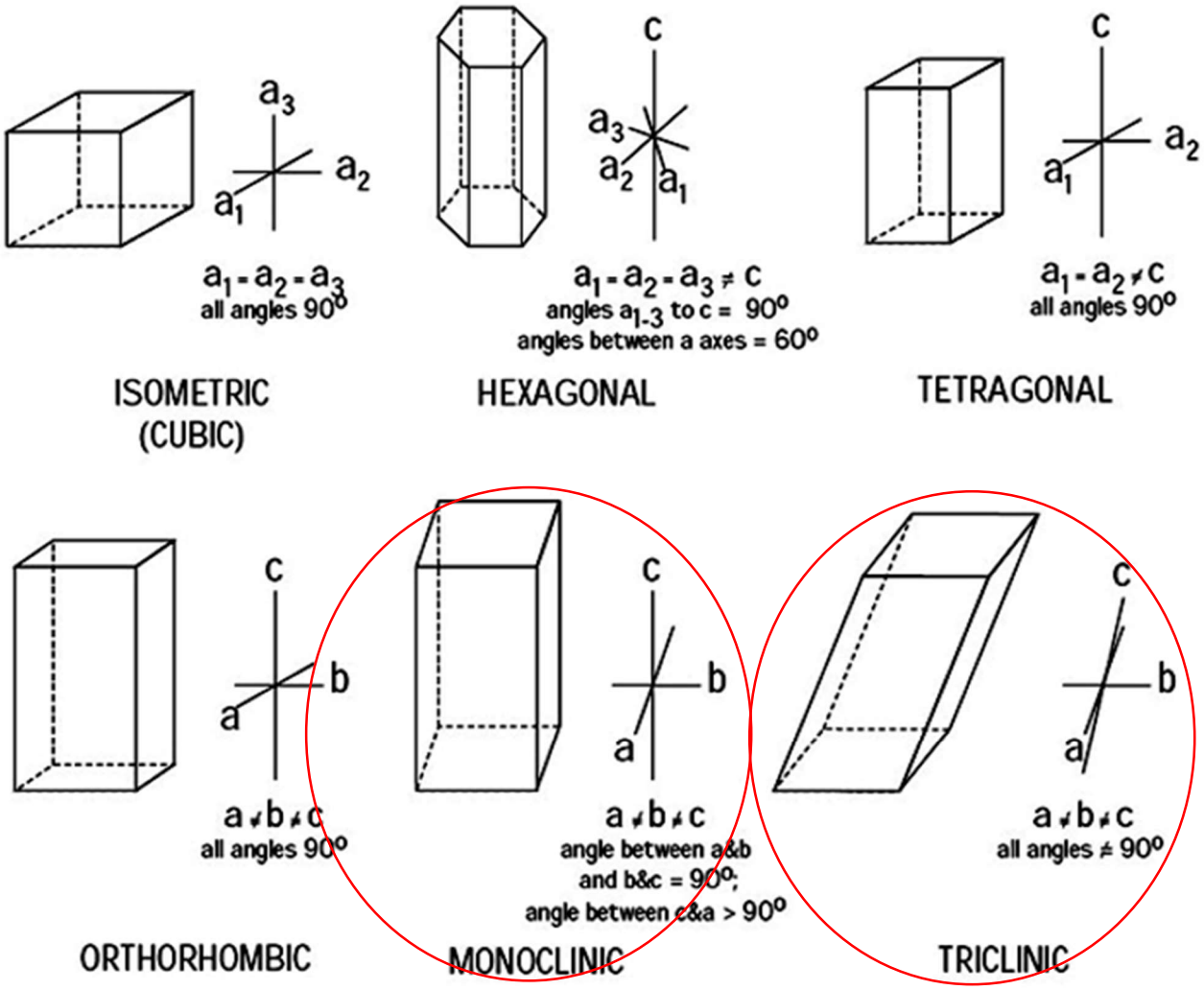
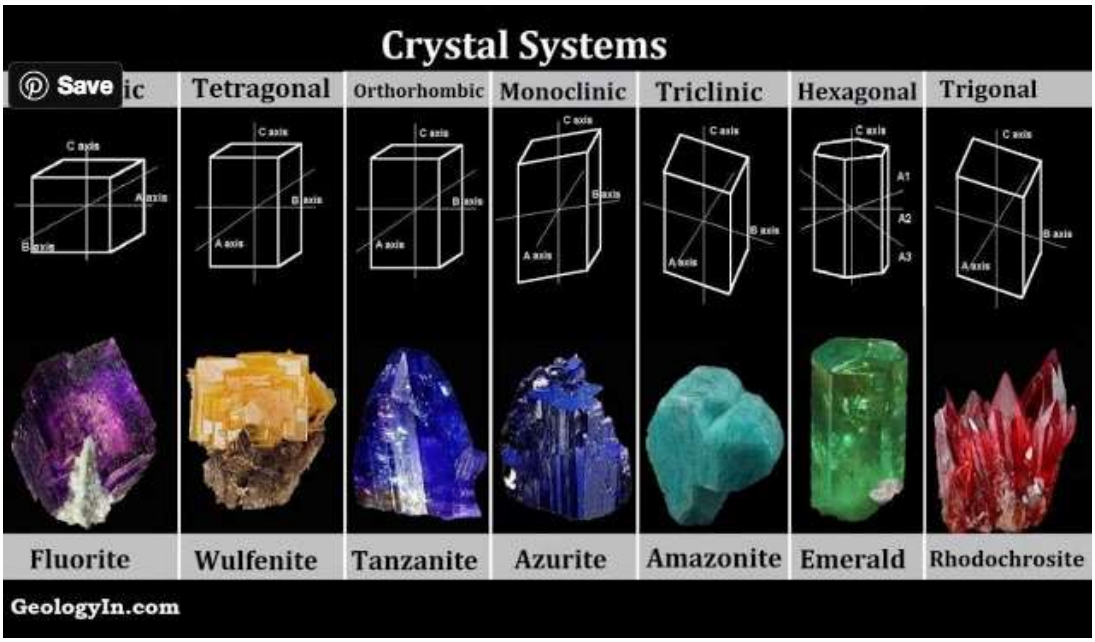
MONOCLINIC and TRICLINIC MINERALS

Introduction

There are 6 geometry systems in which every mineral in the world will belong. Although daunting at first, learning these systems and being able to visualize the common variants will enable you to identify well developed minerals on sight or at least the mineral family (eg- carbonates all look the same)



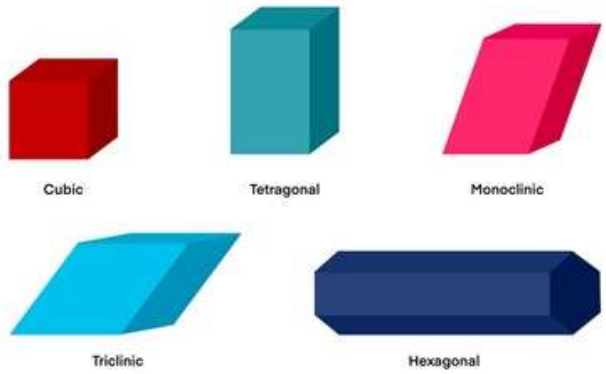


Monoclinic (Mono=one, Clinic = Inclined)

Crystal Growth

- Crystals grow from cooling and solidifying molten melts or precipitation of hot vapors
- They start as tiny blocks and grow (typically) in all directions at the same time – think of Russian nesting dolls or a growing insect- the outer growth surrounds the inner 3D shape
- The starting block is the **unit cell** which is the smallest distinct group of atoms which has all the essential parts of the mineral including its chemical, physical, and geometric properties.
- The outer form will reflect the unit cell which will stack over a trillion trillion times in even the smallest visible crystal. A cubic or rectangular unit cell will never form a hexagonal crystal.
- Crystal growth occurs as a unit cell attaches to another and so on. Where it attaches depends on several factors. It may be the area that is most exposed, an area not hidden by other crystals, or the area with strongest attraction chemically or electromagnetically. Therefore, different areas on a crystal can grow at different rates leading to classic variations which allow us to identify certain minerals on sight.

Simplified Overview and Review of Forms



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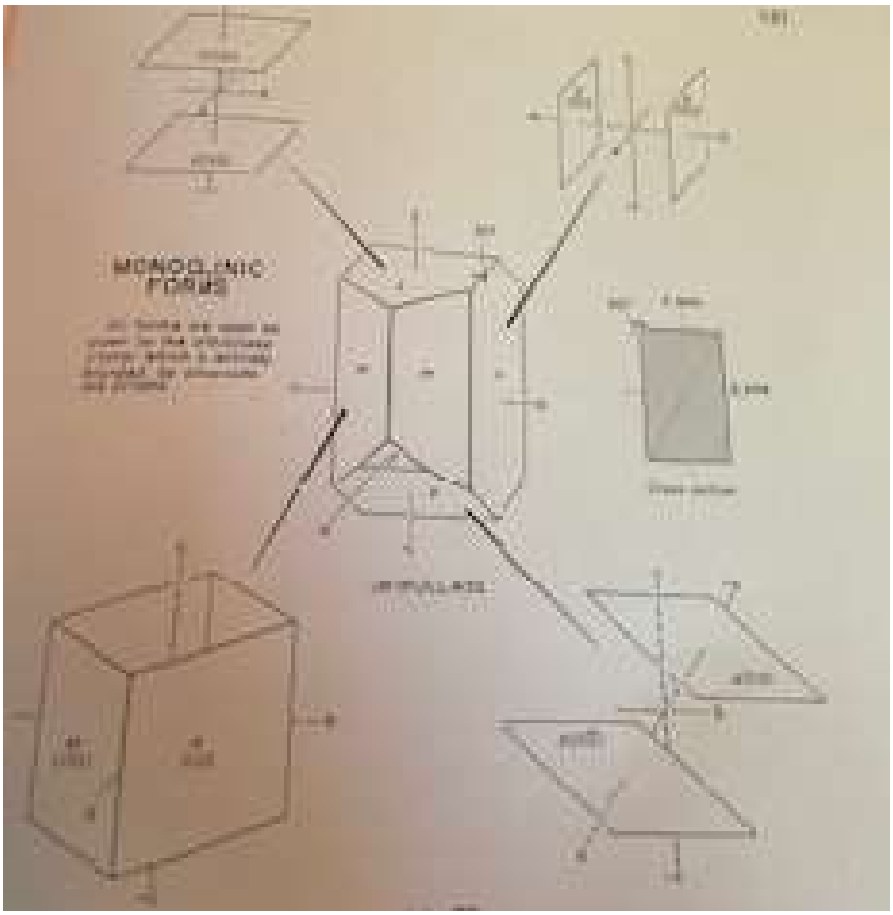
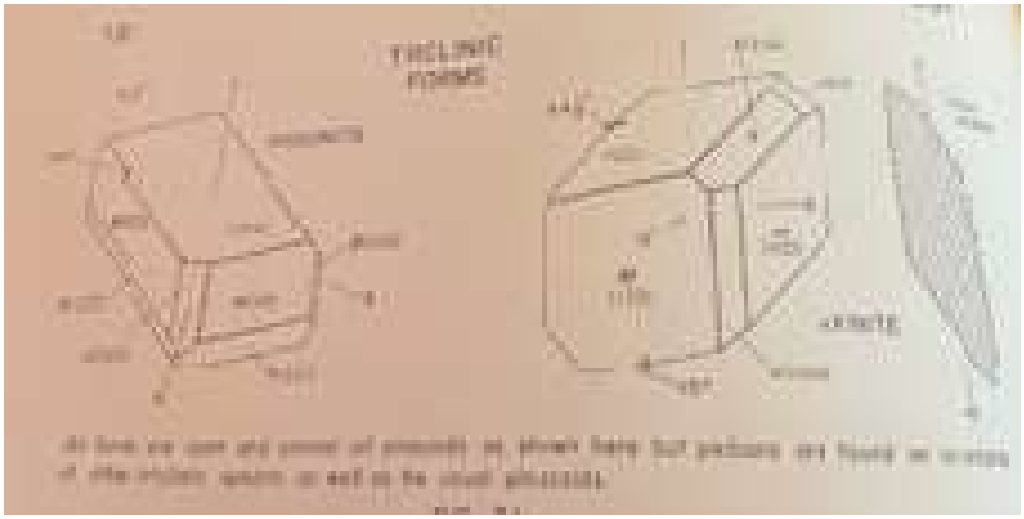
Monoclinic Basic Forms



Triclinic Basic Forms



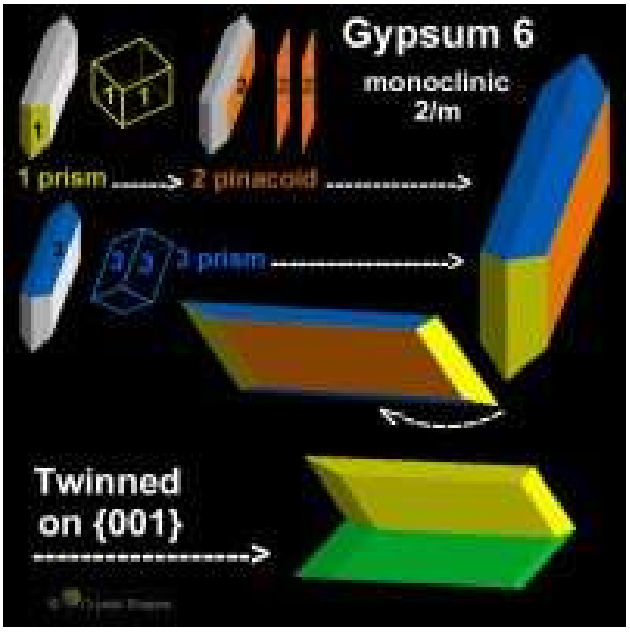
- In the monoclinic crystal system, we will begin to see crystals that have seem to be leaning or bladed, and this will be even further exemplified by the triclinic system. As opposed to all the other crystal systems, these two have a, b, and c axes that are not at right angles to each other. In both systems, all limb lengths will be different. In monoclinic, the a-axis is angled toward the c-axis while the other axes are at 90 degrees. In triclinic, all axes none of the axes are at-90-degree angles. This means that if you have a well-developed crystal face, you may be able to see a leaning parallelogram instead of a nice and regular rectangle or cube. In practice, this can be very difficult to see. Triclinic crystals are easier to distinguish (they look oddly angled sometimes,) but monoclinic crystals can appear to be quite orthorhombic (or even hexagonal).
- The monoclinic system is the largest system with 1400 minerals (and counting) represented here – about 27% of identified mineral species. While they are hosted in 3 main variants – prismatic, sphenoidal, and domatic types, in handheld specimens of reasonably common minerals, they practically are only prismatic. Experts identify these by planes of symmetry, which is beyond the scope of our study.
- The triclinic system is the smallest system with about 400 minerals and only a few collectible ones. Most arebeing blocky or tabular. They are often easier to tell as they often are oblique in 2D or 3D – much more often than monoclinic.
- A good tip for the monoclinic and triclinic systems is that they only have one form, not two. For example, quartz has a pointy pyramidal termination on a prismatic stalk, these clinic forms have a simpler structure (more like a fluorite.) If it looks oblique (leaning) and is prismatic, it is llikely monoclinic. If it is oblique and blocky or tabular, it is likely triclinic.

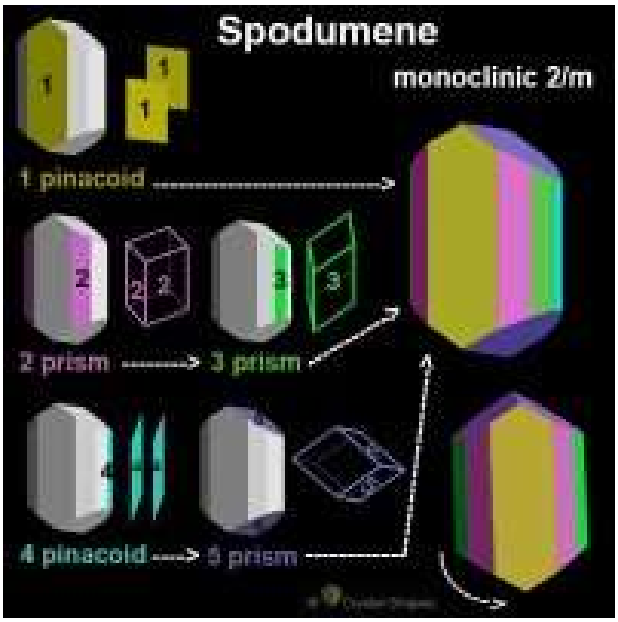
Collectable Monoclinic Minerals:

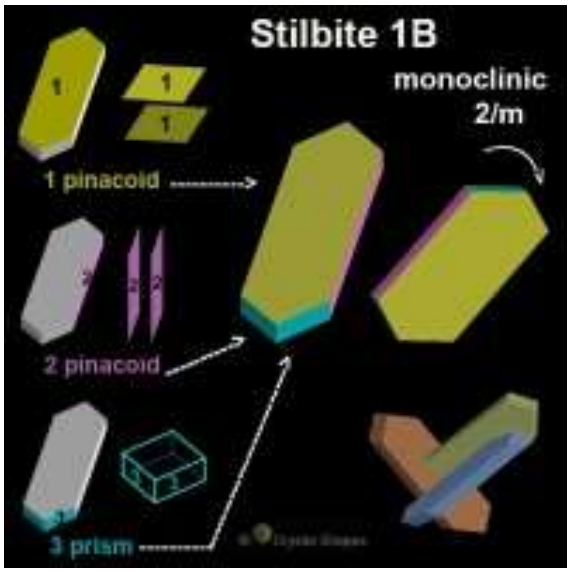
Adularia
Aegerine
Amazonite
Azurite
Gypsum
Heulandite
Liroconite
Ludlamite
Malachite
Microcline
Realgar
Spodumene (Kunzite)
Stibite
Vivianite

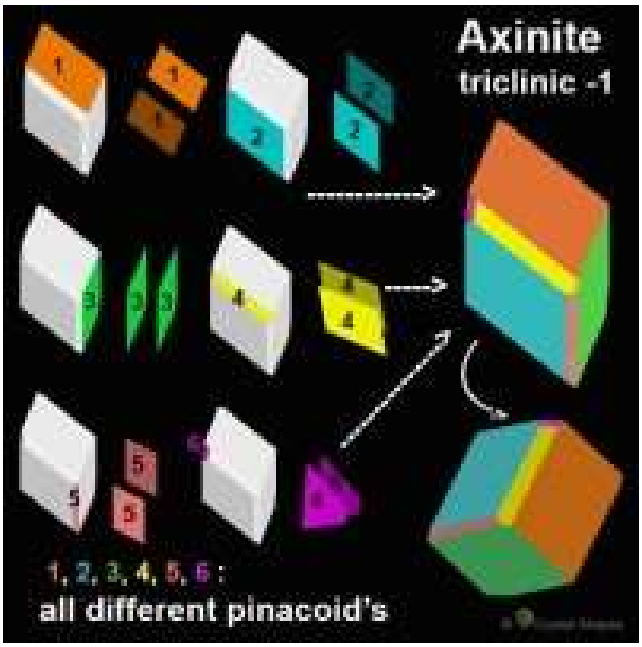
Collectable Triclinic Minerals:

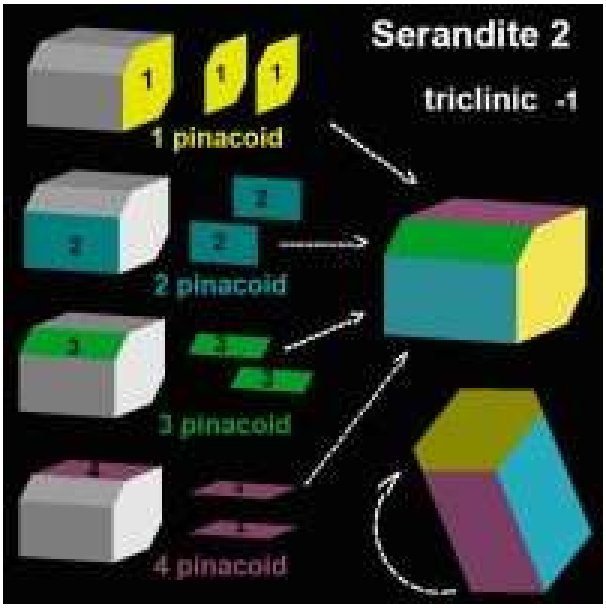
Amblygonite
Axinite
Babingtonite
Chabazite
Rhodinite
Serandite
Vauxite
Weloganite


Gypsum 6
monoclinic
2/m
1 prism
2 pinacoid
3 prism
Twinned
on {001}


Spodumene
monoclinic 2/m
1 pinacoid
2 prism
3 prism
4 pinacoid
5 prism


Stilbite 1B
monoclinic
2/m
1 pinacoid
2 pinacoid
3 prism


Axinite
triclinic -1
1, 2, 3, 4, 5, 6 :
all different pinacoid's


Serandite 2
triclinic -1
1 pinacoid
2 pinacoid
3 pinacoid
4 pinacoid