Structure & Texture of Ores

Akhil Kumar Dwivedi

Assistant Professor

MLSU

Importance of Texture

- Textural identification and interpretation for ore deposits and associated gangue minerals are tools necessary for understanding the processes involved in the genesis of these deposits, which in turn is very important for prospecting for other similar economic bodies.

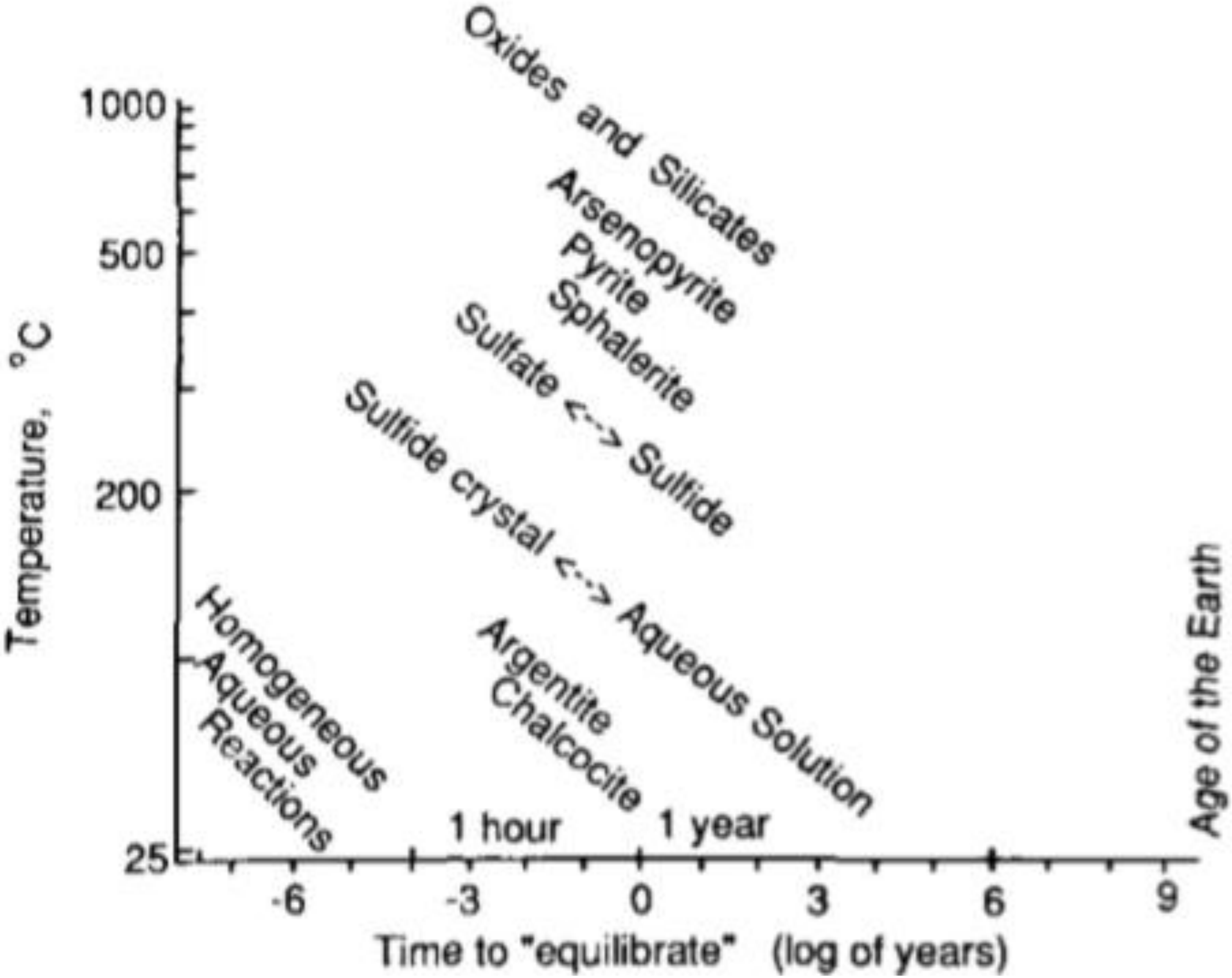
Specifically, textural studies are useful for:

- Understanding the timing of formation of the ore minerals relative to the host rocks and their structures
- Determining the sequence of events or depositional history within an ore body
- Determining the rates of cooling or of ore mineral accumulation
- Identifying the equilibrium mineral assemblages, which in turn are necessary for understanding phase relations and the correct interpretation of geothermometric results.

Structure and Texture of Ores

- Ore and gangue minerals react internally, or with their environment, at widely ranging rates, ranging from the almost inert pyrite, arsenopyrite, well-crystallised quartz, and tourmaline to the notoriously fickle copper/iron and copper/silver sulfides.
- Arrested or incomplete reactions may be identifed by textural criteria and, when appropriately quantified, can provide guides to the duration of geological processes.
- ‘Texture’ to refer to the spatial relations within and among minerals and fluids, regardless of scale or origin. Textures, (defined as the spatial relations within and among minerals and fluids, regardless of scale or origin)
- It provide a means to sort out and identify successive states.
- The interpretation of textures is one of the most difficult yet important aspects of the study of rocks and ores
- It is one of the few areas of scientific endeavor that are more subject to misinterpretation.

Structure and Texture of Ores



Structure and Texture of Ores

- Minerals differ widely in both their initial morphologies and their abilities to retain the record of their heritages.
- All reactions of concern to us are accelerated by elevated temperature.
- Most homogeneous reactions in aqueous media reach completion in milliseconds, but a few, such as the reduction of sulfate or the oxidation of dissolved methane, are so sluggish that their disequilibria can be significant, even in geologic time.
- Reactions involving the precipitation and dis- solution of minerals are much slower than most homogeneous aqueous reactions. Carefully measured rates are available only for silica (among others, Rimstidt and Barnes, 1980)
- Solid-state reactions among the silver- and copper-rich sulfides are also quite rapid, so much so that these fickle minerals probably preserve a record only of very recent events.

- Textures of hydrothermal minerals indicative of relative levels of saturation

Classification of textures

- In all instances the system will contain components derived from precipitation within the fluid filled void spaces and components derived by reaction with the wall rocks (Alteration).
- Infilling
- Alteration
- Overprinting

- Infilling textures are of two types
  - Incomplete Infill
  - Complete Infill

Classification of textures

- Incomplete Infill

  Remaining Void Space: In most cases the precipitating minerals completely fill the space traversed by the ore fluids.

  - However there are numerous circumstances where the process is incomplete and the presence of any form of cavity within a mineralized system would immediately come under suspicion as marking a region of infill.
  - Cavity recognition is simple enough at the macroscale but frequently overlooked at the hand lens scale.

  Crystals projecting into a cavity: Many cases examples of remaining void space also contain well-formed crystals projecting into the cavity. Quartz crystals are particularly common, as are typically late phase low temperature minerals such as calcite, siderite, and fluorite. Pyrite and marcasite are well-represented from

  the sulphide group.

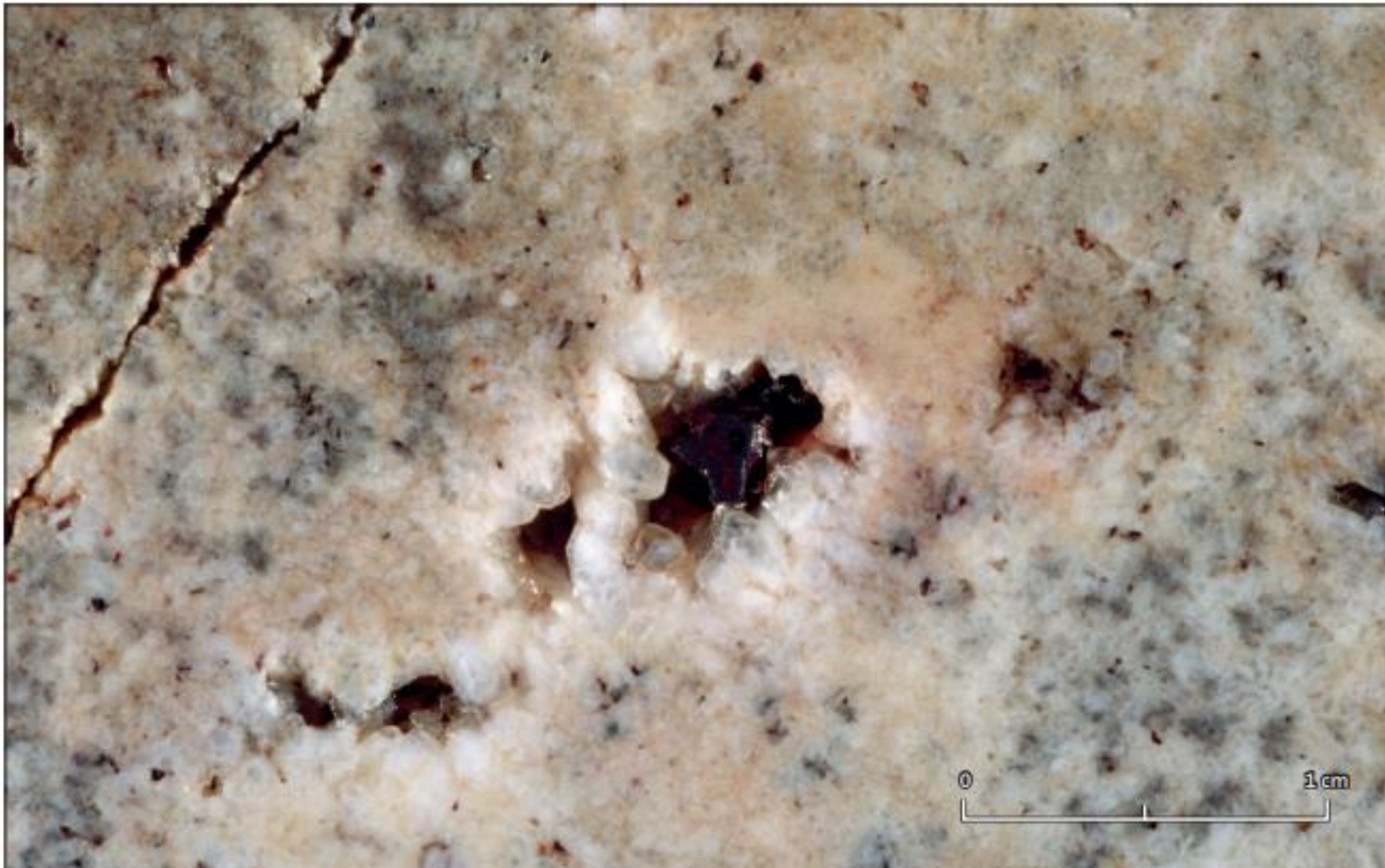


PLATE 1 The remaining void space and crystals projecting into a cavity criteria.
Specimen from Mt Gibson (tin, topaz) region, near Mt Gamet, Queensland, Australia.

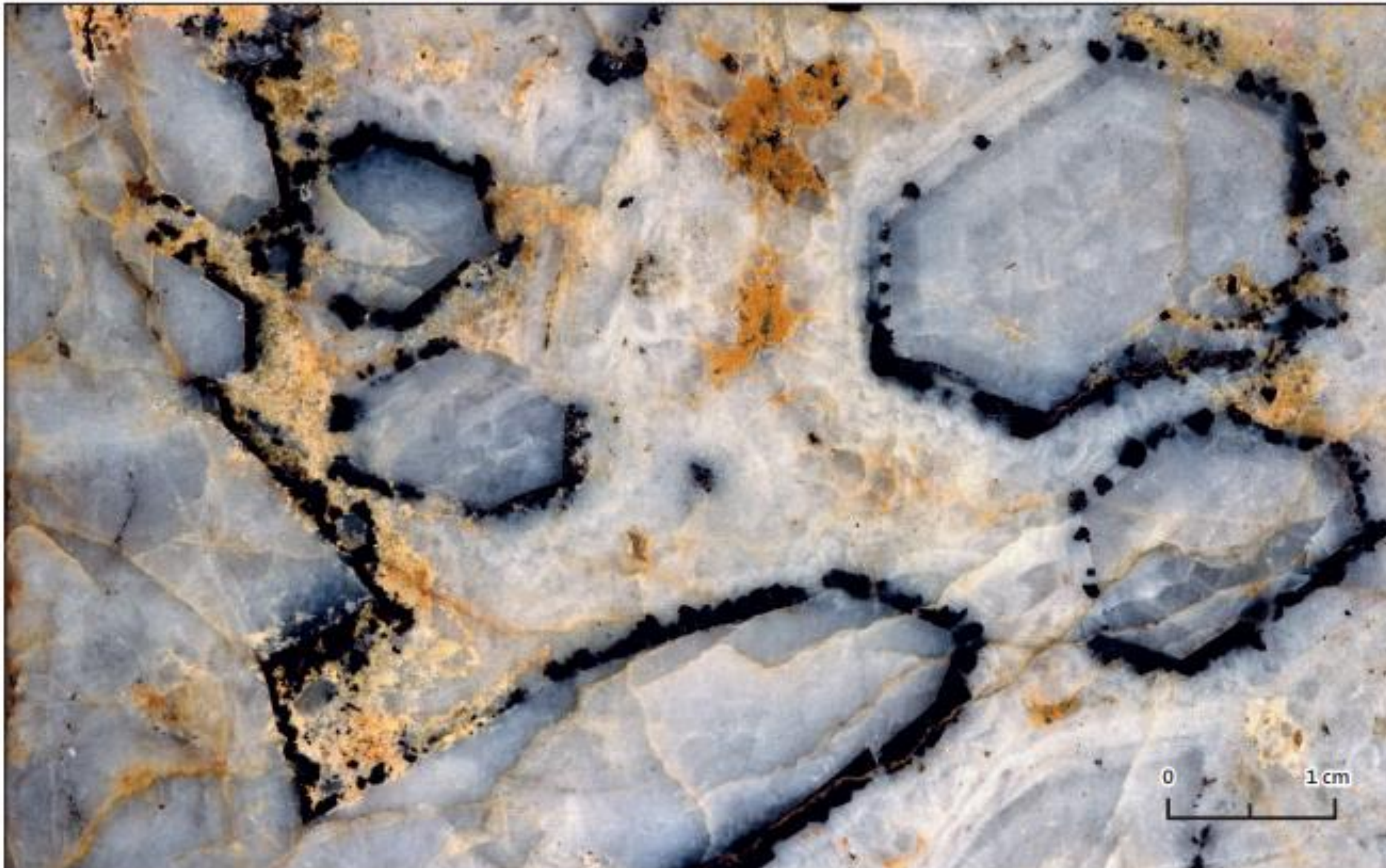
Classification of textures

- Complete Infill

  The absence of voids or free crystals makes the task of recognizing infill a little more difficult. However in the majority of cases the following criteria will prove of value.

  - Euhedral or Partially Euhedral Crystal Outlines: Since the fluid filled void offers an excellent opportunity for unhindered crystal growth it is very common for cavity infill minerals to achieve good crystal forms.
  - Zoned Crystal: Finely zoned crystals are particularly di!cult to develop via alteration/replacement. Hence crystals or hints of crystals with well developed growth zoning are particularly useful indicators of infill.

PLATE 2 The euhedral mineral criterion
Specimen from Mt Misery – Mt Tin – Morning Cloud deposit, Mowbray Creek mineralisation centre, near Herberton tinfield, Queensland, Australia.



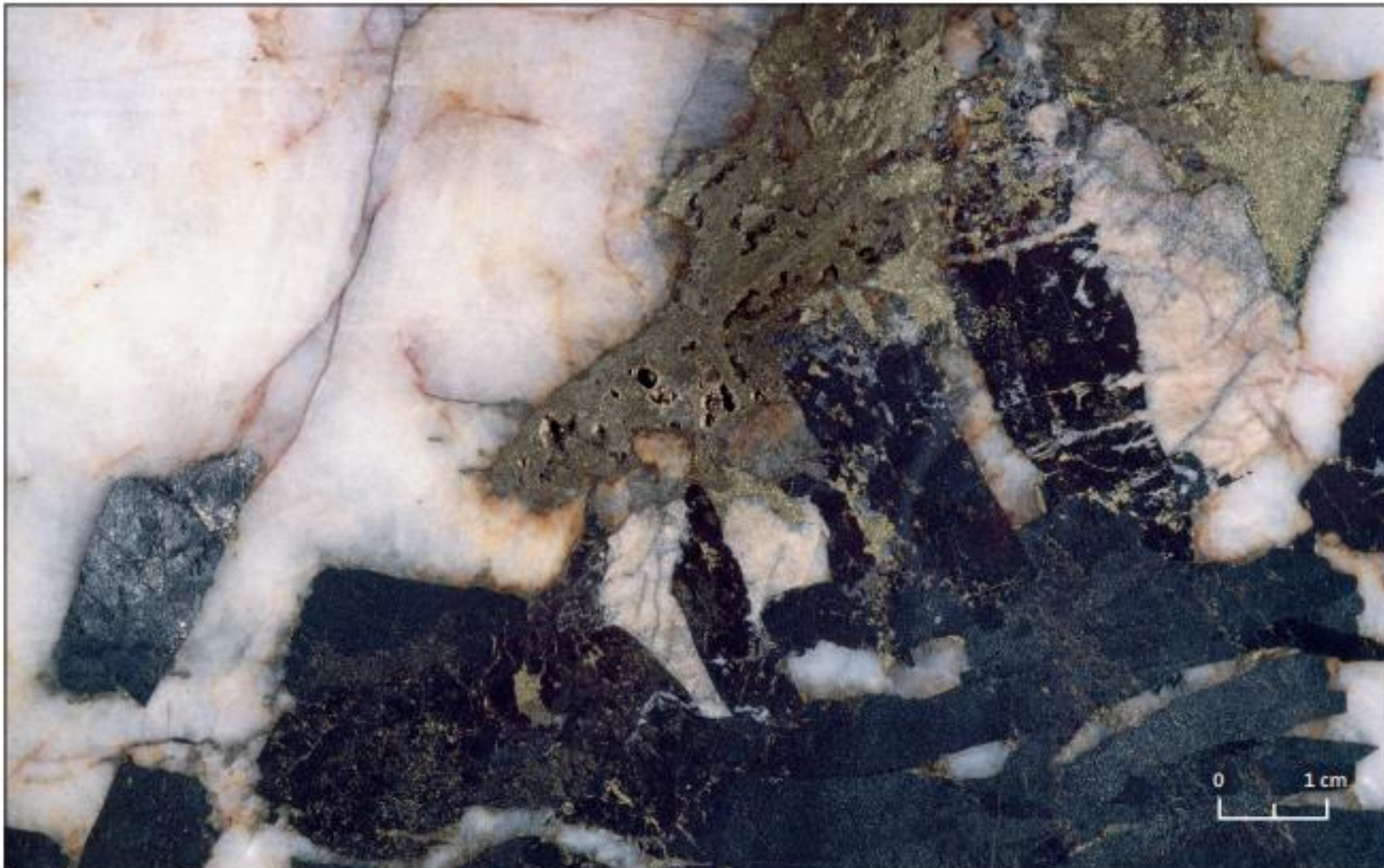


PLATE 3 The euhedral mineral criterion.
The location of the specimen is uncertain but probably from Mt Carbine tungsten mine, Mt Carbine, Queensland, Australia. The plate is presented to show euhedral crystals of wolframite within a quartz vein.

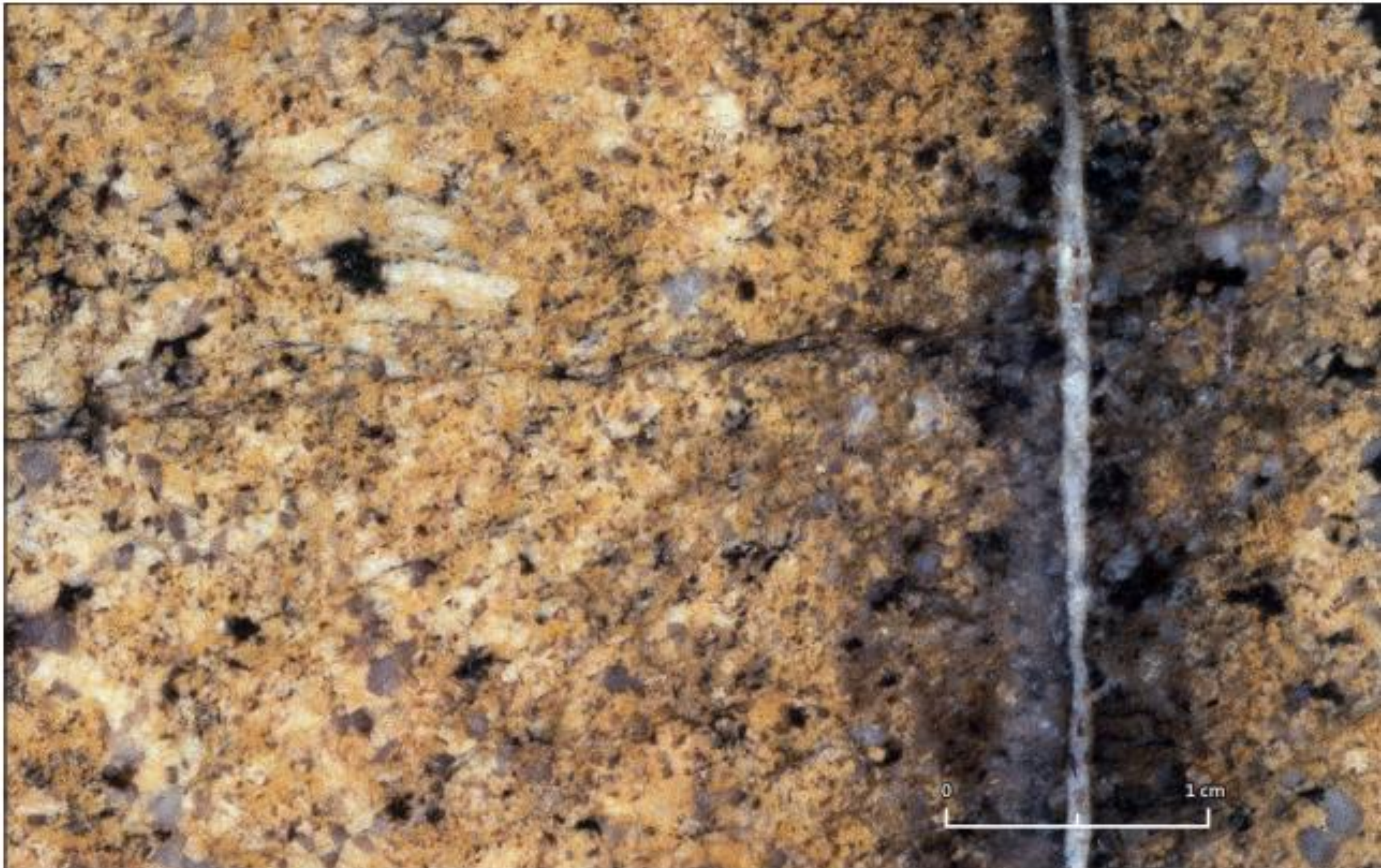


PLATE 1 **SERICITIC ALTERATION**
Quartz vein with dark (sericite-dominated) alteration halo in fine granite host.
New St. Patrick copper mine, Copper Firing Line, Herberton, Queensland, Australia.

PLATE 2A

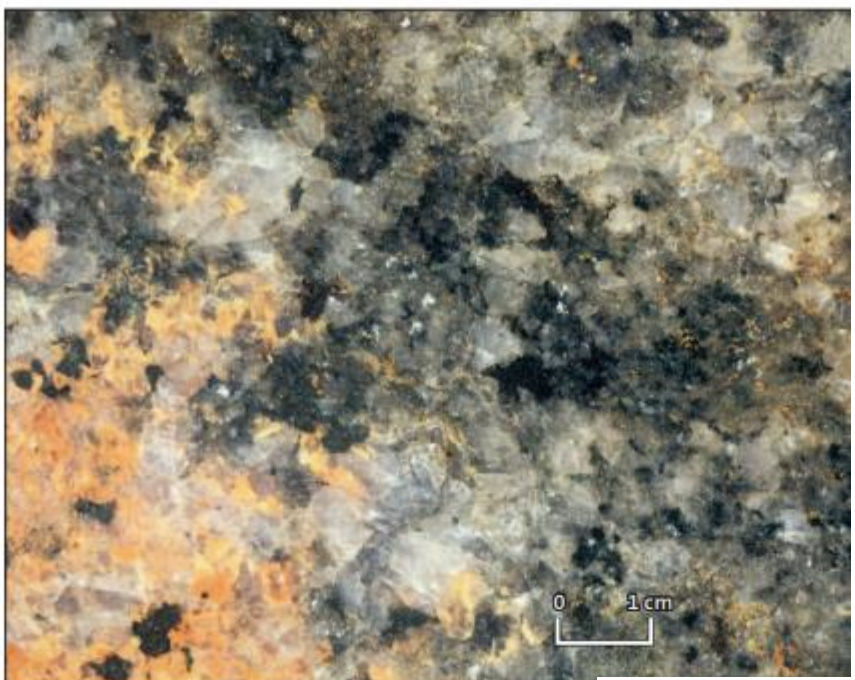


PLATE 2B

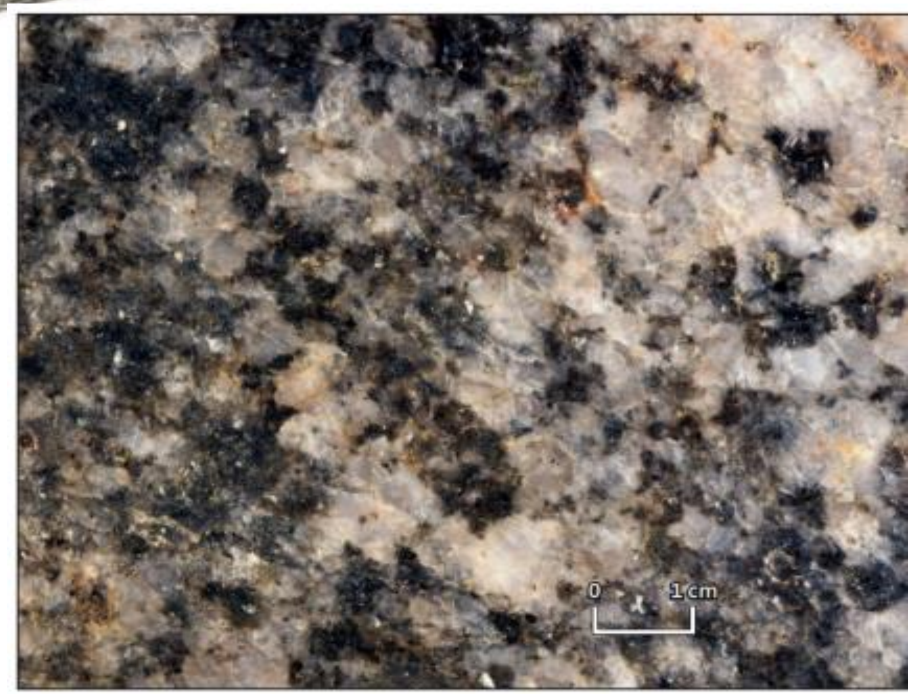


PLATE 2C

PLATES 2 A B C GREISEN (SERICITE-SILICA ALTERATION)
Ollera Creek tungsten mine, Paluma District, Queensland, Australia.
Specimens provided by G. W. Clarke.

PLATE 11 **BIOTITE ALTERATION** , Potassic alteration,
Main Pipe Breccia, Mt Leyshon gold mine, Queensland, Australia.

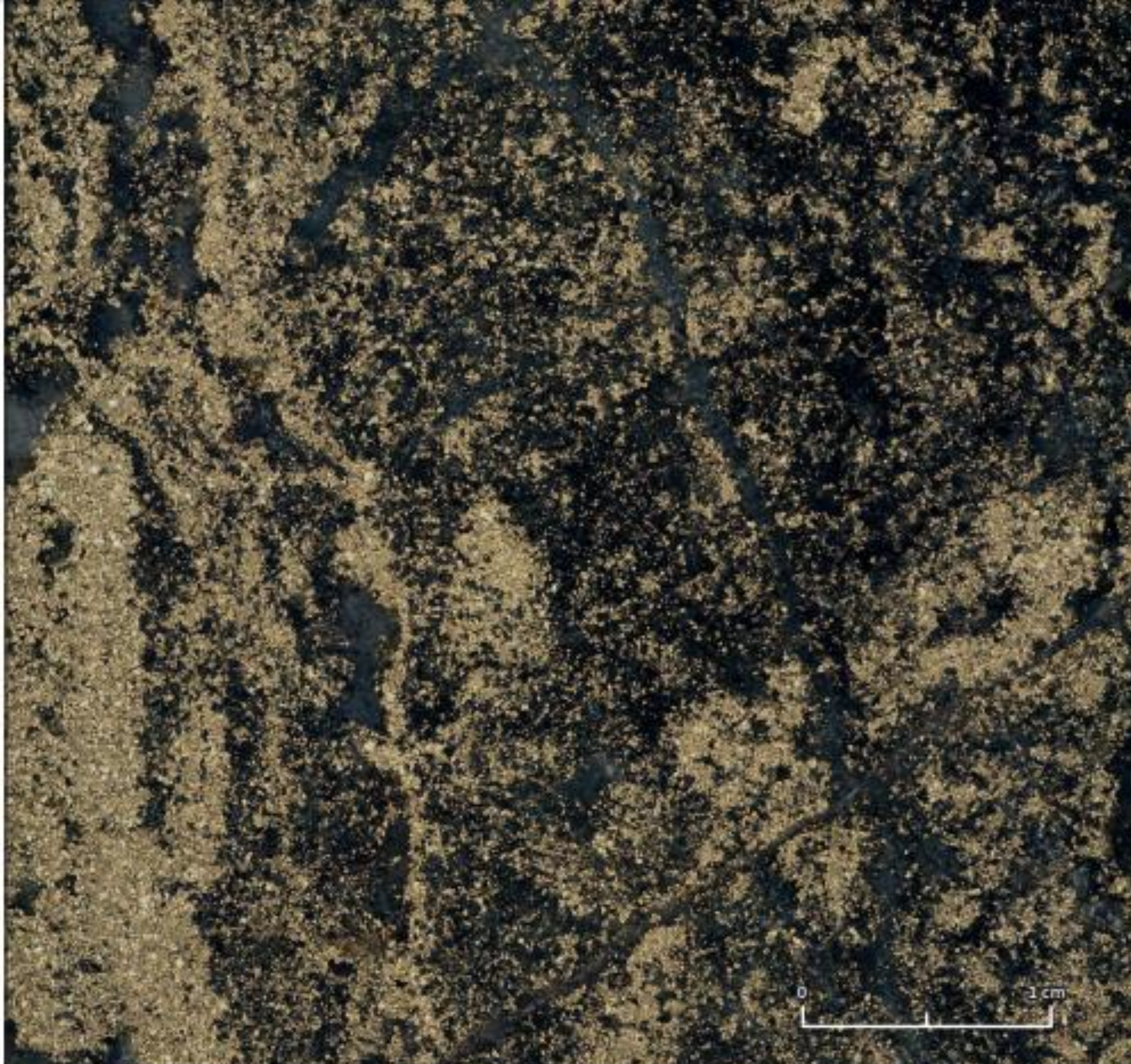


PLATE 19 **PYRITE ALTERATION (sulphide alteration-replacement)**
Mt Morgan gold mine (ore), Queensland, Australia.

- Overprinting

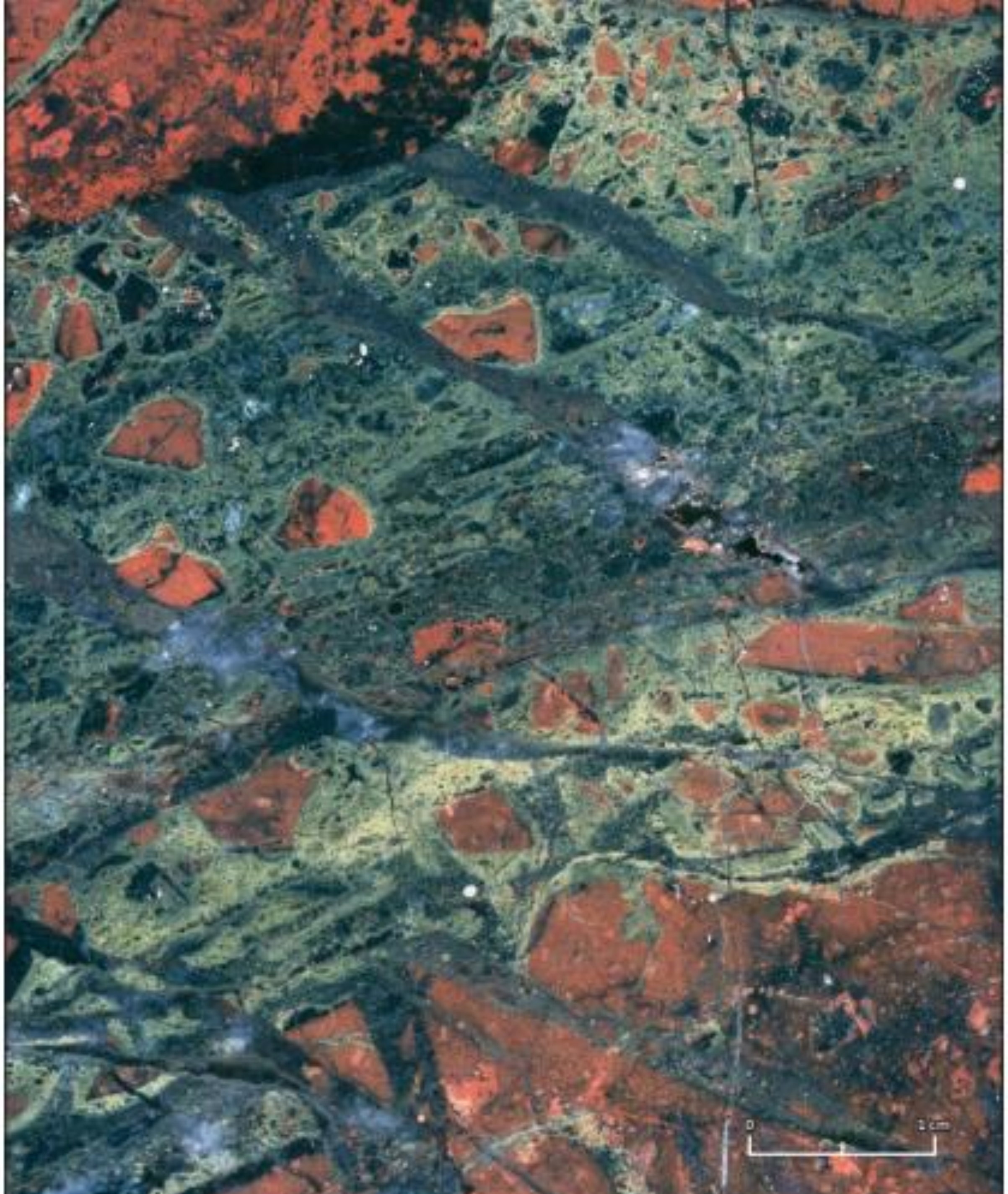
First Order

- Mineral Superimposition: Hydrothermal fluids traversing “open” channel ways may precipitate minerals (infill) and where one mineral can be seen to have nucleated upon another, an obvious timing (overprinting) relationship can be inferred.
- Structural Superimposition: Rock or mineral failure occurring after a period of hydrothermal deposition, will fracture and/or fragment previously formed minerals. This common situation provides a range of new (overprinting) channel ways for Fluid low and deposition. The net result provides the two most common criteria utilised to separate one period of mineral deposition from another:
- (i)Crosscutting vein systems
- (ii)Fragments (breccia) of early mineralisation contained within the new mineralisation


0
1 cm


0
1 cm


0
1 cm


0
1 cm