

***Lecture SEVEN***  
***Nomenclature of***  
***Metamorphic rocks***

# Metamorphic Rocks Nomenclature

- ⇒ **The igneous rocks** are classified according to IUGS system.
- ⇒ **The sedimentary rocks** are classified according to the genesis of the rocks.
- ⇒ But, the classification of **metamorphic rocks** are differ and depends on **what is visible in the rock and its degree of metamorphism**. Four kinds of criteria are normally employed:

**1- The nature of the parent material (protolith composition)**

**2- The rock's texture (grain size and fabric development)**

**3- The metamorphic mineralogy (mineral content)**

**4- Appropriate special name**

# 1- The nature of the parent material (protolith composition)

As mentioned above, the metamorphic rocks are derived from pre-existing rocks, which could be sedimentary, igneous or prior metamorphic nature.

The metamorphic rock categories are principally nominated according to the nature of the protoliths such as:

<b>Parent Material</b>	<b>Rock type</b>	<b>Metamorphic equivalent</b>
Clay-rich sediments	pelites	metapelites
Sandstones	psammites	metapsammites
Clay-sand mixtures	Semi-pelite	metapsammopelites
Quartz-sand (Qtz arenites)	quartzite	metaquartzites
Marl (lime mud)	calcareous	Calc-silicates
Limestone or dolomite	Carbonate / calcareous	Metacarbonate / marble
Basalt		metabasite (metamafic)
Granitoids		Metagranitoids
Ultramafic		metaultramafics

As well if the rock subjected to low grade metamorphism, name of original rock is used with prefix (meta-) Such as: metamudstone, metagraywacke, metagabbros, and metabasalt

## 2- Rock textures (grain sizes and fabrics)

A- when the rock is mica rich (i.e. metapelites and/or mrtapsammo-pelites and exhibit preferred orientation:

1- If the rock is very fine grained (not visible with 10X magnification, not luster (dull) and freshly cleaved **Slate name is used**

2- if the rock is fine grained schistose (not visible with naked eyes but easily recognized with 10X and sheen to foliation in strong sunlight **Phyllite name is used**

3- if the mica is easily visible with the naked eye (the rock is medium grained) and possess schistosis foliation **Schist name is used**

4- if the rock is possessing gneissic foliation and medium to coarse grained **gneiss name is used**



**phyllite**

**Slate**

©2001 Earth Science: The OpenStax Learning

**Schist**





**gneiss**



## 2- Rock textures (grain sizes and fabrics)

### Note that:

- **Schist** is a broad term, and slates and phyllites are also types of schists. In common usage, schists are restricted to those metamorphic rocks in which the foliated minerals are coarse enough to see easily in hand specimen.
- If the gneisses contain augen texture, **Augen gneiss** name is used
- The prefix **ortho-** and **para-** is used to an **igneous** and **sedimentary** parentage, respectively. For example, many gneisses could easily be derived from either an impure arkose or a granitoid rock. If some mineralogical, chemical, or field-derived clue permits the distinction, terms such as **orthogneiss**, **paragneiss**, may be useful.



**Augen gneiss**



# Augen gneiss



## 2- Rock textures (grain sizes and fabrics) cont.

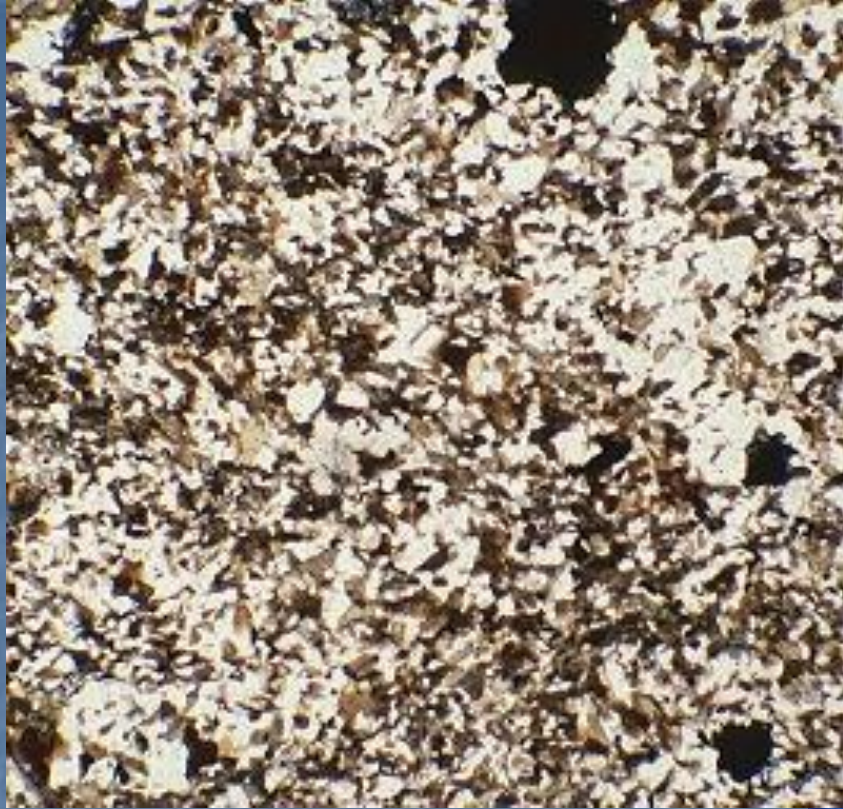
B- When the rock have no preferred orientation (i.e random orientation of individual minerals or isotropic):

1- if the minerals are unequent (prismatic) and fine grained size. It occurs in contact aureoles and is tough, and tend to splinter when broken. **Hornfels name is used**

2- if the minerals are unequent (prismatic) and medium grained size **Granofels name is used**

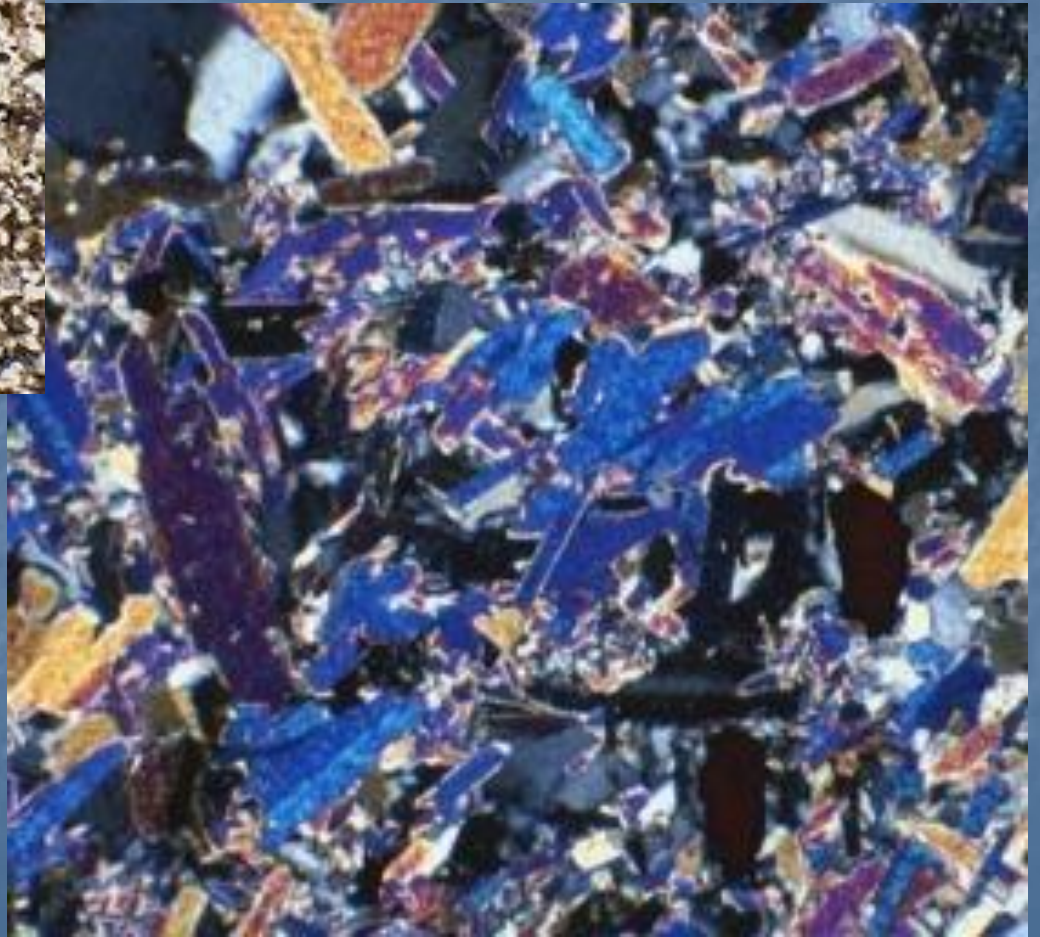
3- if the minerals are equent and fine to coarse grained size **granulite name is used**

**Marble name is used (>50% carbonate minerals)**



**Hornfels**

**Granofels**



**Granulite  
(Eclogite)**



## 2- Rock textures (grain sizes and fabrics) cont.

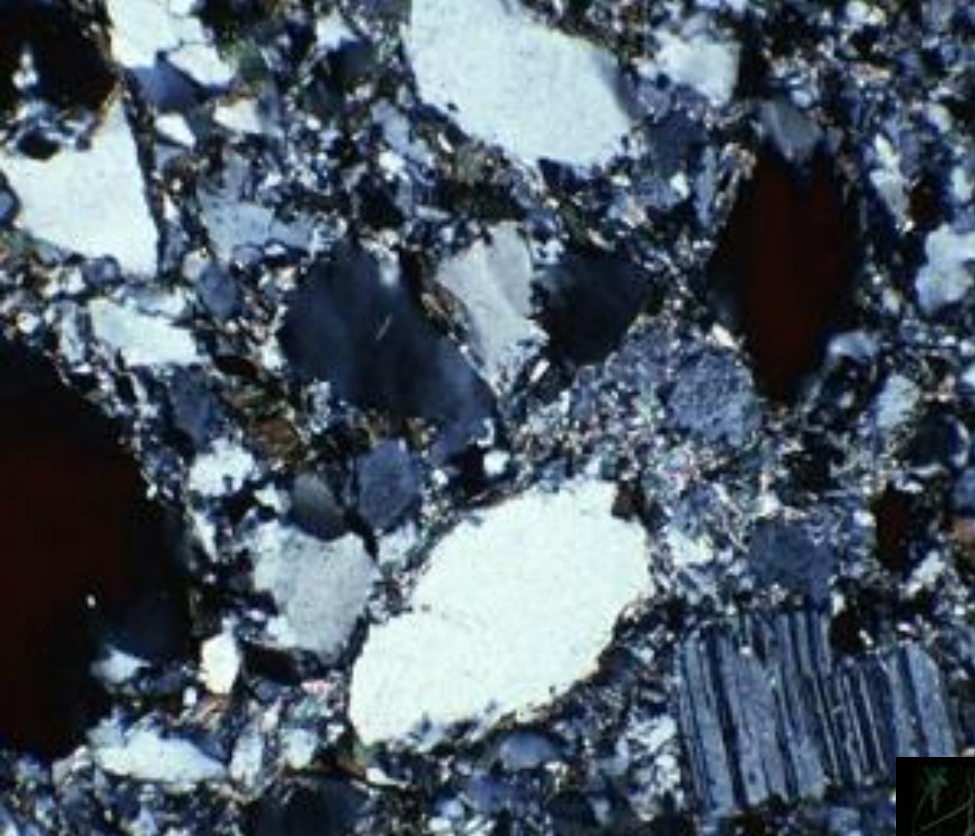
**C- When the rock is subjected to dynamic metamorphism and granulation:**

1- if the rock is coarse to very coarse grained and similar to that of braccia **Fault braccia name is used**

2- if the rock is medium grained and still the original mineral easily recognized **Cataclasite name is used**

3- if the rock is granulated to fine or very fine-grained with pronounced foliation **mylonite / ultramylonite name is used**

4- If the rock is highly strained and the matrix become glassy **Pseudotachylite is used**



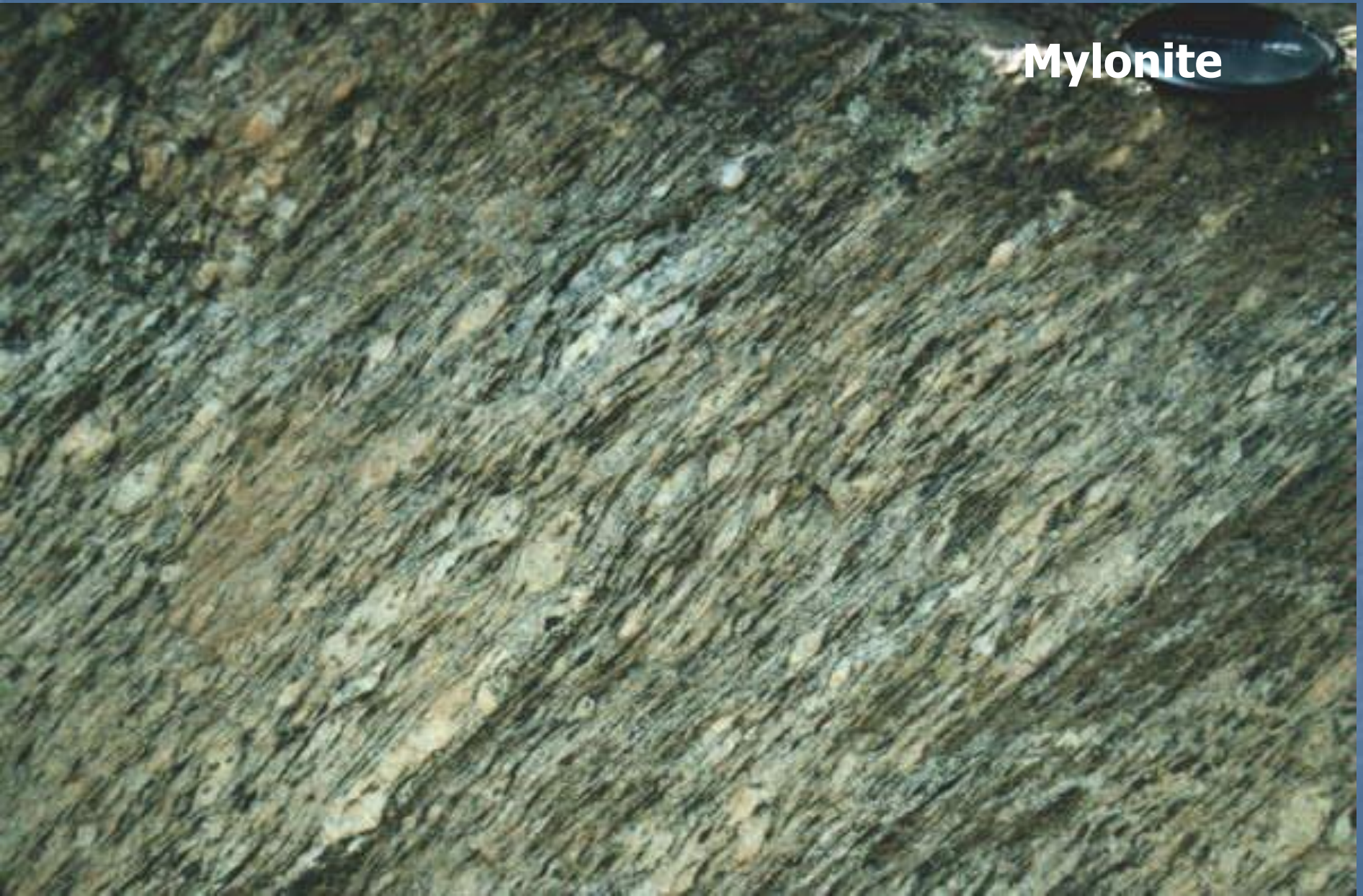
**Cataclasite**



**Mylonite**



**Mylonite**





## Classification of high strain rocks

% fine matrix	Rocks without primary cohesion	Rocks with primary cohesion			
		Non-foliated	Foliated		Glass in matrix
50	Fault breccia	Microbreccia	Protomylonite	Blastomylonite (if significantly recrystallized)	Pseudotachylite
70			Mylonite		
90	Fault gouge	Cataclasite	Ultramylonite		

After Higgins (1971)

### 3- Metamorphic mineralogy (mineral content)

Most distinguished (index) minerals are used as **prefix** to the textural name. The mineral is arranged in order of their percent content such as:

- Garnet biotite schist
- Sillimanite K-feldspar gneiss
- hornblende biotite gneiss
- spotted andalusite hornfels
- Garnet-andalusite-sillimanite-K-feldspars granulite.

## 4- Appropriate (Special) names

**Mafic schist**: A term used to describe foliated or non-foliated metamorphic rocks that containing >50 mafic minerals (chlorite, epidote, amphiboles {actinolite-tremolite-hornblende-gluco-phane-cummintogonite), pyroxene (ortho- and para-types).

-Their color differs from green, black to blue colour and include:

1- greenstone / greenschist: low-grade, fine grained rock composed of (Chl + Act + Ep + Ab). Most of the mineral except the latter are green colors. The greenstone is non-foliated, while the greenschist is foliated. The protolith is either a mafic igneous rock or graywacke

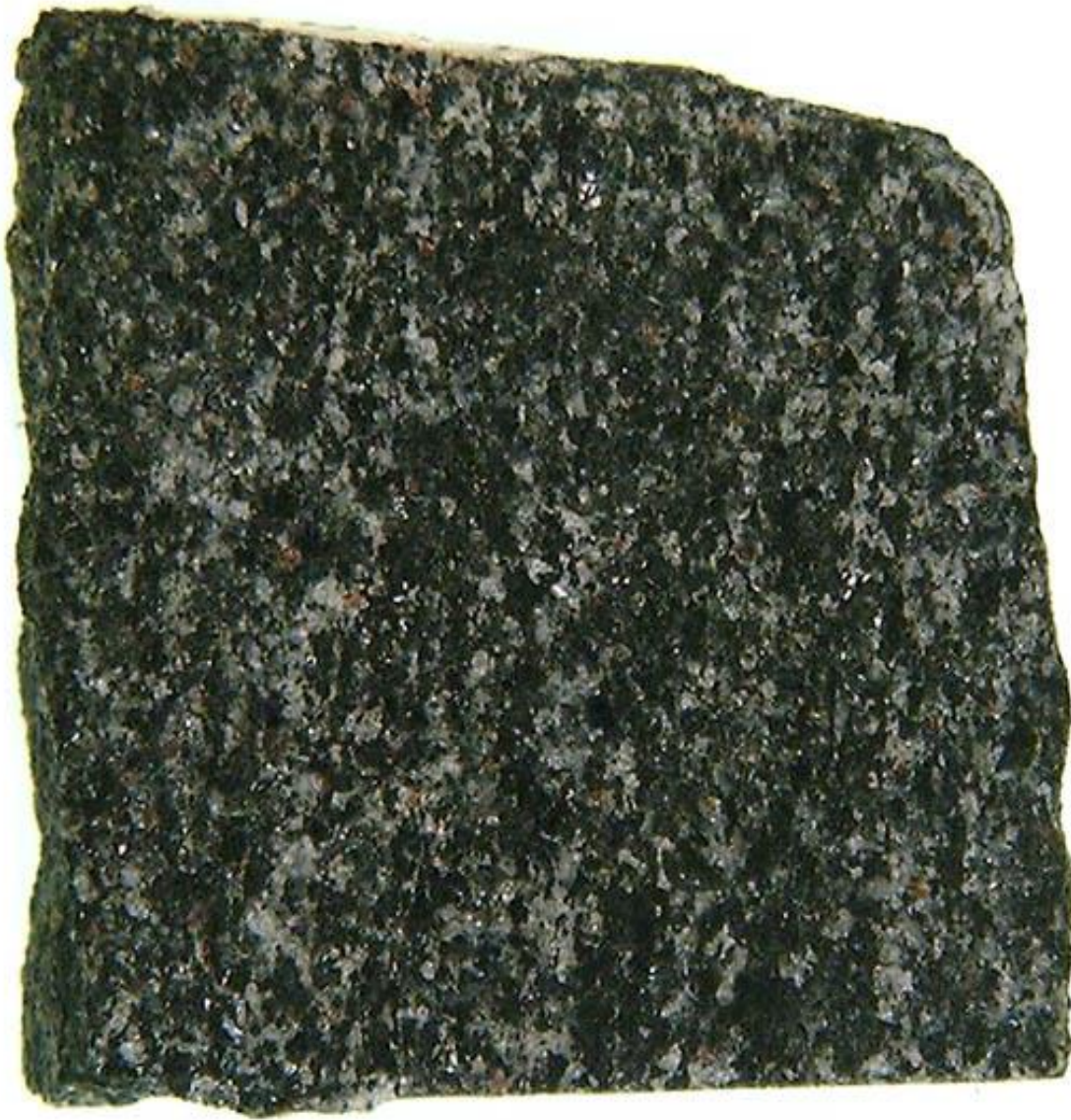
2- amphibolites: foliated or non-foliated fine to medium grained rock composed dominantly of hornblende and plagioclase

3- Blue schists: fine to medium foliated rock (Gluc + Pl + Ep)

# amphibolites



**amphibolite**



**1cm**

## 4- Appropriate (Special) names

4- **Eclogite**: a green and red coarse-grained metamorphic rock that contains clinopyroxene and garnet (omphacite + pyrope). The protolith is typically basaltic.



## 4- Appropriate (Special) names

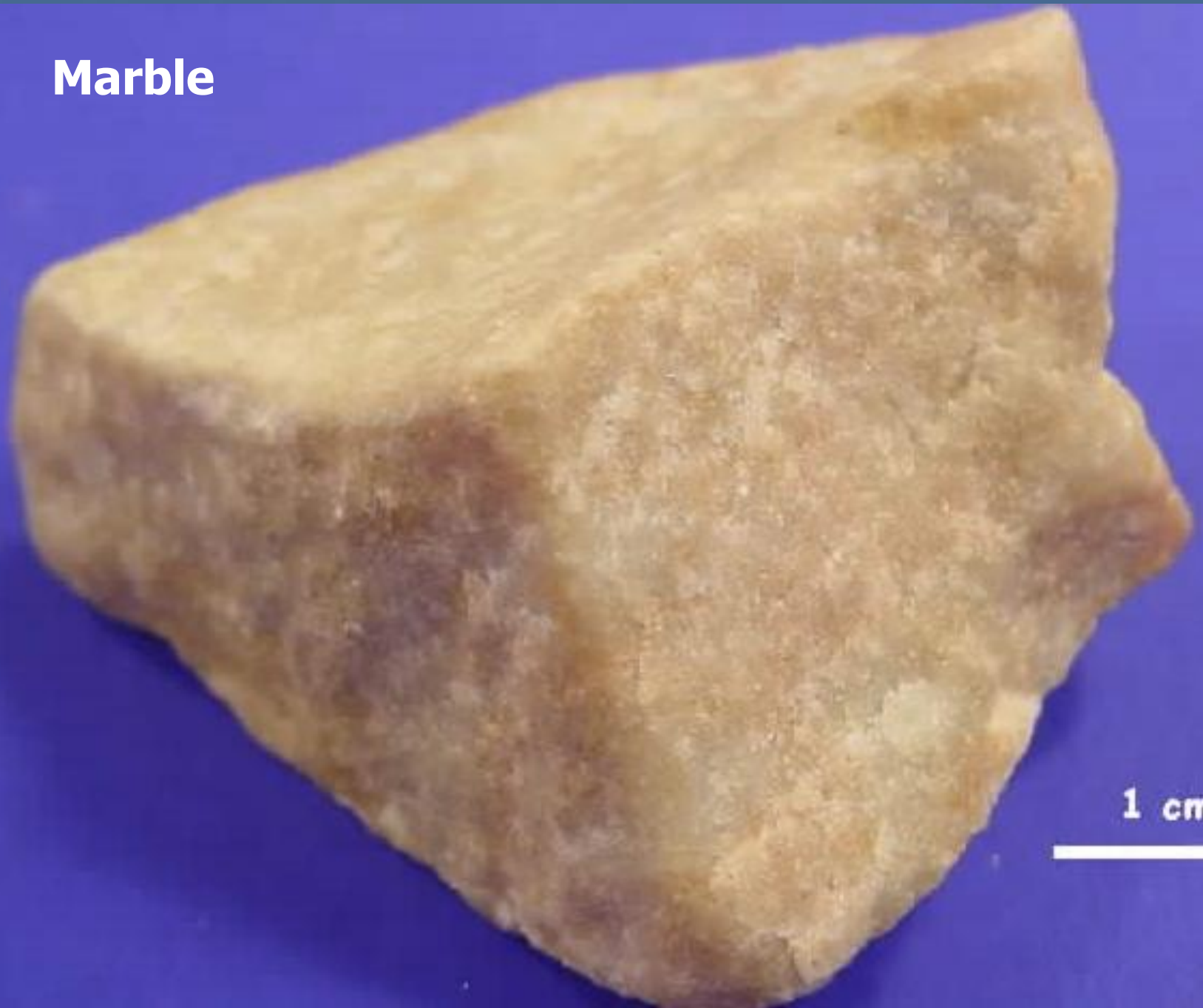
**Marble**: a foliated or non-foliated metamorphic rock composed predominantly of calcite or dolomite (> 50 vol.%). The protolith is typically limestone or dolostone. Prefix with dominant minerals is used such as: wollastonite marble, tremolite-marble, calcite marble, dolomite marble, diopside-grossular marble.

**Calc-schist** a foliated rock with >50 vol.% Ca-silicate minerals (e.g. tremolite diopside, hornblende, wollastonite, grossular).

**Calc-silicate** a non-foliated equivalent of calc-schist.

**Skarn**: a calc-silicate rock formed as a result of metasomatism of carbonate rocks as a result of fluid action from a magmatic rocks.

**Marble**





## 4- Appropriate (Special) names

**Quartzite:** a foliated or non foliated metamorphic rock composed predominantly of quartz (> 90 vol. % quartz). The protolith is typically sandstone.

**Soapstone:** a non-foliated rock with abundant talc and greasy feel.

**Talc-schist:** a foliated equivalent of soapstone.

**Serpentinite:** a foliated or non-foliated rock with >50 serpentine minerals.

**Migmatite:** a composite silicate rock that is heterogeneous on the 1-10 cm scale, commonly having a dark gneissic matrix (melanosome) and lighter felsic portions (leucosome). Migmatites may appear layered, or the leucosomes may occur as pods or form a network of cross-cutting veins

quartzites



1 cm

**serpenitinites**



# Migmatites

