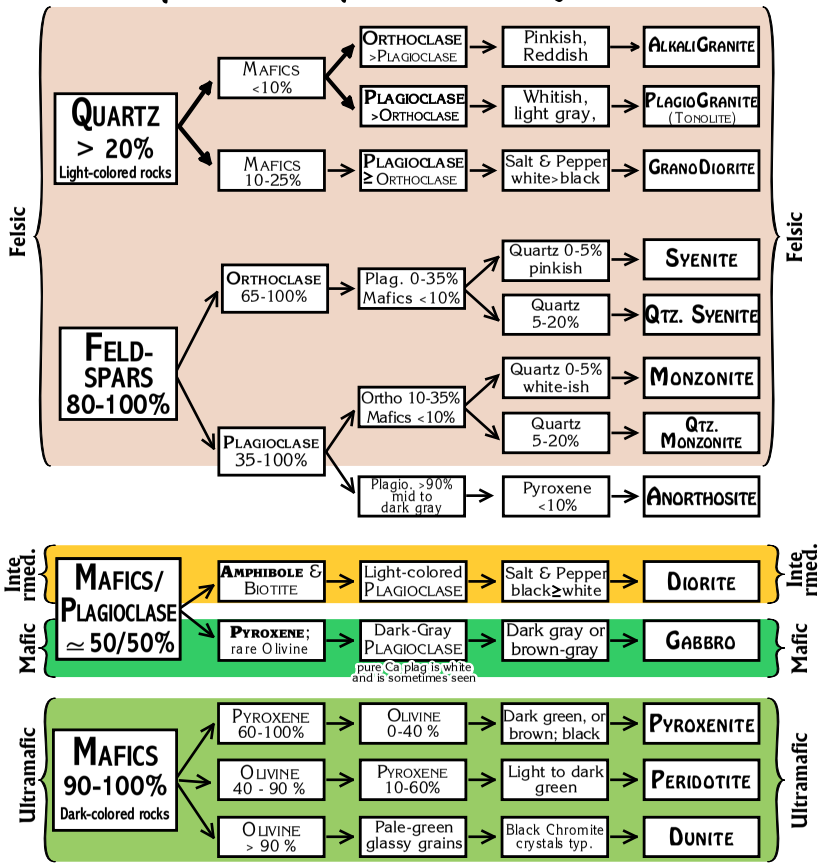
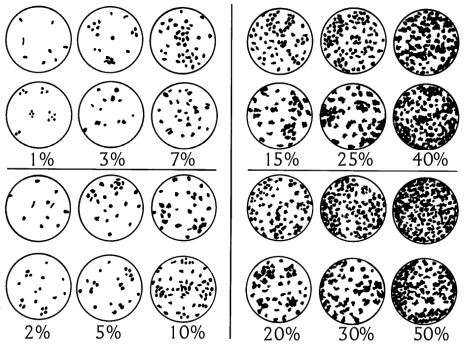
Composition Key Phaneritic Igneous Rocks





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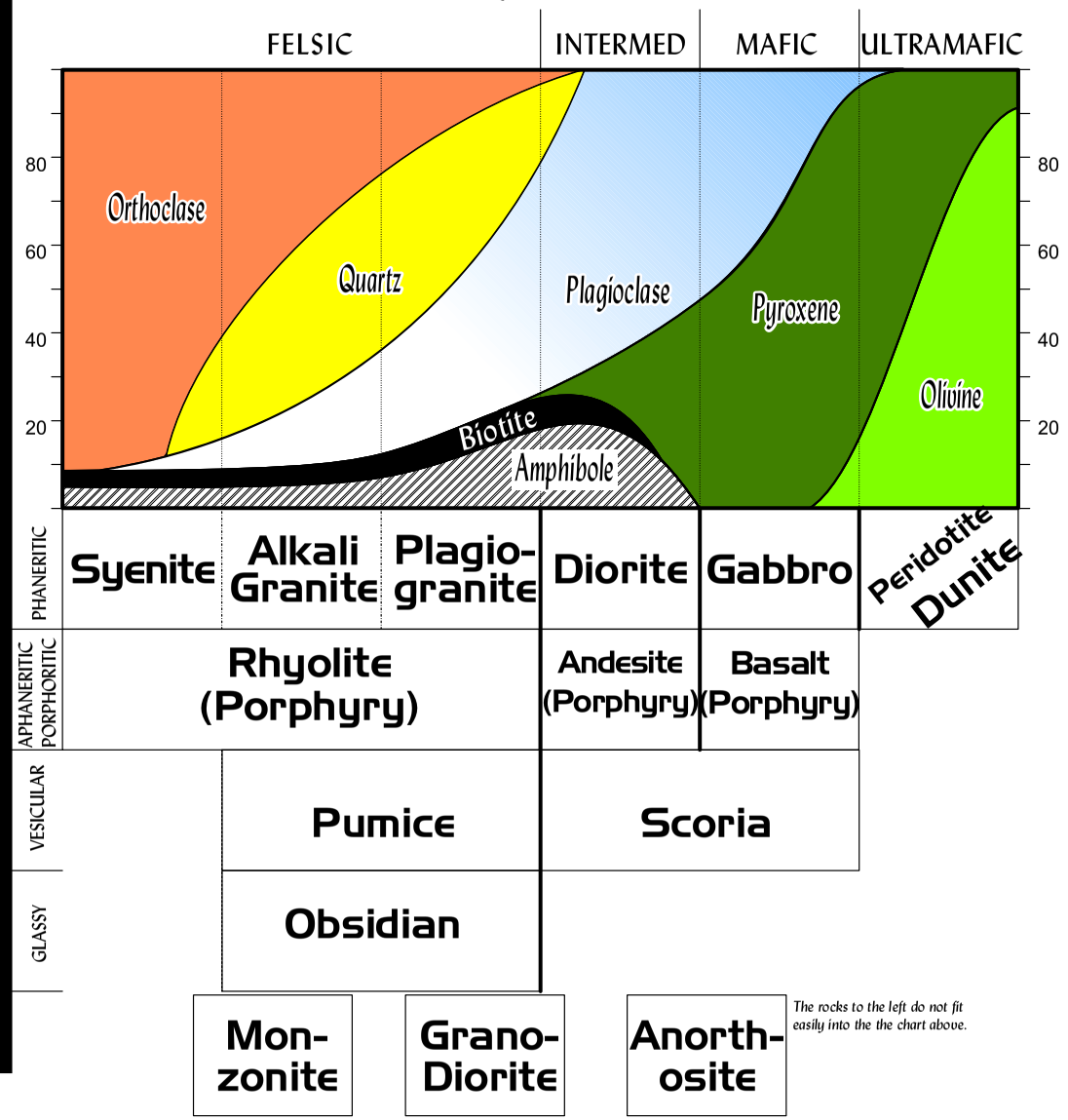
Each circle is a view through the microscope. The entire circle represents 100%. The black areas represent various percents of the total circle, ranging from 1% to 50%. Study the rock through the microscope and compare the abundance of any particular component with these charts to get the percent abundance of the component. Observe the following:

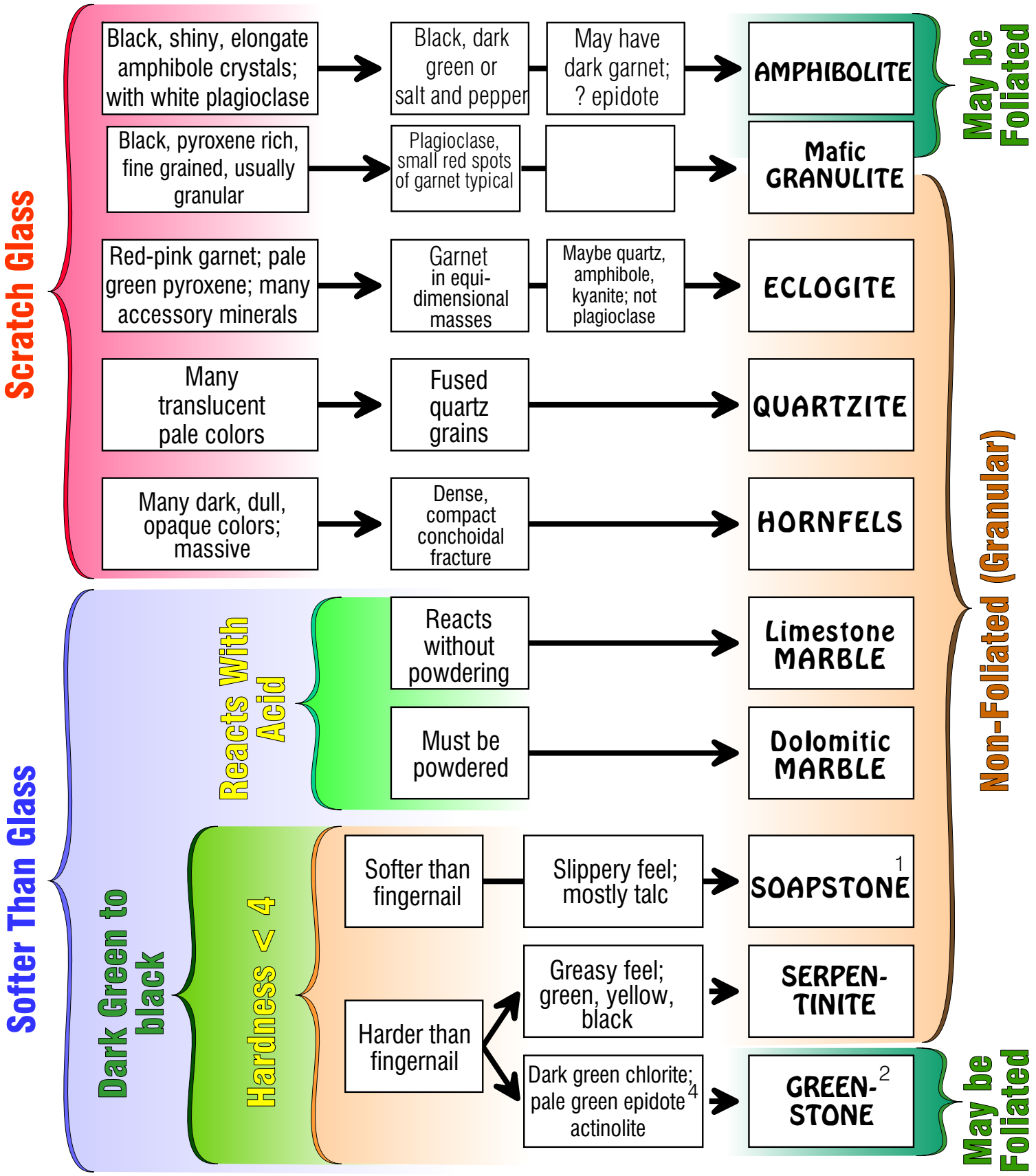
1. A 50% abundance looks more than 50% (because the eye sees the dark areas easier than the light.
2. Begin estimates with dark or distinctively colored fragments since they are easier to see.
3. Begin estimates with less abundant fractions rather than the most abundant fractions. Small fractions are easier to pick out of the background.

Igneous Rock Classification Based on Composition and Texture



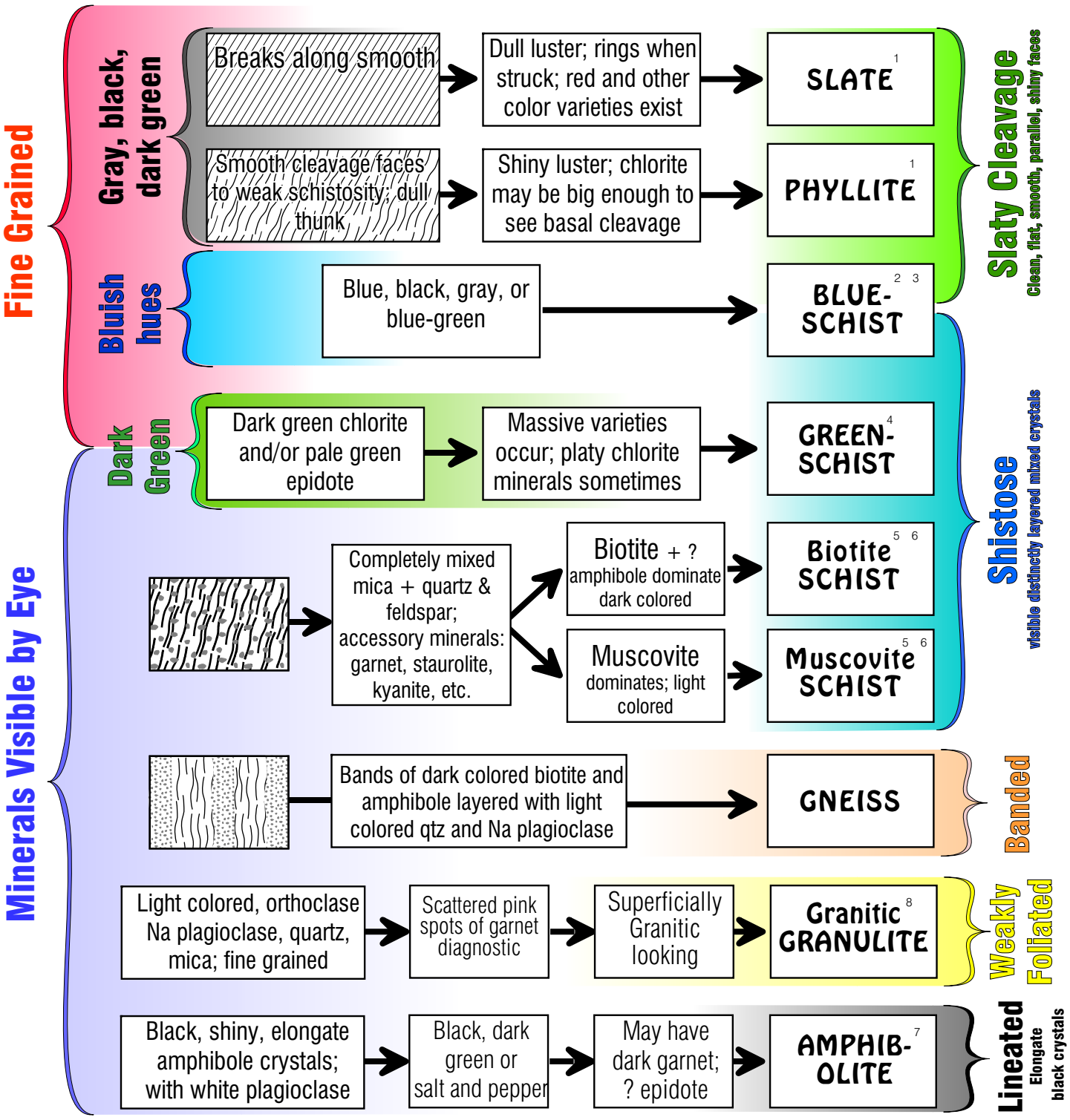
The rocks to the left do not fit easily into the the chart above.

Granular Metamorphic Identification Key



1. May be weakly foliated.
2. Greenstone is usually well foliated, but massive varieties exist.

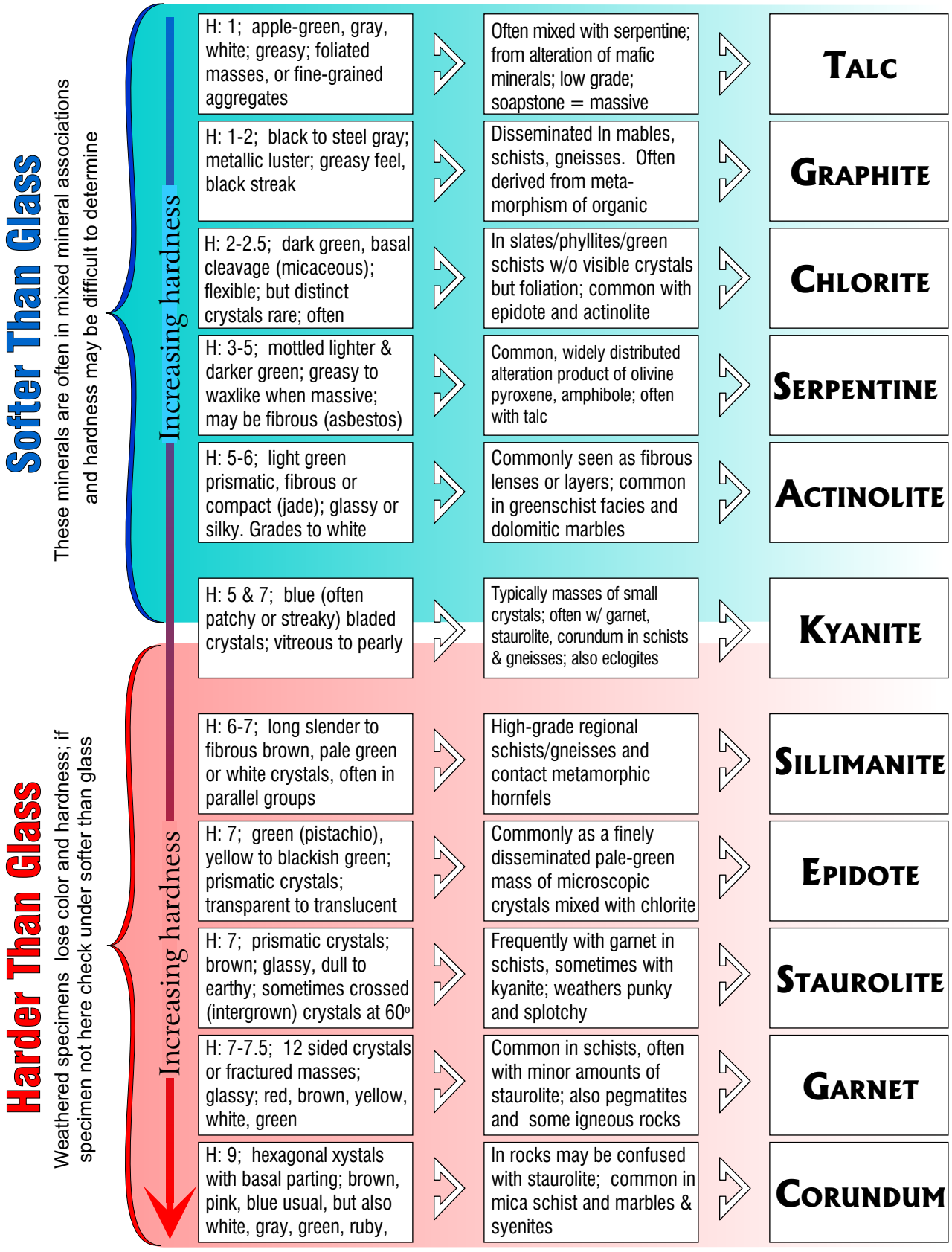
Foliated Metamorphic Identification Key



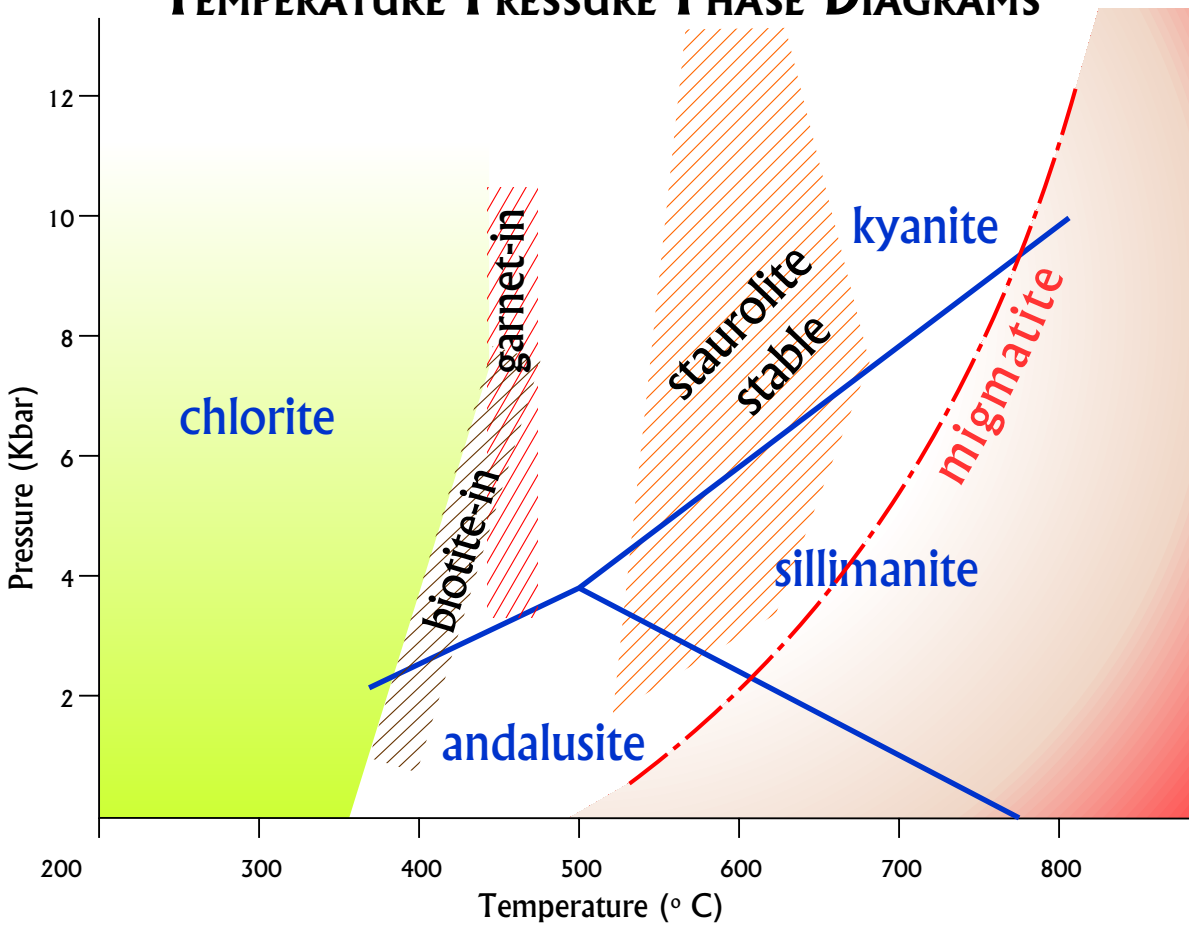
L. S. Fichter, 2007

1. (Shale), slate, and phyllite completely intergrade with each other. Distinctions may be difficult. Ask for help.
2. Under fluorescent light bluish hues may not be easy to detect. On the outcrop in full daylight rock is usually a distinctly blue color.
3. Blue schist is also called glaucophane schist.
4. Greenschist may superficially look like slate/phyllite, but has moderately developed schistosity.
5. Schistosity = coarse-grained foliation with mineral all mixed together in a distinct layering.
6. Rock name may be modified as garnet schist, or garnet-kyanite schist, etc. depending on the accessory minerals present.
7. Amphibolite may be granular in appearance.
8. The term granulite has two different meanings and referes to two different rocks. Felsic granulite comes from high grade metamorphism of a continental basement rock while mafic granulite from a mafic parent. These rocks look nothing alike.

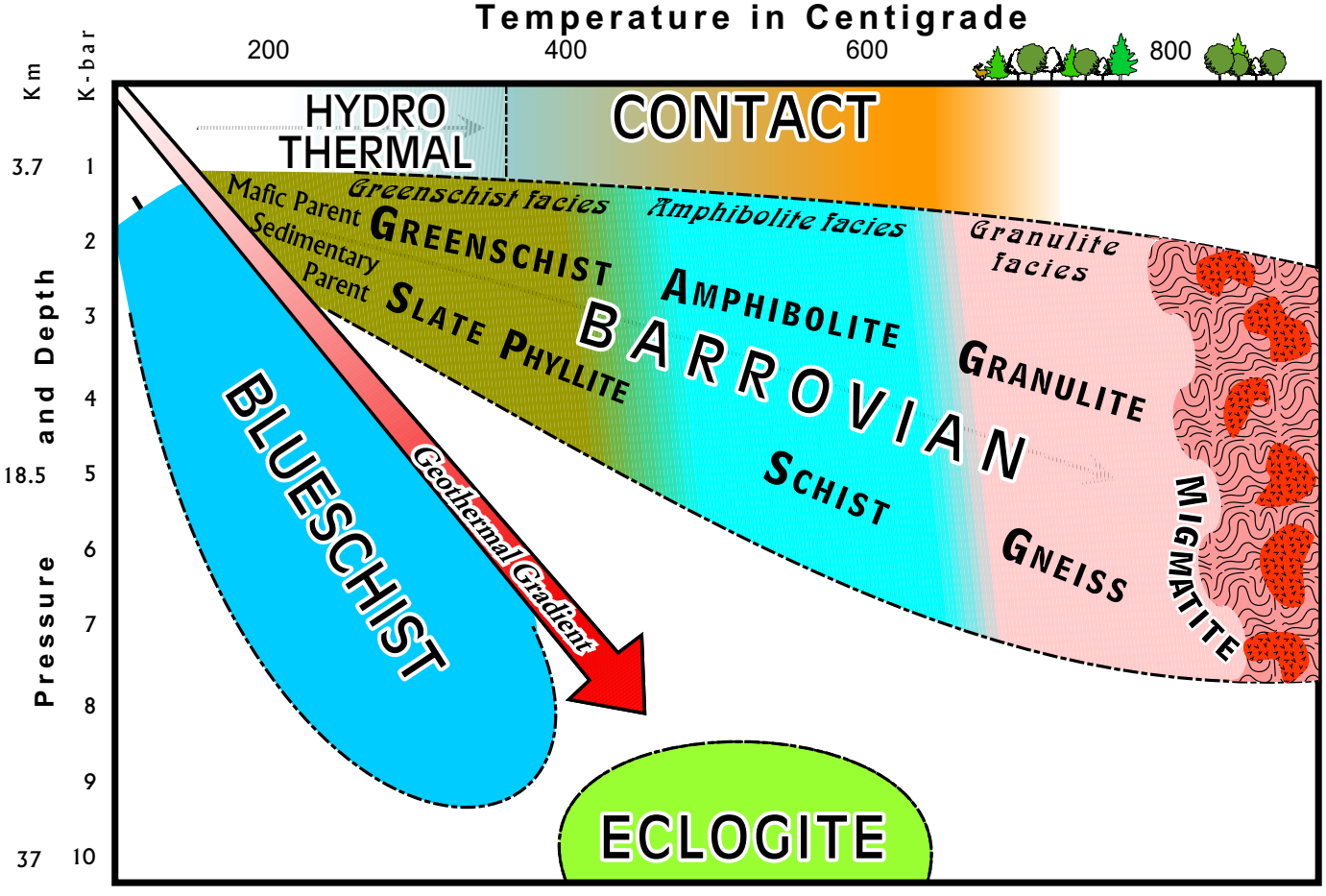
Metamorphic Mineral Identification Key



Temperature Pressure Phase Diagrams



Metamorphic Zones and Facies



Keys to the Identification of Sedimentary Rocks

Basic Key to All Sedimentary Rocks

DO NOT React With Acid

- Grains visible or rock feels gritty
  - **Grains > 2mm** Gravel
    - Angular Gravel Grains → **Breccia**
    - Rounded Gravel Grains → **Conglom-erate**
  - **Grains < 2mm but still visible**
    - Grains distinct & visible even under a microscope → **Sand stone**
- No grains , may feel gritty or be glassy
  - Feels gritty but can't see particles even with microscope; scratches fingernail readily → **Silt stone**
  - Conchoidal fracture glassy; dull luster; many colors → **Chert**
  - Feels smooth; does not scratch fingernail; often layered → **Shale**
- Black, light weight smudgy or shiney → **Coal**
- White, pink, clear crystalline, softer than fingernail
  - Salty taste; three perfect right angle cleavages; clear, gray, → **Rock Salt (halite)**
  - Softer than finger nail; pink or white; fiberous thick plates, or dense → **Gypsum**

Use Key on Right

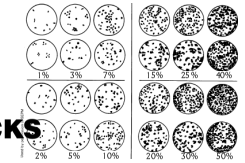
Scratch Glass

Softer Than Glass

React With Dilute HCl

- Reacts with dilute hydrochloric acid (HCl)
  - Abundant fossils present, whole or broken
    - Fine grained martix (micrite) with many fossils or fossil fragments → **Fossil Limestone**
    - Porous, light weight; broken shell fragments; tan to whitish → **Coquina**
  - Miniature spheres about 1mm in diameter, like tiny pearls; white, gray, blue-gray common → **Oolitic Limestone**
  - White, powdery feels gritty; reacts vigorously with acid → **Chalk Limestone**
  - Fine grained; smooth, dense; often conchoidal fracture, or irregular blocky → **Micrite Limestone**
- **Rock must be powdered to react with acid (HCl)** → Must be powdered to react with acid; dull luster; gray, tan white, plus many other colors → **Dolomite**

Key to Coarse Grained Clastic Rocks



Quartz Dominates

At least 90 % quartz

- **Gravel particles > 2mm**
  - YES
    - Rounded fragments — Quartz gravel in quartz sand matrix → **Sandy Quartz Conglomerate**
    - Rounded fragments — Quartz gravel in mostly silt/clay matrix; may be sandy → **Wacke Quartz Conglomerate**
  - NO → **Sand Sized Particles < 2mm**
    - White or very pale — 90 - 100% quartz sand (If lithics or feldspar > 10 % then search elsewhere) → **Quartz Sandstone**
    - Quartz often masked — **Hand Specimen:** wide variety of matrix colors. **Microscope**: Wet rock to see quartz > 90% → **Quartz Wacke**

White to very pale colors

Feldspar > 10 %

Pink (Orthoclase) or White to Gray (Plagioclase)

- **Gravel particles > 2mm**
  - YES
    - Angular fragments — Check for cleavages; may be granite or gneiss lumps. Quartz and mica typically common. → **Arkose Breccia**
    - Rounded fragments — Check for cleavages; may be granite or gneiss lumps. Quartz and mica typically common. → **Arkose Conglomerate**
  - NO → **Sand Sized Particles < 2mm**
    - Feldspars > 25% — **Microscope**: Wet the rock; find cleavage to verify felspar; verify % of feldspar; quartz/mica common. → **Arkose Sandstone**
    - Feldspars 10 - 25% — **Microscope**: Wet the rock; find cleavage to verify felspar; verify % of feldspar; quartz/mica common. → **Sub-Arkose Sandstone**

If lots of matrix masking sand → **WACKE** → *name it a wacke*

Pink to Gray Colors

Both feldspar and lithics > 10% — Rocks with mixtures of both feldspars and lithics, often mixed with quartz, are named → **Names like Lithic-Arkosic or Arkosic-Lithic**

Lithics > 10 %

Look for dark particles that are not quartz or feldspar; finer matrix very common

- **Gravel particles > 2mm**
  - YES
    - Angular fragments — **Hand Specimen:** Gray, green, dark colors typical, but lithic colors dominate. may be a matrix of finer material. → **Lithic Breccia**
    - Rounded fragments — **Hand Specimen:** Gray, green, dark colors typical. **Microscope**: on finer gravels wet the rock to expose lithic compositions; matrix common. → **Lithic Conglomerate**
  - NO → **Sand Sized Particles < 2mm**
    - Lithics >25%; rock often — **Hand Specimen:** Gray, green, dark colors typical. **Microscope**: Wet the rock; check lithic %; lithics scattered in quartz or buried in finer matrix. → **Lithic Sandstone**
    - Lithics 10 - 25 %; lots of — **Hand Specimen:** Gray, green, dark colors typical. **Microscope**: Wet the rock; check lithic %; lithics scattered in quartz or buried in finer matrix. → **Sub-Lithic Sandstone**

If lots of matrix masking sand → **WACKE** → *name it a wacke*

Typically Darker Colors

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