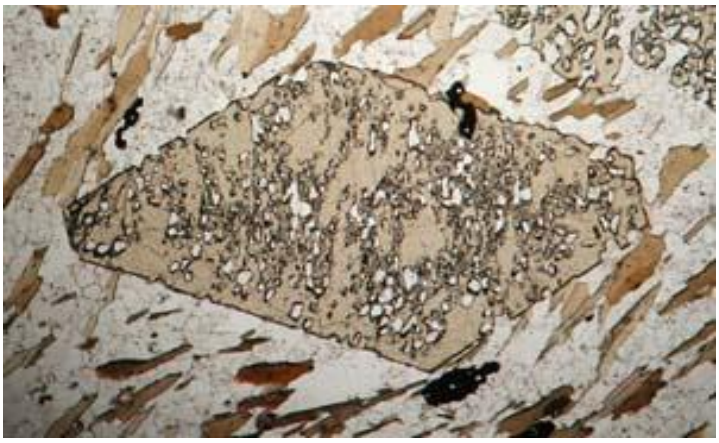
Figure 6

c) <u>Foliated textures-</u>

Foliated metamorphic rocks are generally associated with regional metamorphism. The mineral constituents of foliated metamorphic rocks are oriented in a parallel or subparallel arrangement due to differential stress/directed pressure.

i) Lepidoblastic Texture: texture exhibited by abundant platy minerals (chlorite, biotite, etc) with strong preferred orientation (Causes Foliation). Slate, phyllite and schist all have lepidoblastic textures. (Figure 7- Lepidoblastic muscovite)

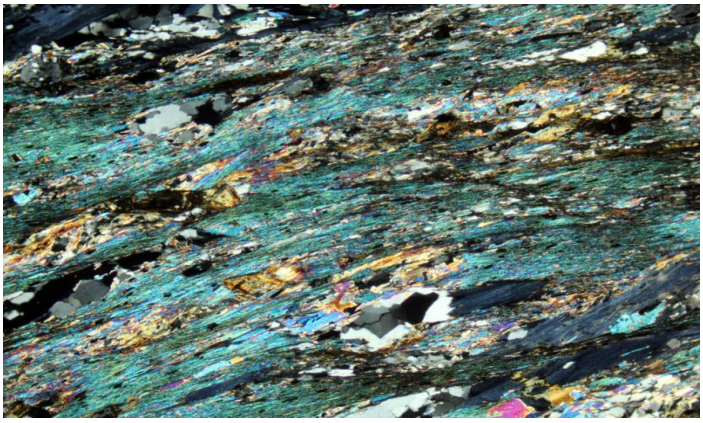
Figure 7

ii) **Nematoblastic Texture-**Abundant linear minerals (actinolite, hornblende, etc.) with strong preferred orientation (Causes Lineation). (Figure 8- Nematoblastic glaucophane)


Figure 8

d) <u>Non foliated textures-</u>

Metamorphic rocks with no visible preferred orientation of mineral grains have a nonfoliated texture. Nonfoliated rocks commonly contain equidimensional grains of minerals such as quartz, calcite, or dolomite. Examples of such rocks are *quartzite* , formed from a quartz sandstone, and *marble* , formed from a limestone or dolomite. Conglomerate that has been metamorphosed may retain the original textural characteristics of the parent rock, including the outlines and colors of the larger grain sizes such as granules and pebbles. However, because metamorphism has caused recrystallization of the matrix, the metamorphosed conglomerate is called *metaconglomerate.*

Some common textures seen in non foliated rocks are-

Granoblastic texture - Granoblastic texture is formed in non foliated rocks containing equidimensional idio/xenoblastic crystals of approximately equal size. (Figure 9 (a) and (b)- idio blastic and xenoblastic crystals of Quartz in quartzite respectively)

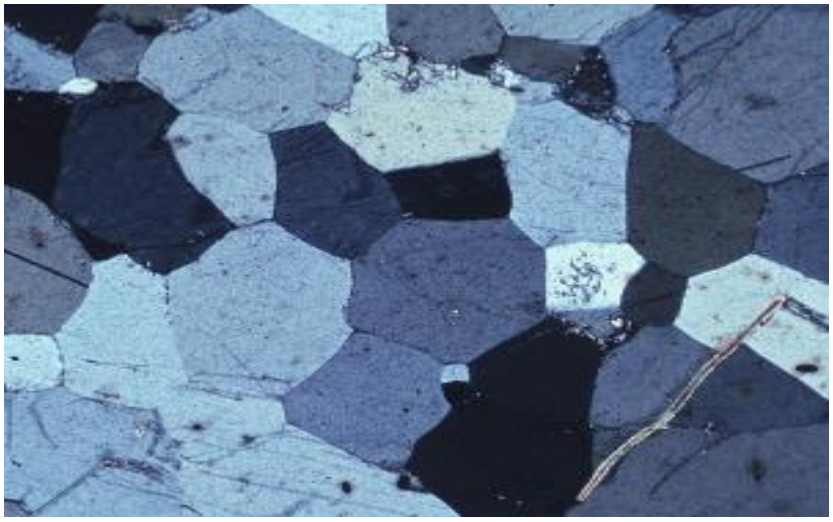

Figure 9 (a)

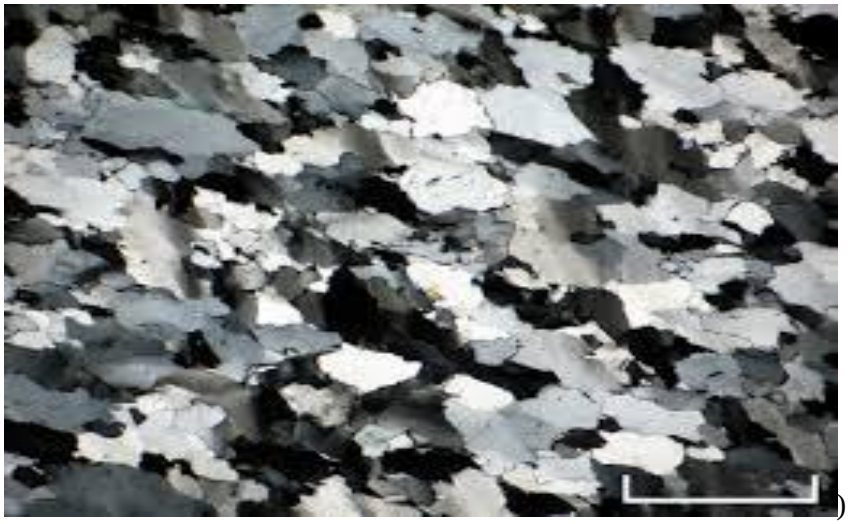

Figure 9 (b)

Hornfels are nonfoliated rocks, generally fine-grained, formed due to contact metamorphism of rocks such as shale, basalt etc. **Hornfelsic Texture -** the minerals formed are randomly oriented / scattered. (Figure 10- Brown mica crystals in hornfels)

Figure 10

Other textures-

Decussate Texture - A Decussate or Diablastic texture, most commonly associated with thermal metamorphism is a metamorphic rock texture comprising of equigranular, interlocking, randonly orientated platy, tabular, prismatic or elongate minerals. The texture arises to minimise surface energy in a rock with elongate crystals and is thus similar to a granoblastic texture. (Figure 11- Decussate texture in a non-foliated blueschit with Stilpnomelane).

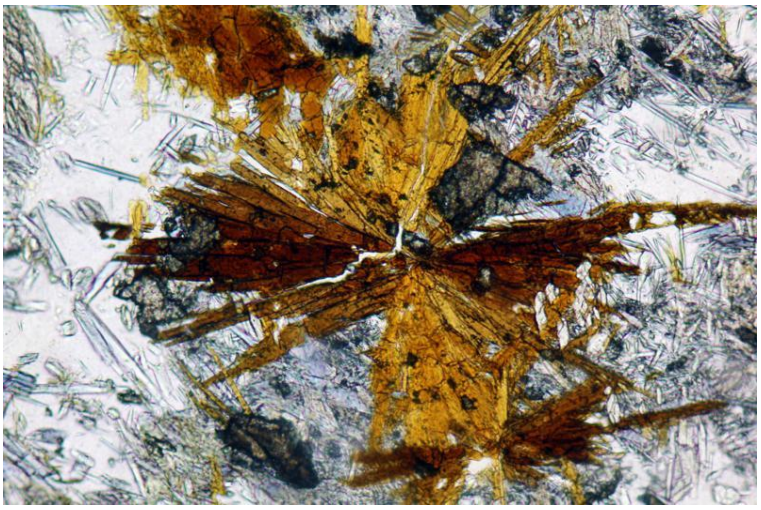

Figure-11

Augen texture - Augen is an eye-shaped large crystal or mineral aggregate (German "auge" means eye) visible in some foliated metamorphic rocks such as in gneiss or schist. In cross section they have the shape of an eye. Feldspar, quartz, and garnet are common minerals which form augen. Augen form in rocks which have undergone metamorphism and shearing.(Figure 12-augen of feldspar)

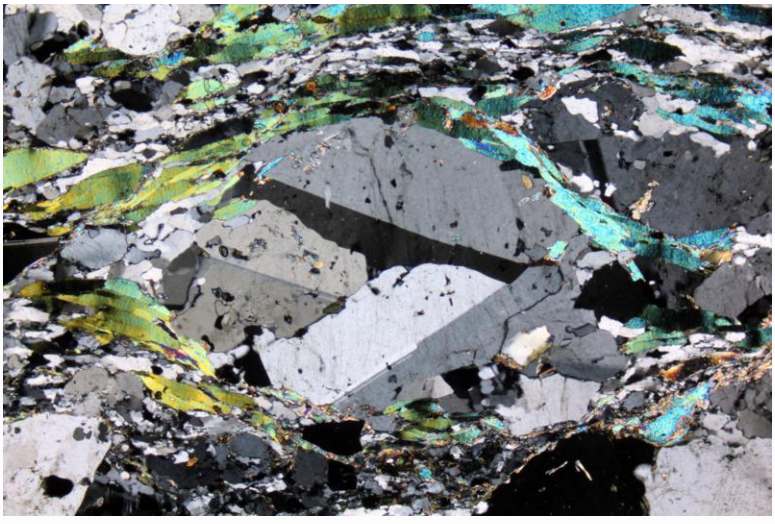

Figure 12