SECTION III

III. CLASSIFICATION OF METAMORPHIC ROCKS

III.1 METAMORPHIC SEQUENCE

A metamorphic sequence is a set of metamorphic rocks of varying degrees, derived from the same protolith and characterized by a given mineralogical composition.

Para-ectinitic sequences

☒ Pelitic sequence :

Clay → Slate → schiste (chlorite, séricite…etc.) → micaschist (Biotite) →gneiss (K-feldspar)

☒ Siliceous or arenaceous sequence

Sandstone → quartzite & micaceous quartzite → leptynite (for arkose)

☒ Carbonate sequence

Limestone and dolomite → marbre (or cipolin) → serpentinite (if magnésium)

☒ Marl Sequence (clay + carbonate)

Marl → calc-schists → parasinite → para amphibolite et para pyroxenite

Ortho-ectinitic sequences

☒ Granitic Sequence

Granite → protogine → orthogneiss et ortholeptynite

☒ Gabrro-dioritic sequence

Gabrro → parasinite (zoïsite, epidote, albite) → ortho amphibolite et orthopyroxenite.

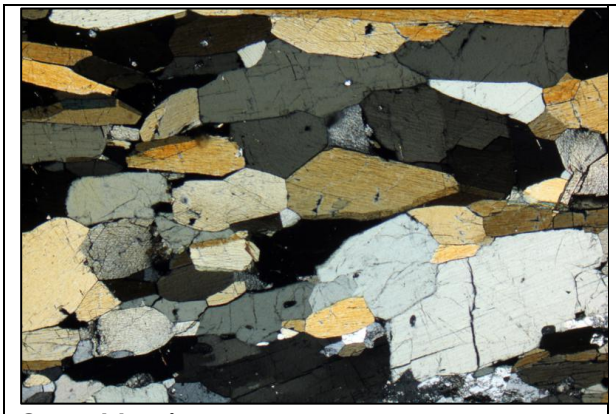
☒ Mafic lava Sequence

Mafic Lava → granular schist formation (amphibole, epidote et albite)

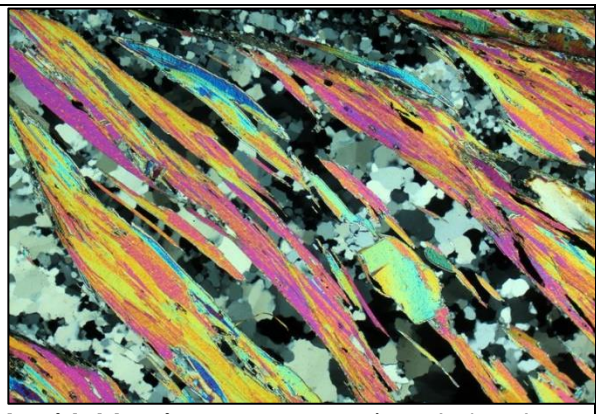
Eclogite → parasinite → ortho amphibolite et ortho pyroxénite.

III.2 Texture of metamorphic rocks

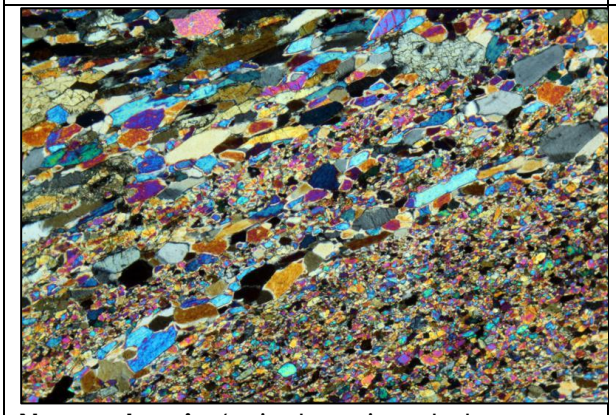
On a microscopic scale, the arrangement of minerals leads to pertinent conclusions regarding the timing of rock formation processes. This is why the term "texture" is employed.



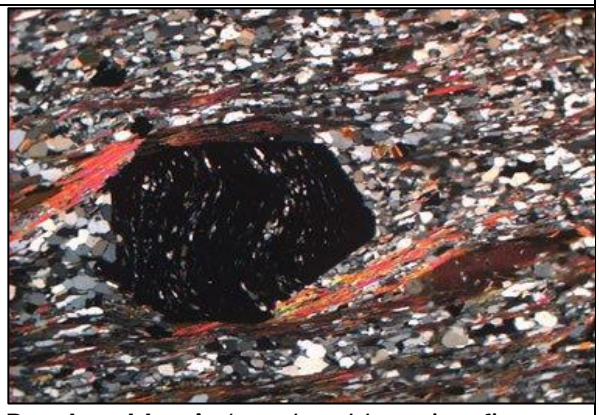
Granoblastic
The grains are visible to the naked eye and are generally equigranular. Making 120° angle limit



Lepidoblastic mecaceous minerals (ex : les micas, les chlorites, la séricite).

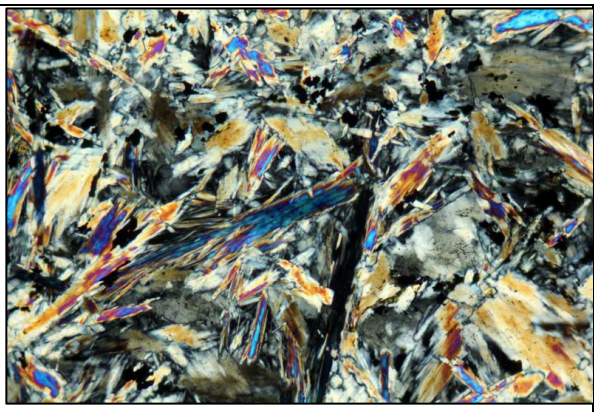


Nematobastic (acicular mineral shape, e.g. actinote, pyroxene…etc.

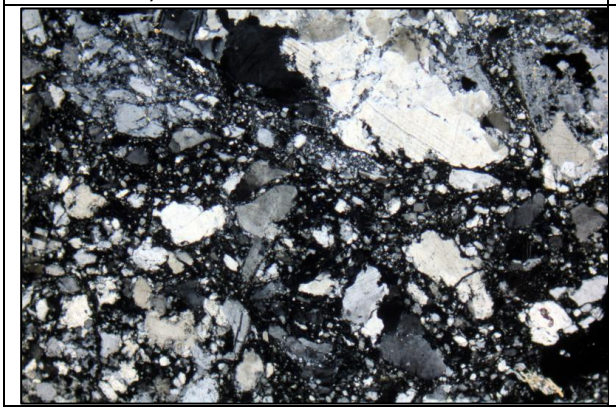


Porphyroblastic (porphyroblasts in a fine-grained groundmass more granoblastic)

Poeciloblastic
(porphyroblasts containing mineral inclusions)



Decussate or diablastic (interlocking but not overlapping minerals. The grains are medium to coarse (crystals > 0.5 mm),



Mylonitic or cataclasic
(Minerals are ground and crushed)

III.3 Nomenclature of metamorphic rocks

For metamorphic rocks, there are too explicit nomenclature systems. A name needs to identify the particular rock and provide important details about the metamorphic rock. Some adopted criteria are listed below and are widely used:

III.3.1 The nature of the parent material

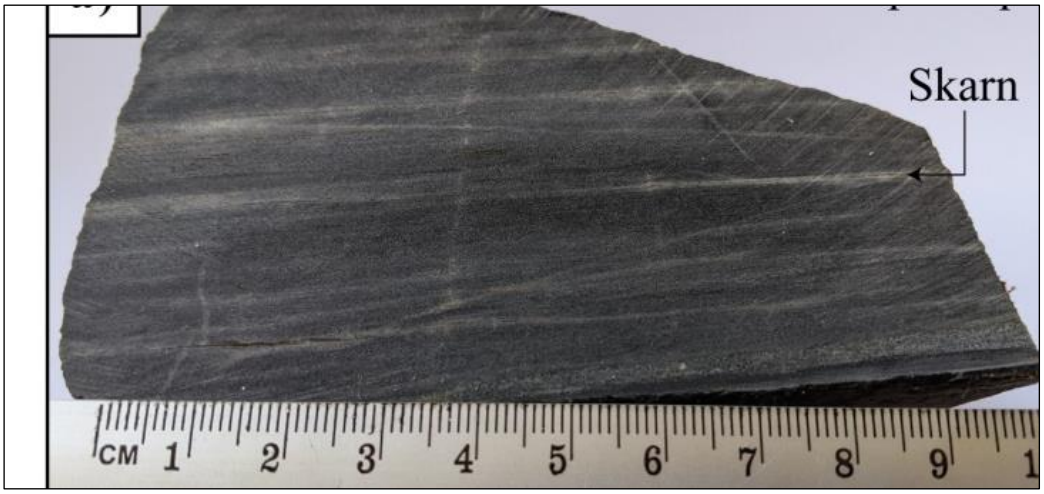
When the rock protolith is derived from sedimentary origin , we add the prefix ‘’Para’’ to the root of the rock name (e.g paragneiss), when it is of igneous origin we add the prefix ‘’Ortho’’ (e.g.Orthogneiss).

The prefix "meta" is generally used to distinguish metamorphic rocks from other types of rock (e.g. metapelites, metabasites, metasediments, metavolcanites, etc.).

III.3.2 The texture of the rock

Rock name	description

Slate	a low-grade rock with extremely fine grains and a prominent, widely-developed cleavage that is characterized by aligned sheet silicate grains that are too small to be seen with the naked eye. New surfaces appear dark (see also phyllite). 
Phyllite	a fissile, low-grade rock with fine grains that has a luster on the foliation surfaces due to strongly aligned but hardly noticeable sheet silicates. 
Schist	a medium-grained rock with parallel mineral alignment that is fissile (has schistosity) (usually sheet silicates). 
Gneiss	a medium- to coarse-grained rock with preferred mineral orientation and/or compositional layering (or mineral aggregates). not fissile.

	
hornfels	Hornfels. a metamorphic rock (mostly fine-grained) lacking from mineral lineations, gneissic structure, and schistosity. Rocks with a pelitic composition undergo contact metamorphism to generate hornfels. Porphyroblasts of andalusite and cordierite may be present. Though they can occasionally have a parallel structure derived from the original sedimentary rock, these rocks can also be completely enormous. But this structure prevents the rock from being divided into tiny platelets. 

III.3.3 The mineral assemblage

The most abundant mineral:

When one mineral constitutes the majority of the composition (e.g., 70%) in metamorphic rocks, the name of the rock is obtained by appending the suffix "ite" to the name of the mineral. Examples include pyroxenite (>70% pyroxene), tourmalinite (>70% tourmaline), sanidinite (>70% sanidine), and quartzite (>85% quartz). Note that certain rocks are an exception to this rule. Examples of these are the mineral calcite, which is calcareous or cipolin (>85% calcite), and the rock dolomite, which is made by more than 85% dolomite (mineral).

Minor minerals or accessory minerals: e.g garnet-bearing micaschit, phlogopite-bearing marble, kayanite-bearing gneiss, etc. all the prefixed mineral names are in small amount of the metamorphic rock (= 15-20%)

Major minerals or essential constituents: e.g Biotite-quartz-plagioclase gneiss, hornblende-pyroxene hornfels, two micas gneiss, biotite-muscovite gneiss...etc. prefixed mineral names are believed to form more than 50% of the rock volume.

III.3.4 Specific nomenclature

These names are descriptive and generally non-genetic. However, some have petrogenetic significance and may be indicative of metamorphic conditions. The most common names are given here:

blast is the suffix while blasto is the prefix. While the suffix blast indicates new textures created by metamorphic recrystallization (e.g., porphyroblastic texture resembles igneous porphyry texture but is acquired by metamorphic recrystallization), the prefix blasto generally indicates remnants of the pre-existing texture (e.g., blastoporphyry texture comes from metamorphism of igneous porphyry texture).

Marble and cipolin. A metamorphic rock composed mainly of calcite and/or dolomite (e.g. dolomitic marble).

Skarn / **calc-silicate** rock. A metamorphic rock that is mostly made up of calcic silicates, including wollastonite, anorthite, scapolite, ca-amphibole, diopside-hedenbergite, zoisite, vesuvianite, and calcic garnet (grossular - andradite). It can include Up to 50% carbonates. These rocks are often the result of contact metamorphism.

Migmatites. Medium- to high-grade metamorphic terrains contain silicate composite rocks, which are the typical rocks of the middle and lower continental crust. The complex structural relationship of magmatites is made up of dark (mafic) components called melanosomes and light (felsic) elements called leucosomes. The foliation of magmatitites is either obscured or distorted due to elevated temperatures and pressures.

III.3.5 Nomenclature with the métamorphic facies

Greenschist. These are actinote, epidote, and chlorite-based greenish metabasites with a foliated texture.

Bleuschist. These metabasites have a foliated structure and are greyish in color. Because of the sodium amphibole glaucophane, they get their name.

Eclogite. These metabasites are made of clinopyroxene and garnet. Plagioclases are almost nonexistent.

Granulit. Distinctive rocks with high temperatures; they have a range of compositions, from basic to acidic. The individual minerals are saccharoid in texture and equigranular.

III.4 High deformation nomenclature

Mylonite. Rock produced by mechanical reduction in grain size resulting from ductile, non-cataclastic deformation in localised zones (shear zones, fault zones), leading to the development of small-scale penetrative foliation, often with mineral stretching along a lineation.

Ultramylonite. A mylonite in which most of the megacrysts or lithic fragments have been eliminated (fine-grained matrix >90%).

Blastomylonite (augen mylonite). Mylonite containing distinctive large crystals or lithic fragments around which a fine-grained band is wrapped.

Cataclasite. A high-pressure rock that has undergone cataclastic metamorphism.

Fault breccia. Cataclasite with a breccia-like structure formed in a fault zone.

Pseudotachylite. A flint-like rock with a vitreous appearance and ultrafine grains, occurring in the form of thin veins, a matrix of pseudoconglomerates or pseudobrèches, which fill fractures in the surrounding rocks.