

Igneous and Metamorphic Geology

Useful for Module 5: Petrology – Igneous Petrology, Metamorphic Petrology, Mining Geology

A rock is an aggregate of minerals (or mineral-like substances), therefore understanding what these minerals are is a key skill for Earth Scientists! A good place to start with this is studying Igneous and Metamorphic Geology.

Igneous Geology considers rocks produced under conditions involving intense heat, as rocks of volcanic origin or rocks crystallized from molten magma. The first step is to describe the minerals using the following properties:

The first property to note for an igneous rock is **COLOUR!**



Light coloured igneous minerals are called: **FELSIC**



Dark coloured igneous minerals are called: **MAFIC**

The second property we look for is **LUSTRE** (how a mineral reflects light)!

Vitreous!
(glassy)

Metallic
(shiny)

Pearly
(shell-like)

Resinous
(like dried glue)

Earthy
(dull)



The third property to be aware of is **SHAPE!**



CUBIC



EQUANT



PRISMATIC



NEEDLE



LATH

The fourth property to consider is **CLEAVAGE** (the ability of a mineral or rock to fracture along parallel planes)



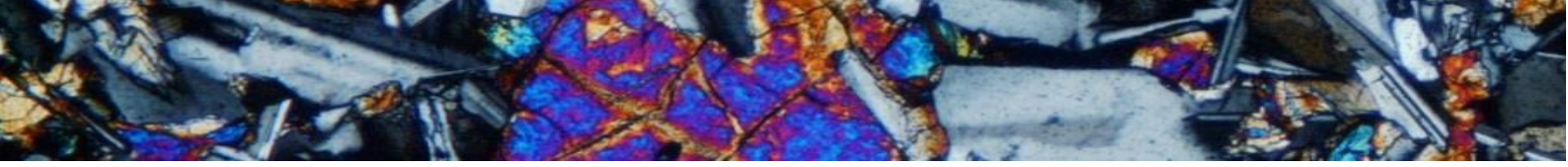
Poor cleavage
Only some splitting along planes



Good cleavage
Some clear cleavage planes



Perfect cleavage
Some clear cleavage planes



Metamorphic Geology describes the mineral and structural adjustment of solid rocks in response physical and chemical conditions

One thing to carefully describe for metamorphic rocks is their **TEXTURE!**

Foliated textures: Foliation is the existence or appearance of **LAYERS** and forms from the parallel arrangement of flat and platy minerals. A basic indicator is that the coarser-grained the metamorphic rock, the greater the pressure the rock has undergone.



SLATE

Very flat foliation (layers) that look similar to the cleavage we saw above. It develops in clay or mica-rich rocks. Indicative of low-grade metamorphism



PHYLLITES

Wavy and wrinkled foliation (a bit like fingertips after a bath) made up of platy minerals such as muscovite and chlorite. Usually gives rock a somewhat metallic 'shiny' look. Indicative of medium-grade metamorphism



SCHISTS

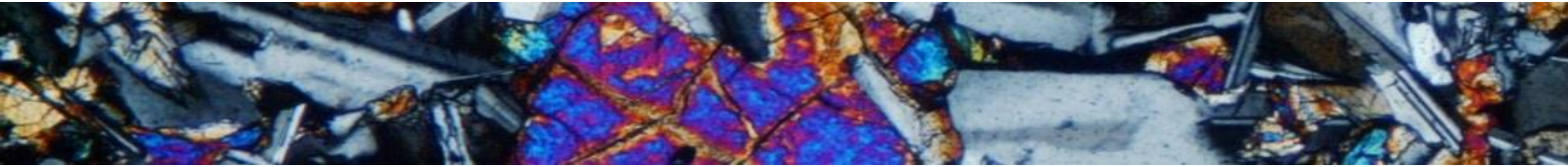
Scaly layering of large (visible) crystals of platy minerals such as amphibole, micas, and chlorite. Indicative of intermediate to high-grade metamorphism



GNEISS

Alternating layers of dark and light medium to coarse grained minerals. Fun fact: the lenses are called 'augen' after the German for eye. Indicative of high-grade metamorphism

Want to know more? We recommend '**An introduction to igneous and metamorphic petrology**' by Winters

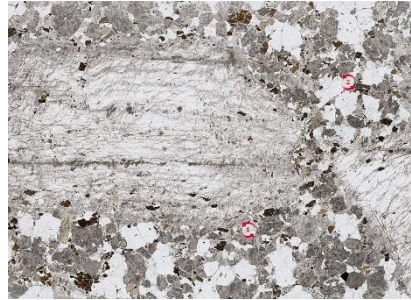


In order to properly describe igneous and metamorphic rocks we look at them underneath a microscope. Try your hand at describing what you see below by using the terms we've introduced above:

All pictures are taken from virtuamicroscope.org a great resource for learning more about petrology. Each rock comes with a hand sample, a thin section photo in PPL (plane polarised light), and a close up in XPL (cross polarised light).

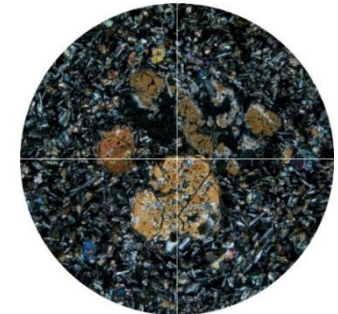
Coarse-grained igneous rock from Shap, Cumbria

What terms can you use to describe the minerals? Can you identify the rock?



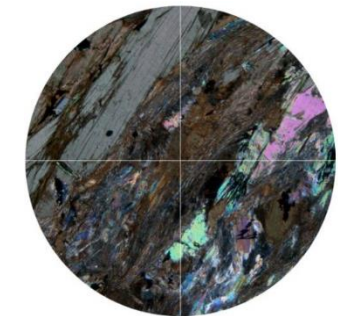
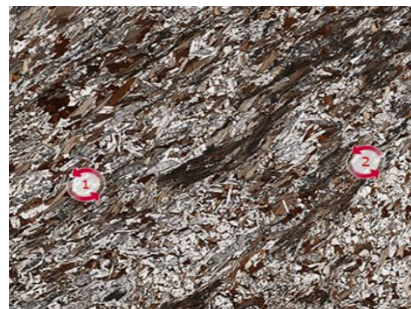
Fine-grained igneous rock from Staffa, Scotland

What terms can you use to describe the minerals? Can you identify the rock?



Fine-grained metamorphic rock from Glen Doll, Scotland

Can you identify the metamorphic texture of this rock?



Coarse-grained metamorphic rock from Harris, Scotland

Can you identify the metamorphic texture of this rock?

