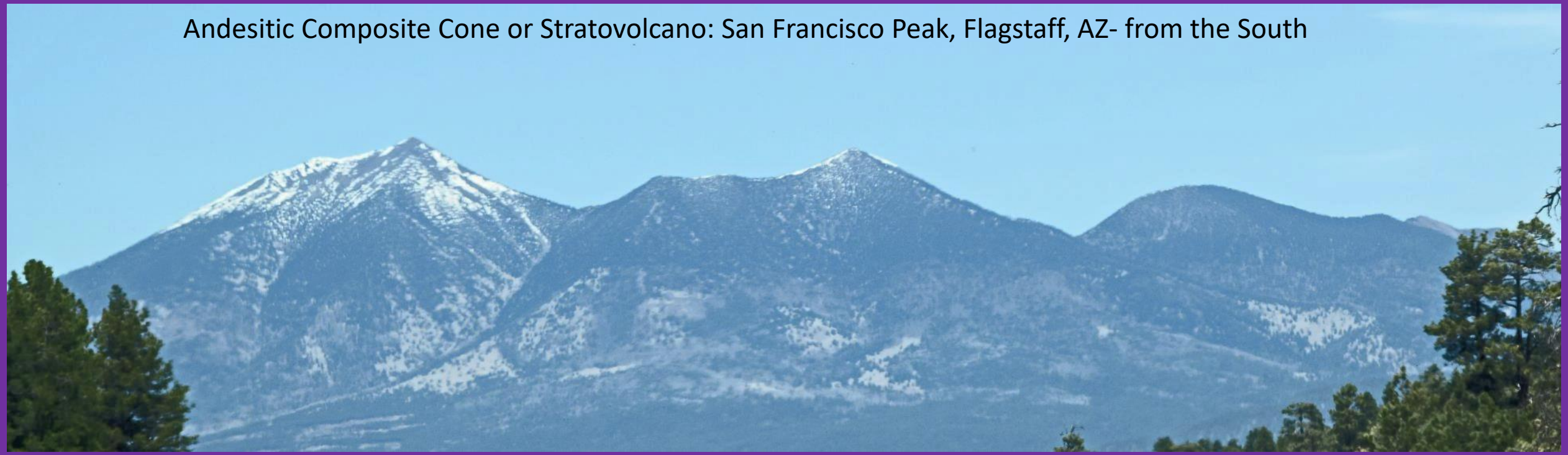
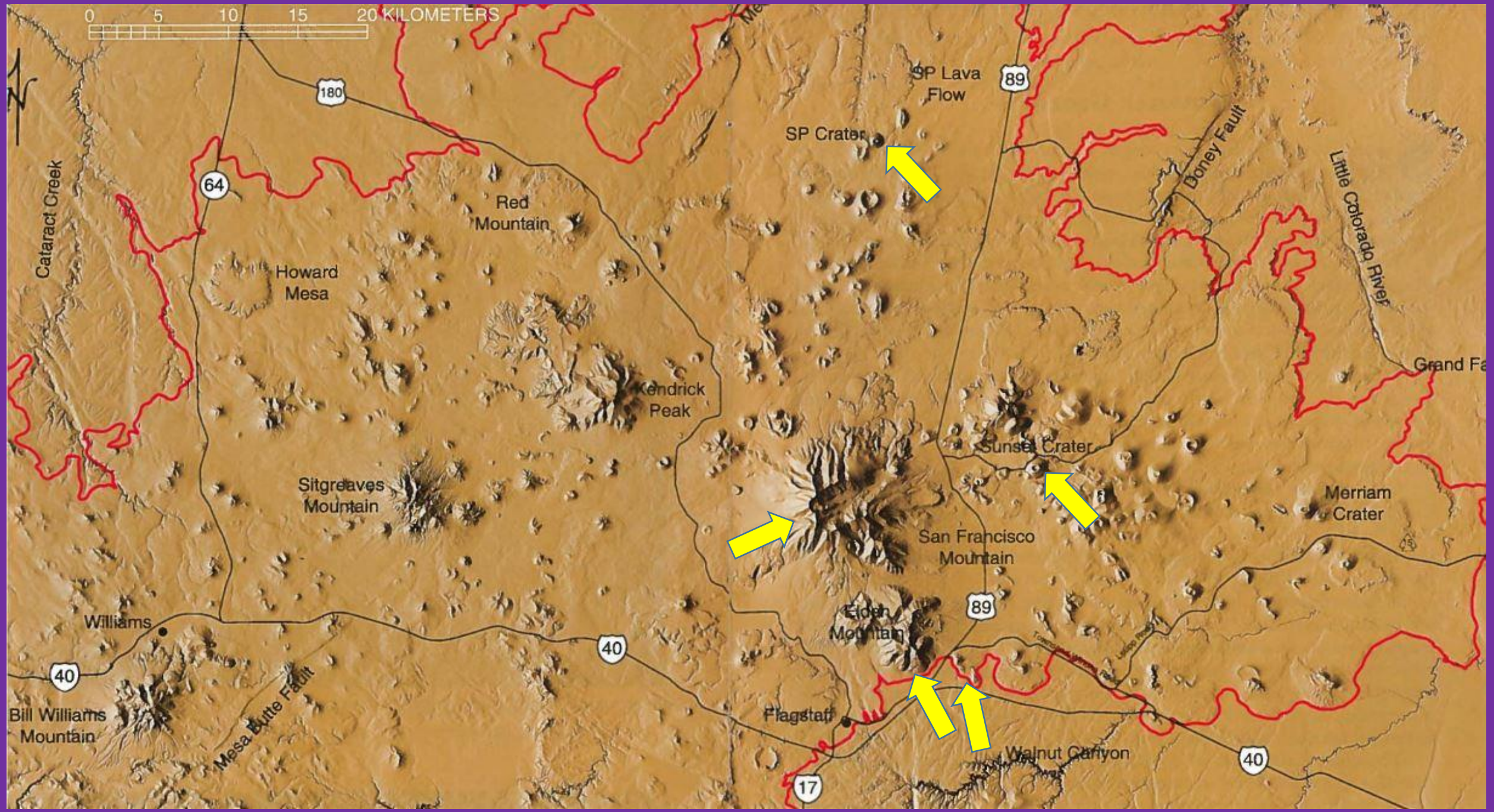
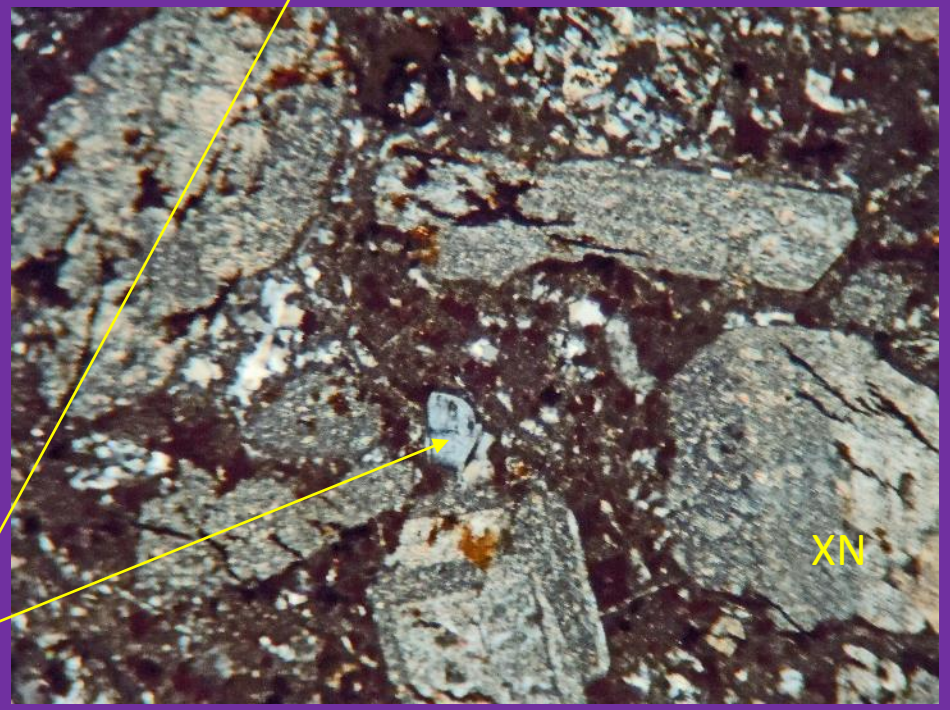
San Francisco Volcanic Field: Sunset Crater, near Flagstaff, AZ

Andesitic Composite Cone or Stratovolcano: San Francisco Peak, Flagstaff, AZ- from the South

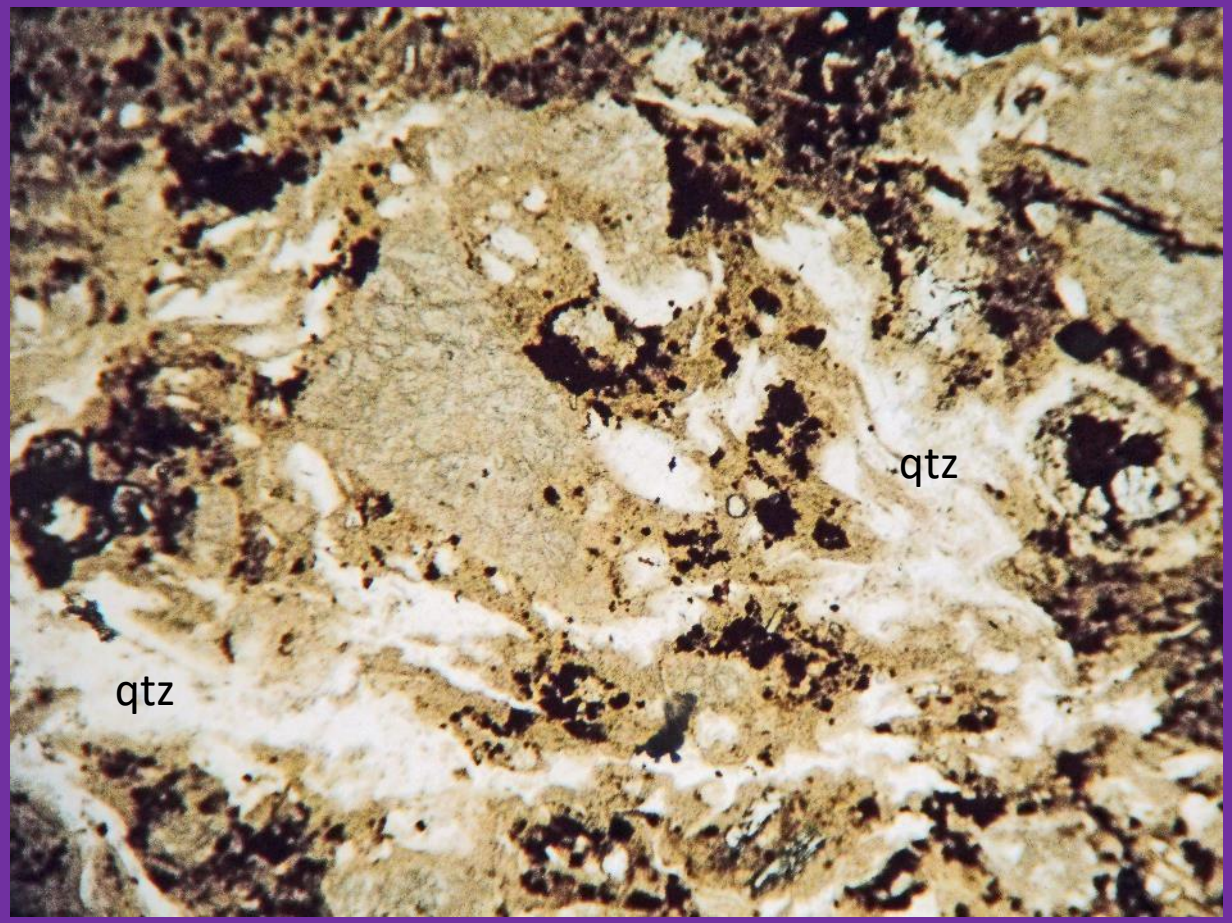


San Francisco Peaks from the East looking into the center

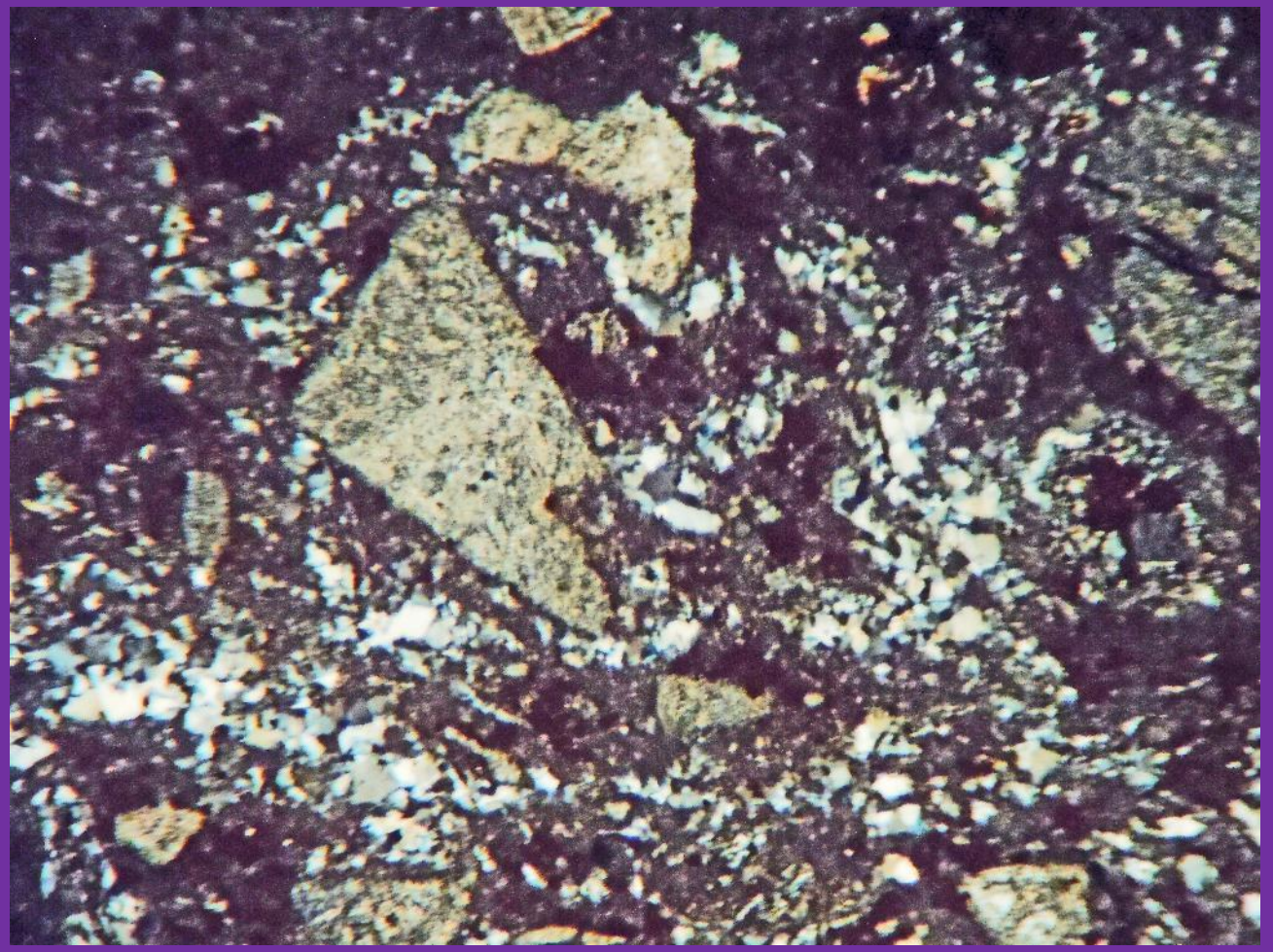

0 5 10 15 20 KILOMETERS
180
64
89
40
17
Cataract Creek
Red Mountain
Howard Mesa
Kendrick Peak
Sitgreaves Mountain
Williams
Bill Williams Mountain
Mesa Butte Fault
SP Lava Flow
SP Crater
Boney Fault
Little Colorado River
Grand Fa
Sunset Crater
Merriam Crater
San Francisco Mountain
Elden Mountain
Flagstaff
Walnut Canyon



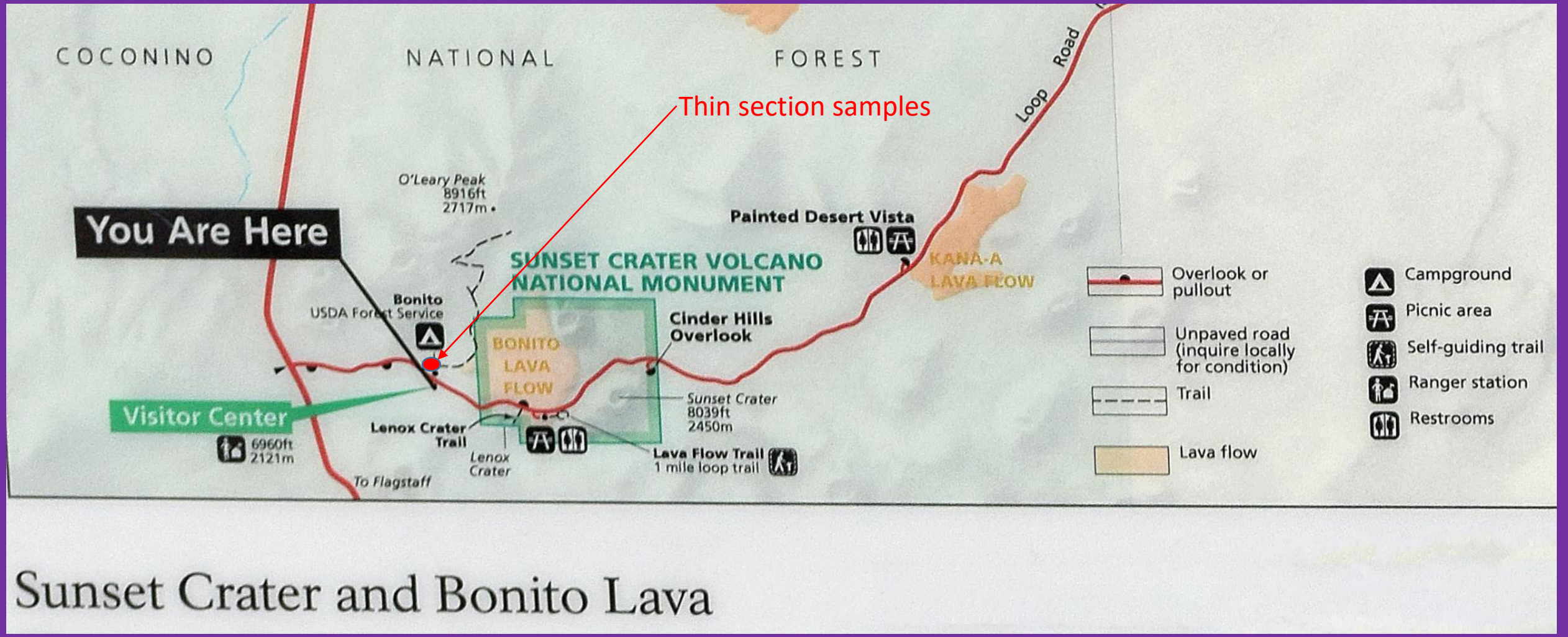
Dacite Dome/Plug of Elden Mt.(Flagstaff) from the SW: sericitized, zoned & twinned feldspar phenocrysts in an altered glassy groundmass w/ a lot of opaque Fe+ oxides



Same: note flow

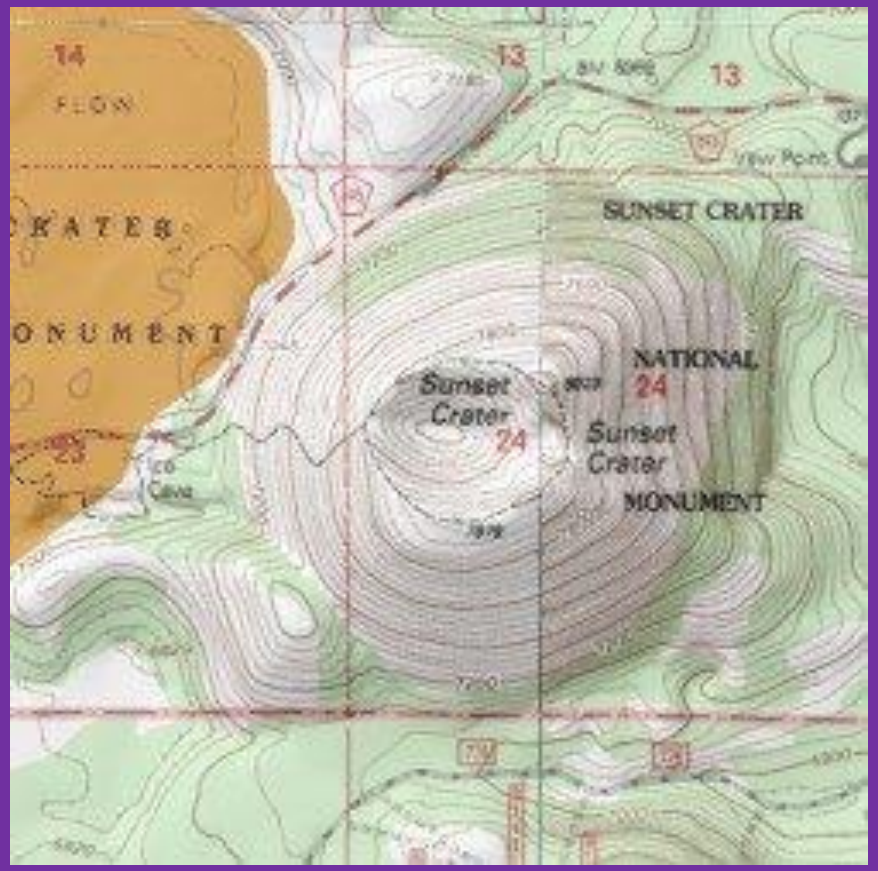


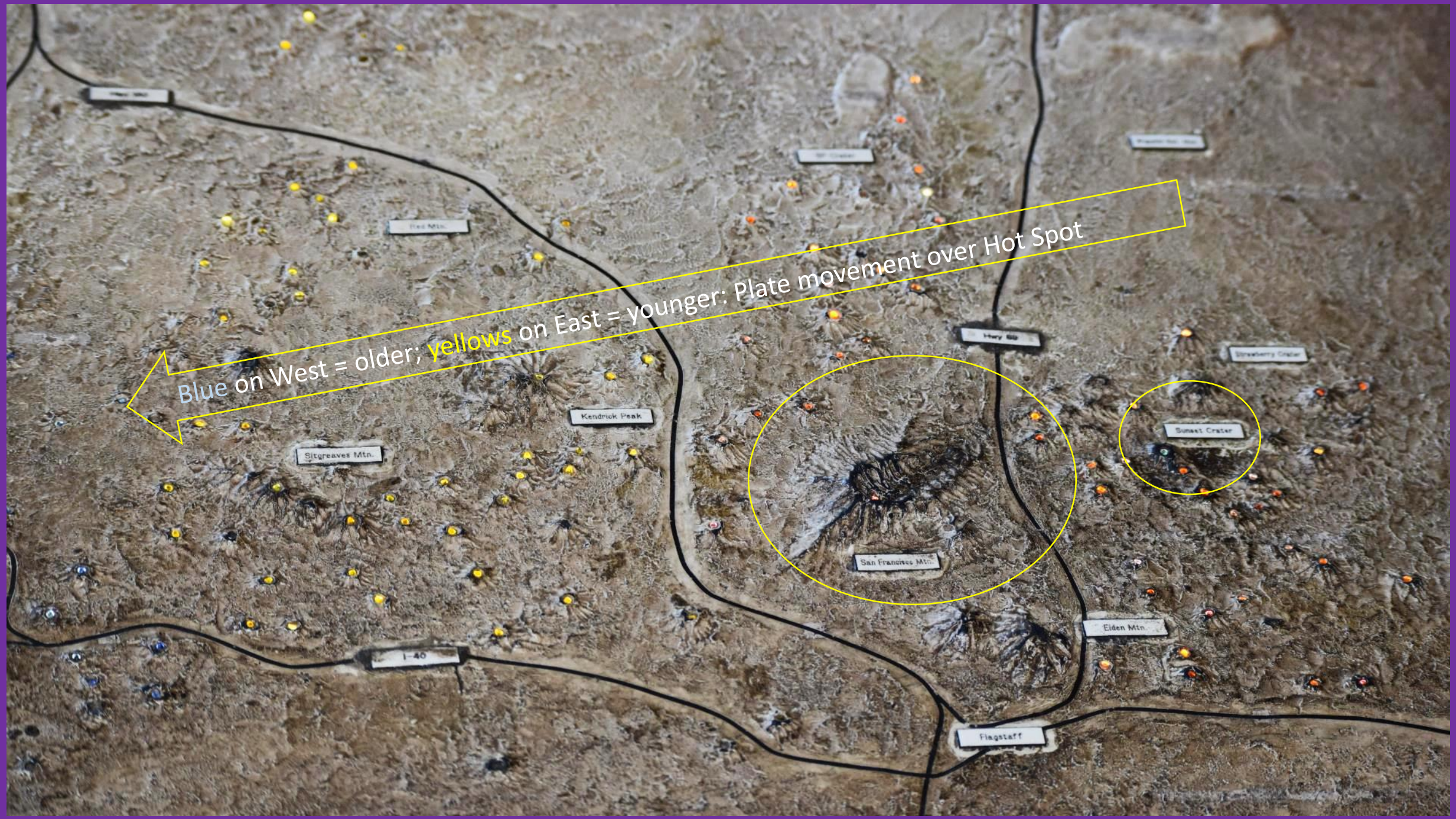
Ponderosa pine
Sunset Crater Volcano 2 Mi
Visitor Center
Wupatki Visitor Center 21 Mi

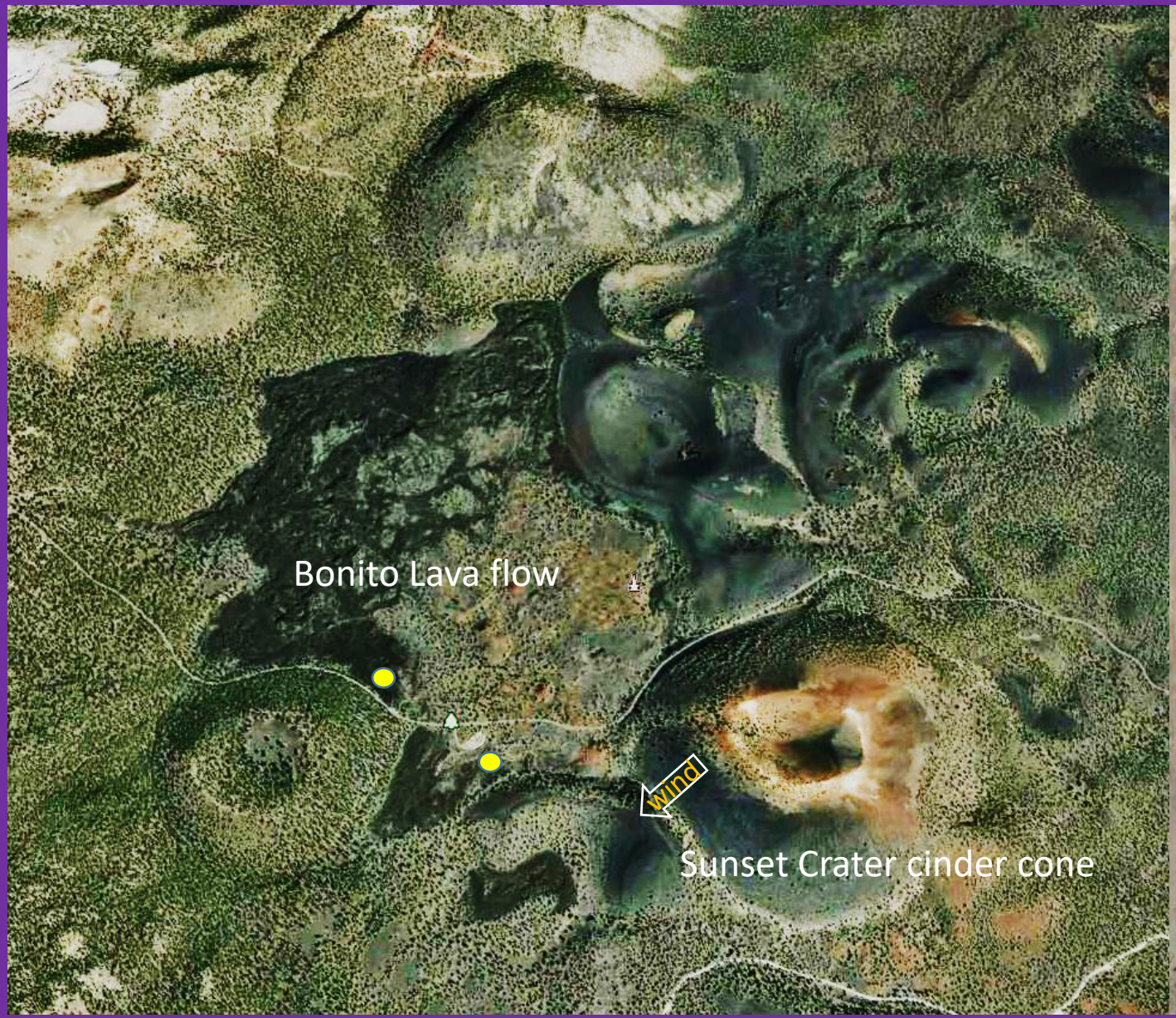


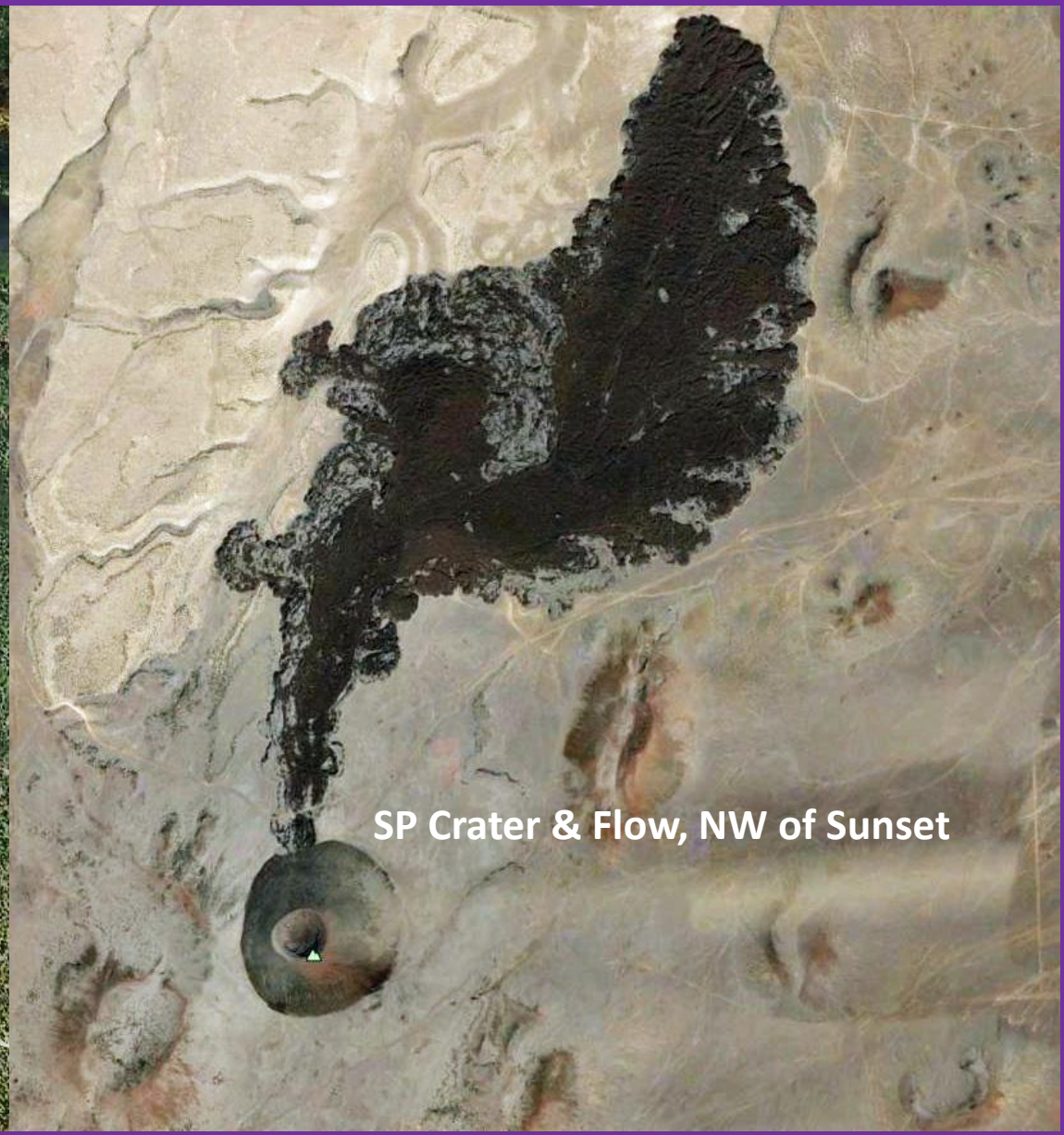
Sunset Crater and Bonito Lava

Basalt: Columnar Jointing , near Flagstaff




Blue on West = older; yellows on East = younger: Plate movement over Hot Spot
Red Mtn.
Kendrick Peak
Sitgreaves Mtn.
Hwy 89
Strawberry Crater
Sunset Crater
San Francisco Mtn.
I-40
Elden Mtn.
Flagstaff


Bonito Lava flow
Wind
Sunset Crater cinder cone


SP Crater & Flow, NW of Sunset

Winter 1064-5 AD: cone starts over 6.2 mile deep fissure; 1180 Bonito Flow starts

BASALT

CINDER CONE

Sunset Crater

Tephra

Crater

34 degree slope

Pile of cinders/Lapilli

Bonito

Lava Flow

Lava Tubes/Tunnels

1064-5 AD

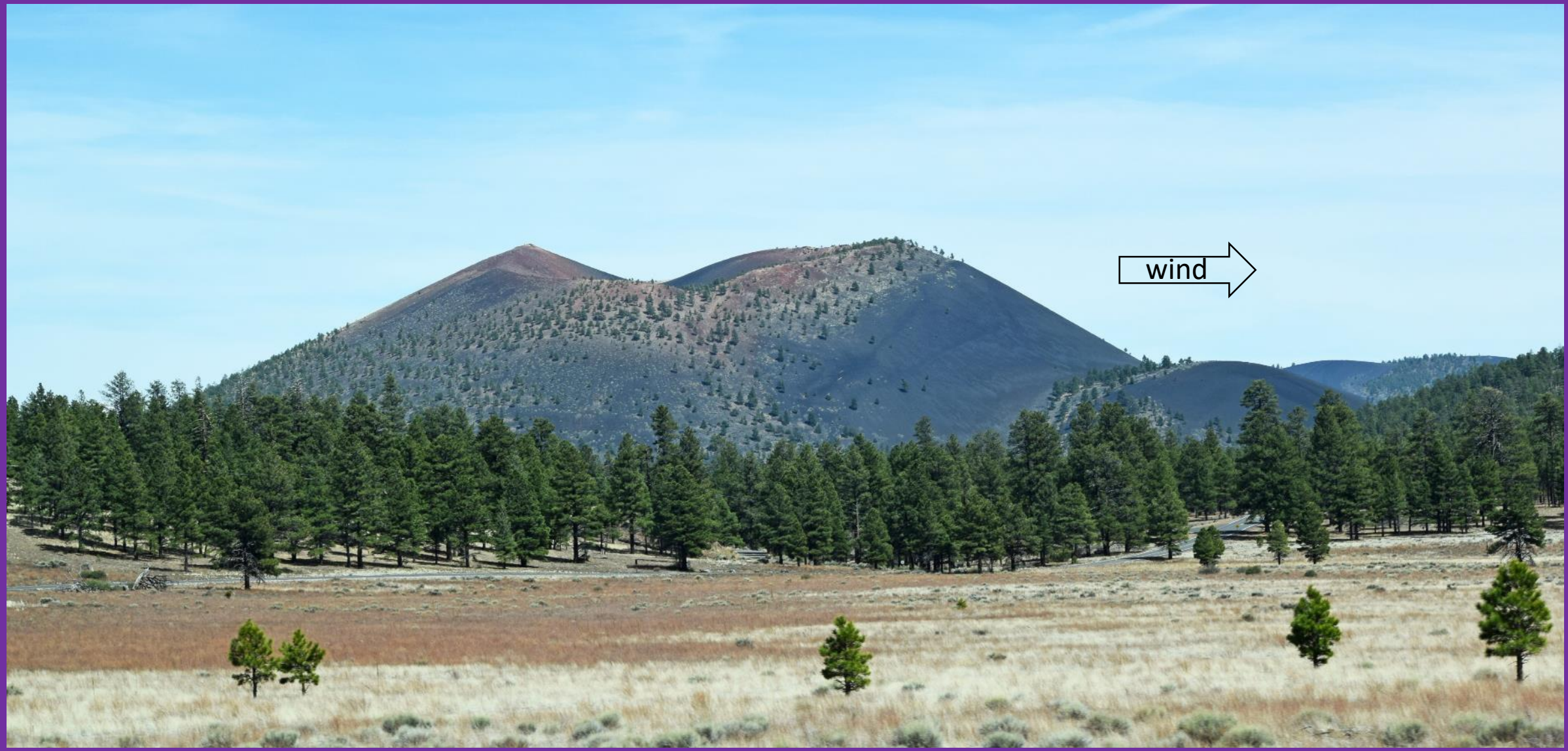
1180 AD

Fissure

Conduit

> 2,000°F; 1,000°C

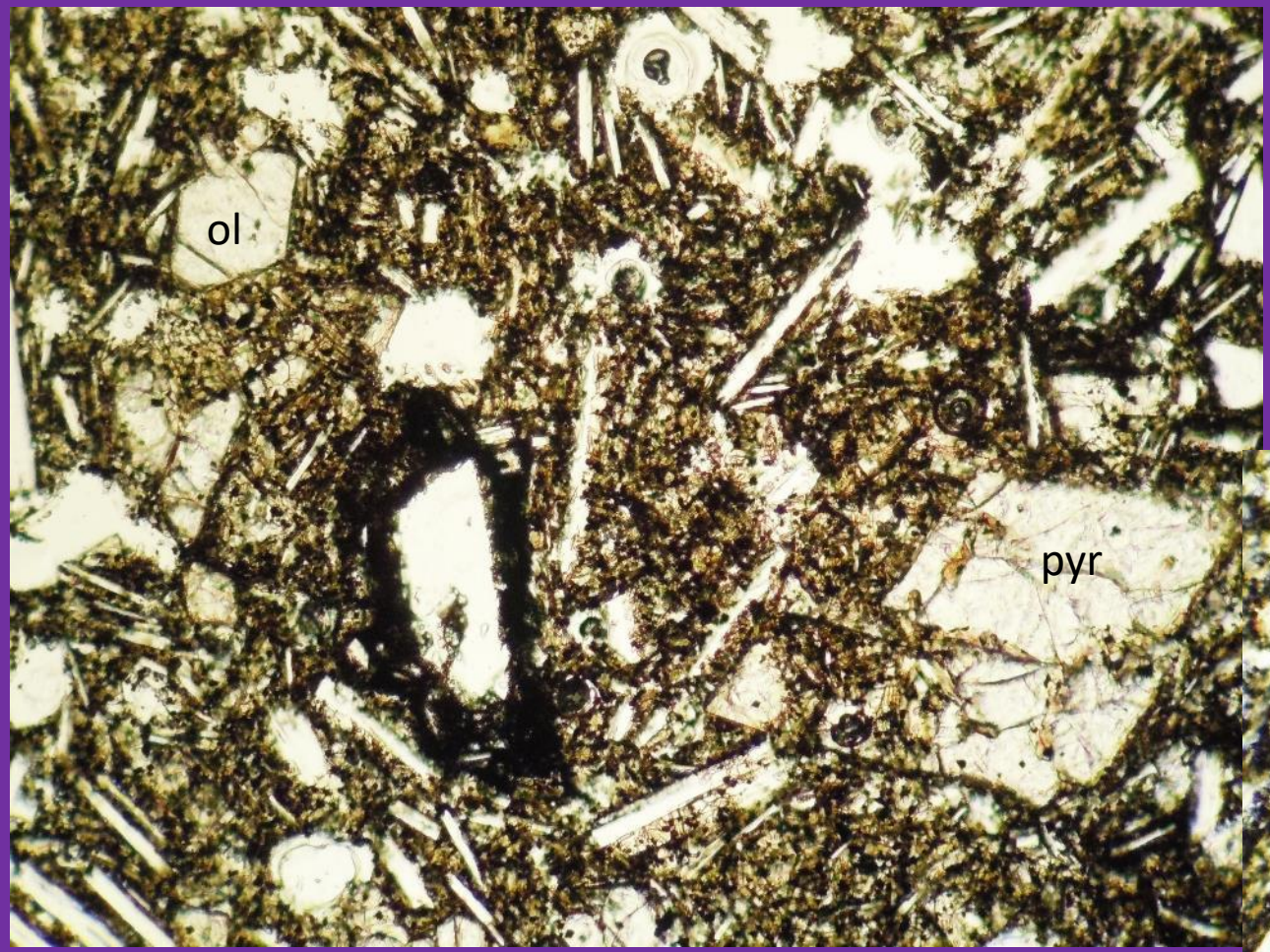
Sunset Crater Cinder Cone: Basalt (Alkali-olivine type) tephra and adjacent Basalt (Bonito) lava flow; eruption between 1064 AD and 1180 AD



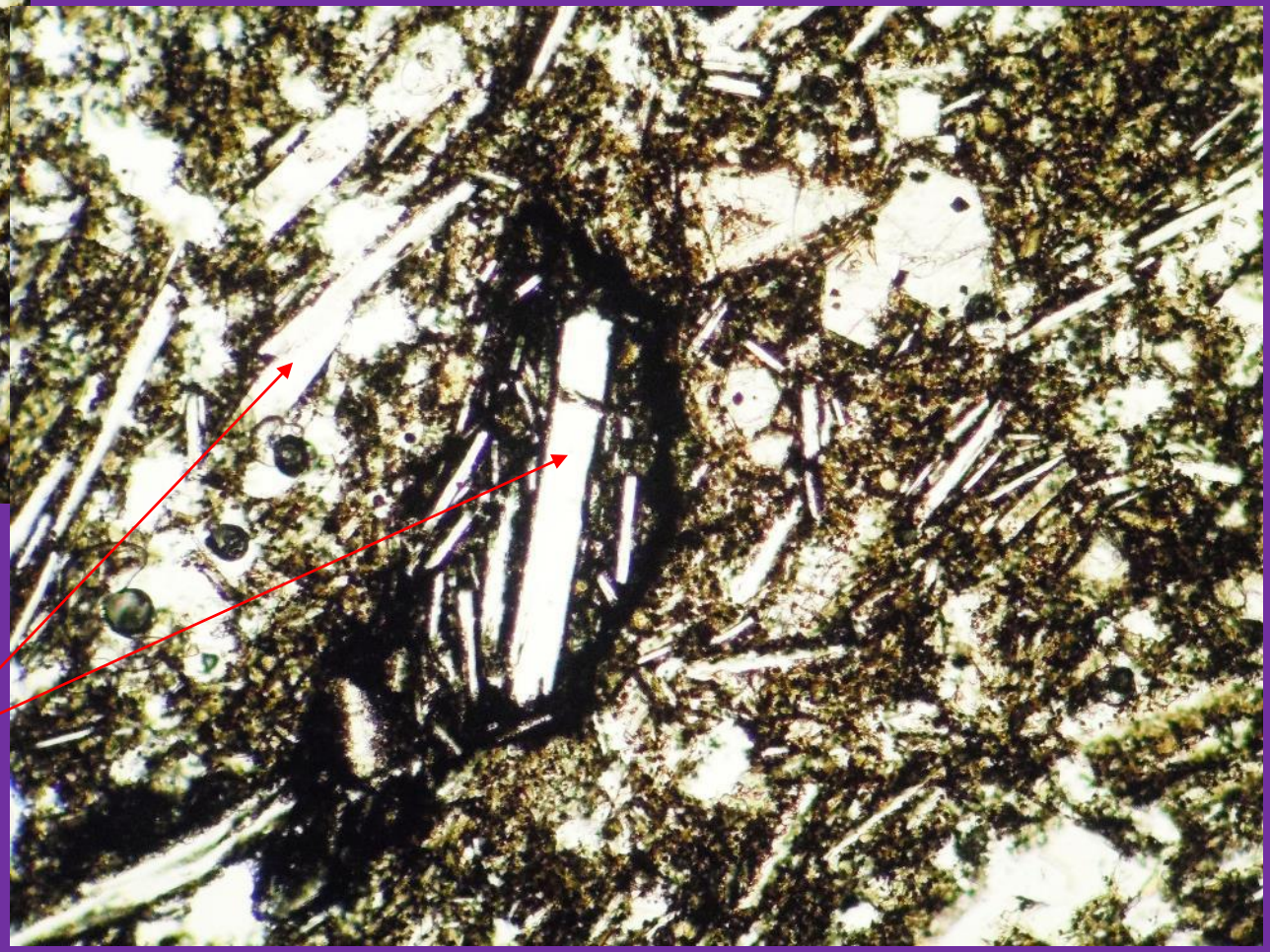
Wind direction during eruption
Wind-blown pile of
ash/cinders to S. of Cone

Wind blown pine straw and small flowers on ***cinders/lapilli of scoriaceous basalt (black = earlier, red=later)***

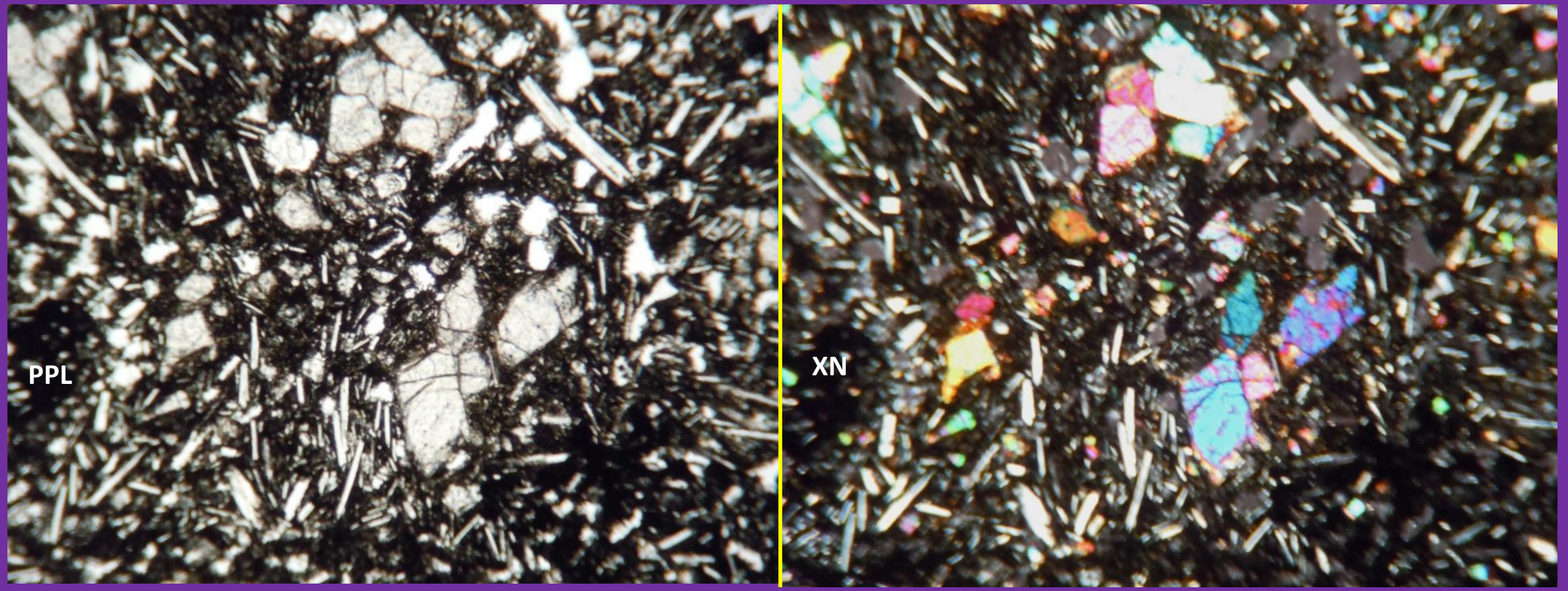
Green glass covers basalt cinder as a liquid splatter



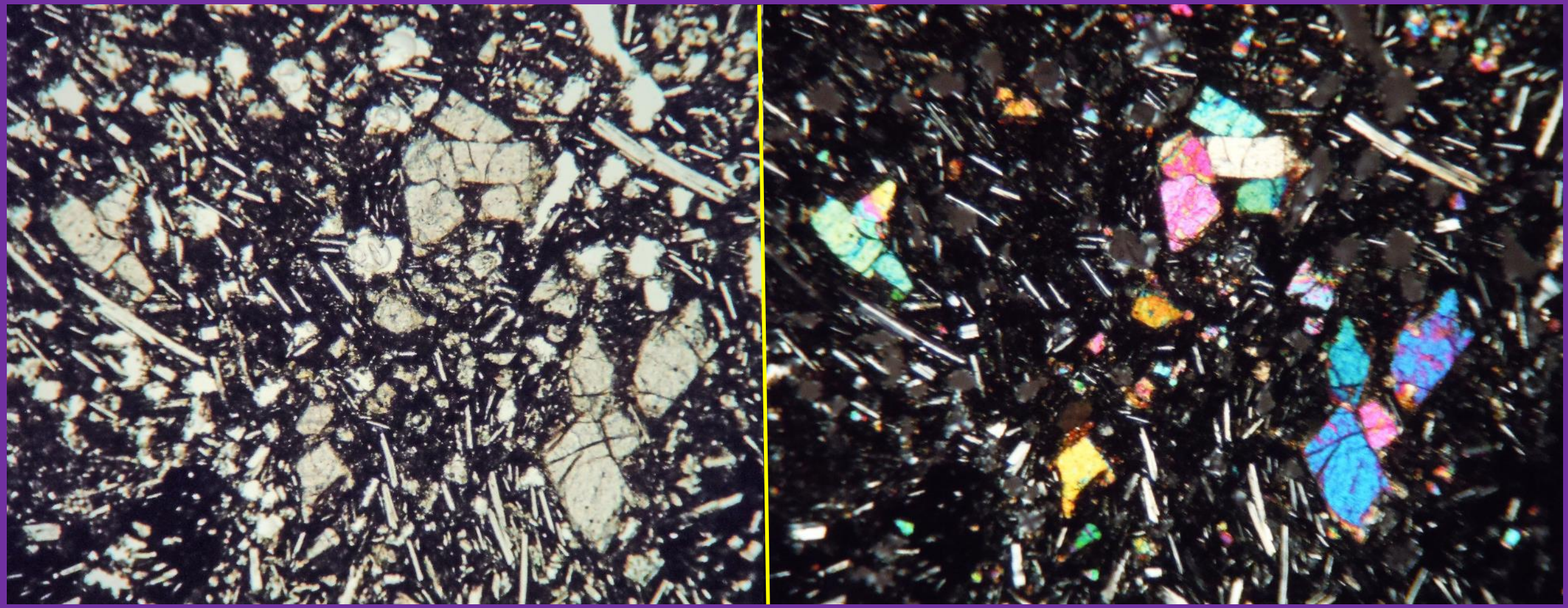
Alkali-olivine Basalt: Iron oxide around phenocrysts of plagioclase;
Note brownish glass in groundmass - PPL



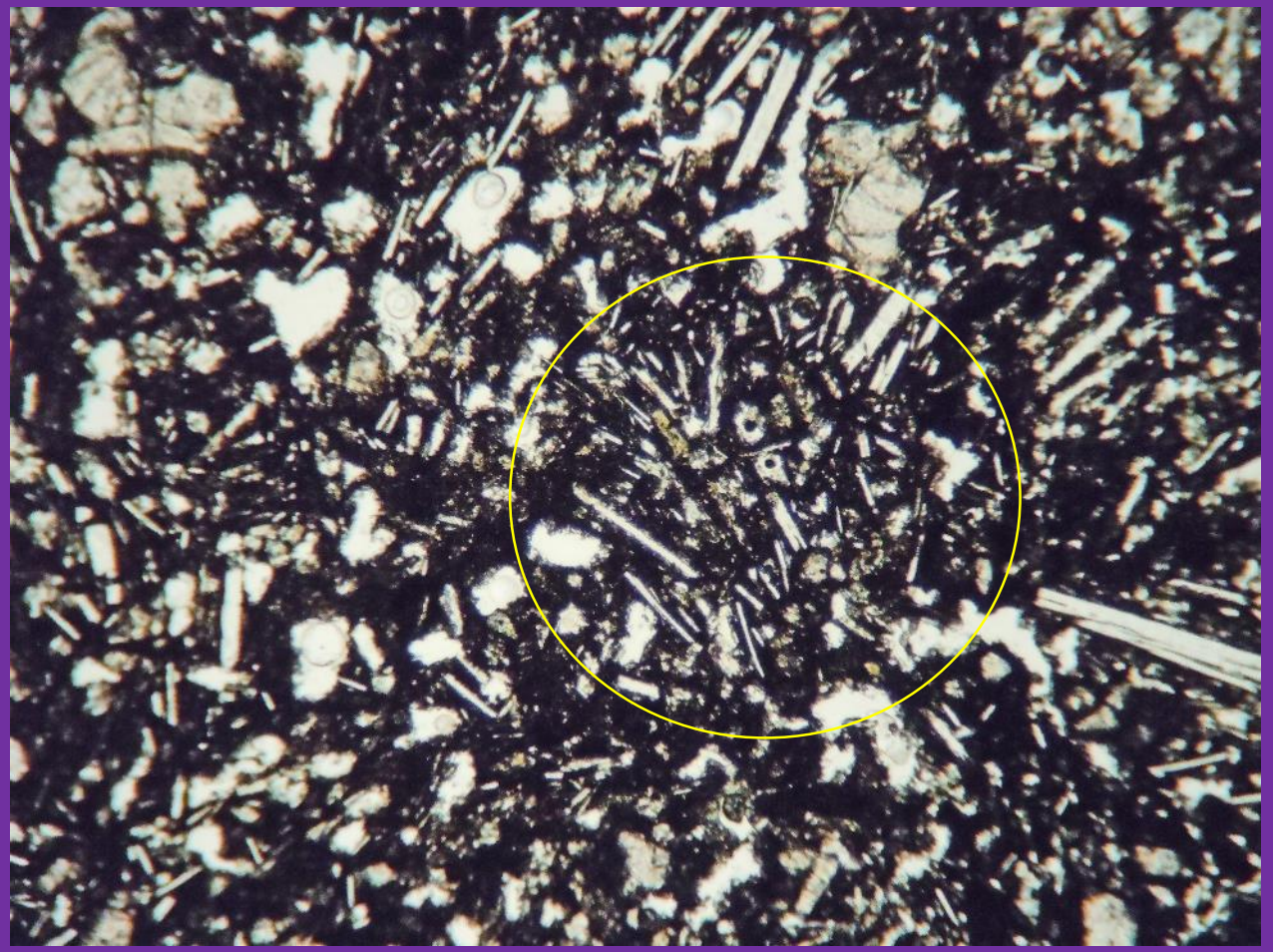
Labradorite laths

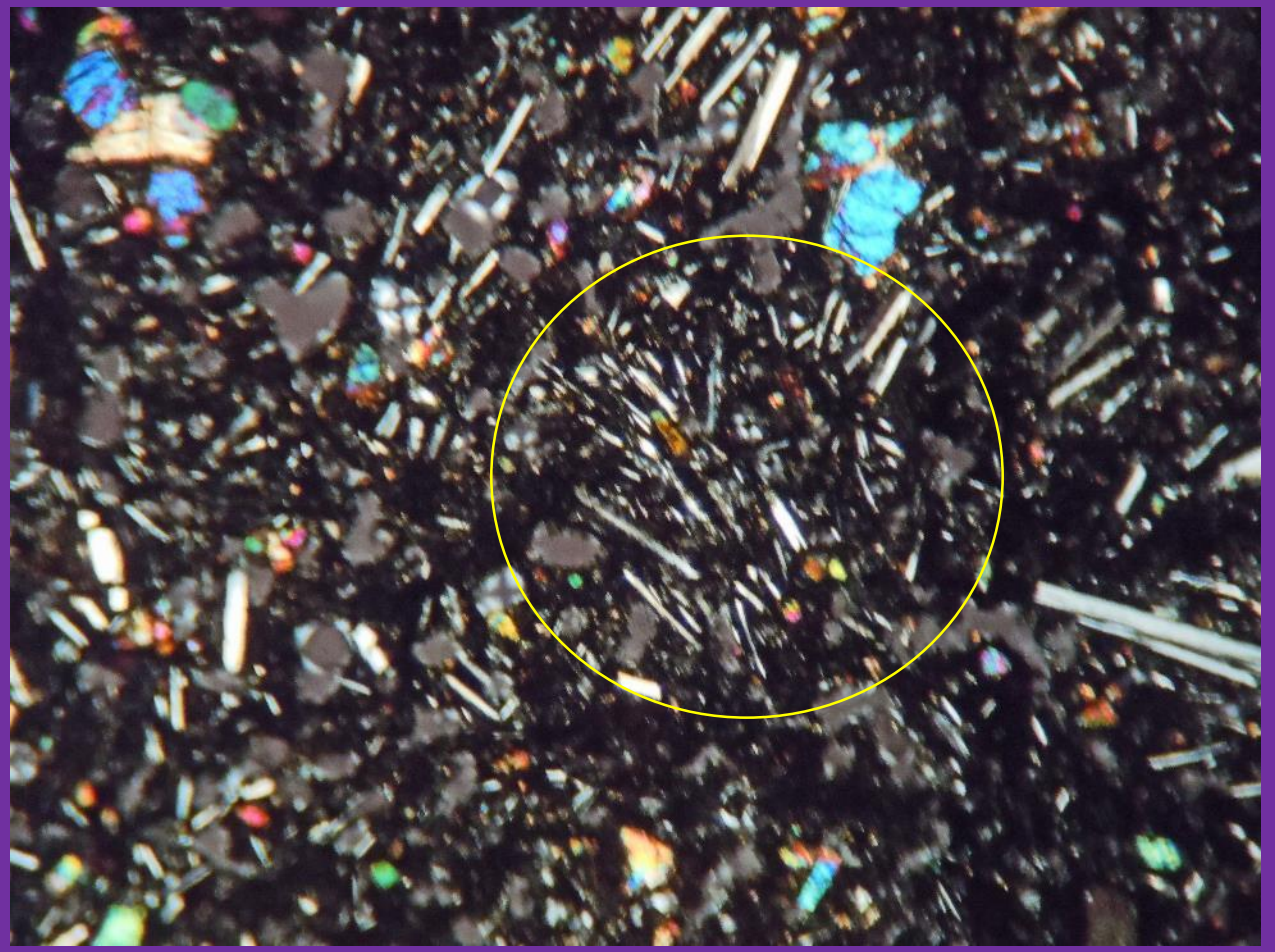


Basalt, note Olivine and Plagioclase feldspar laths

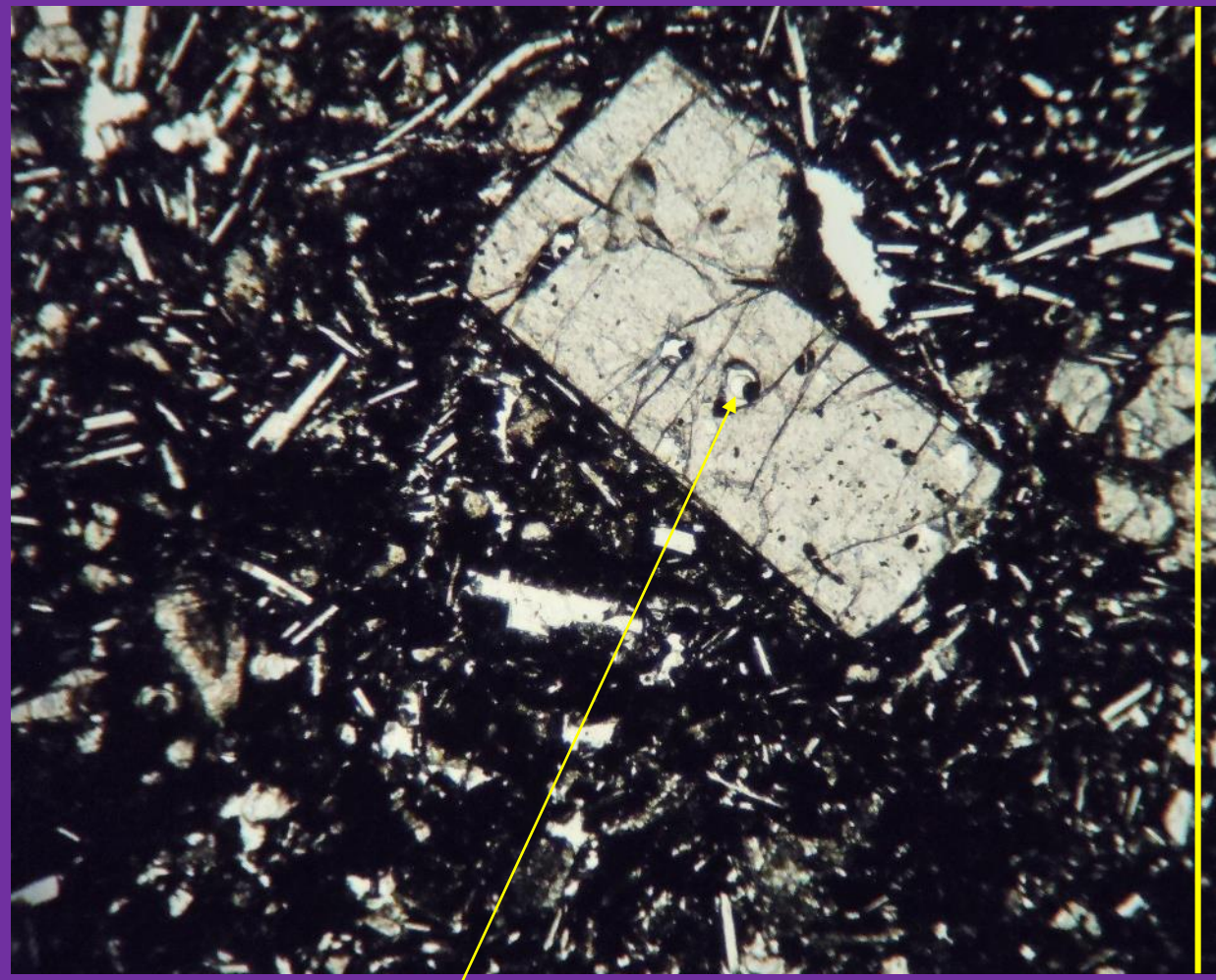


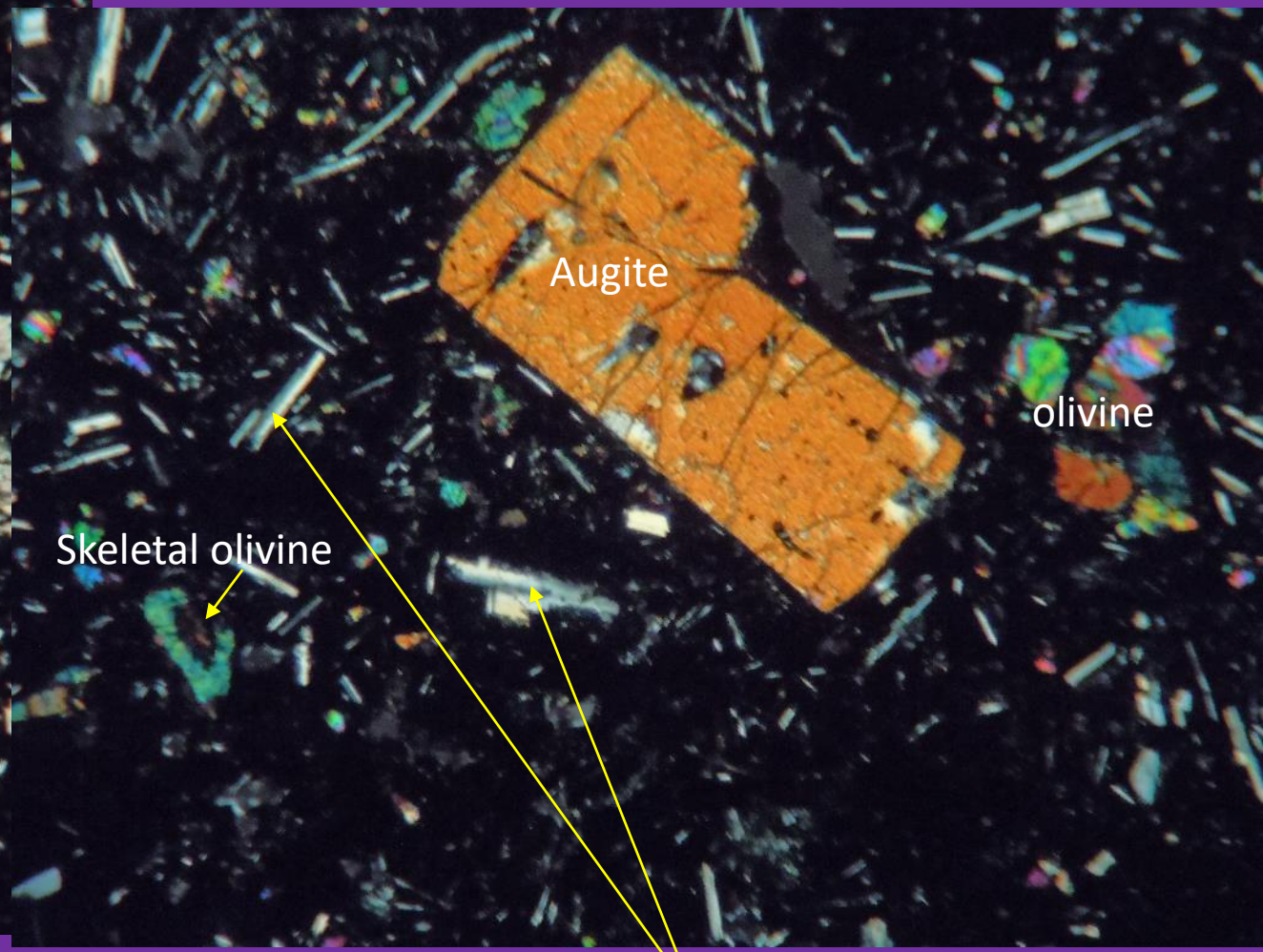
Olivine phenocrysts





Radiating splay of plagioclase

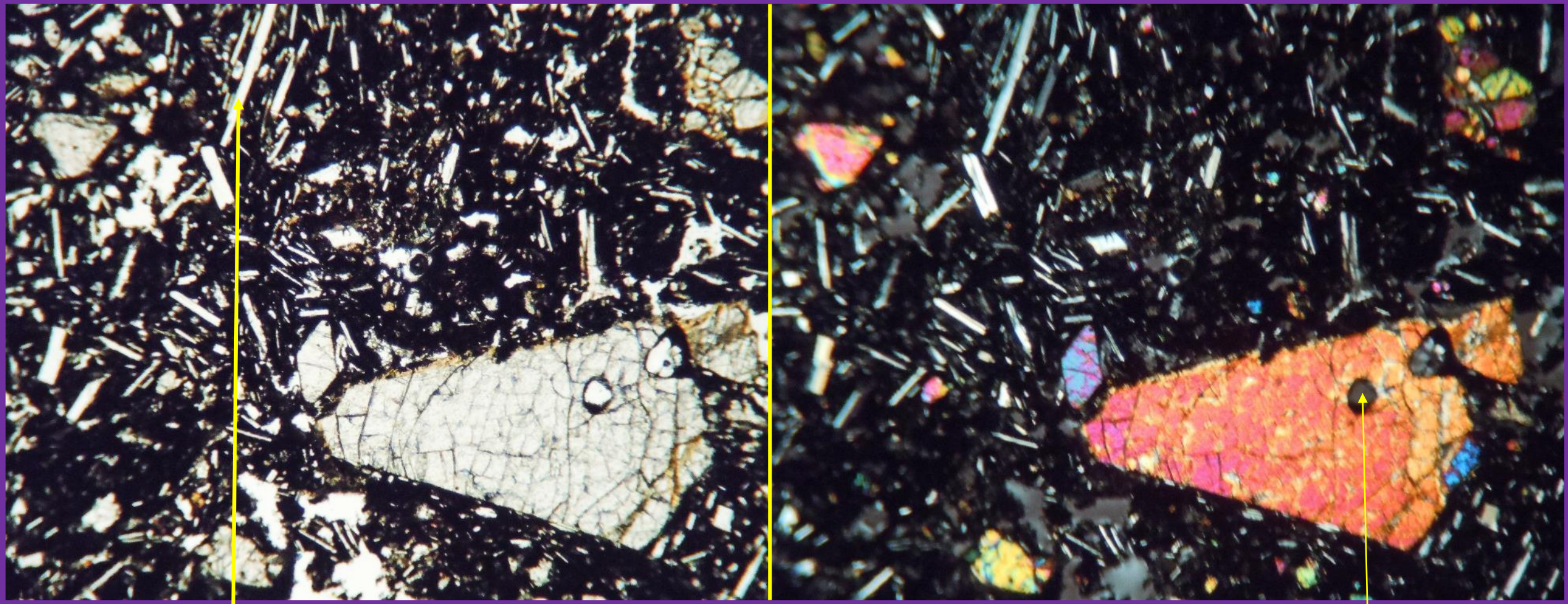




apatite

Plagioclase (labradorite) laths

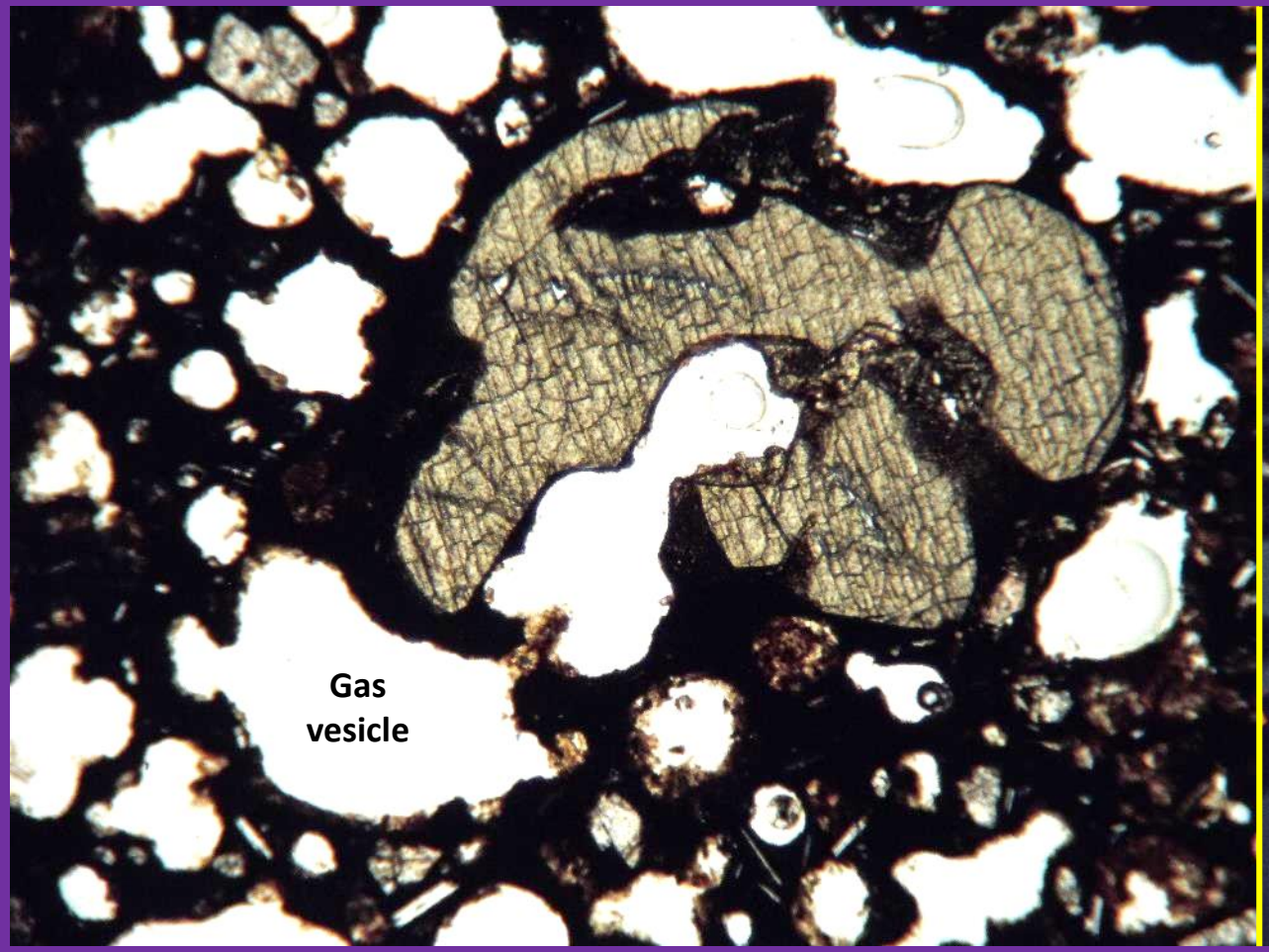
Basalt, note Augite (large phenocryst), Olivine (smaller one is skeletal) and Plagioclase feldspar laths

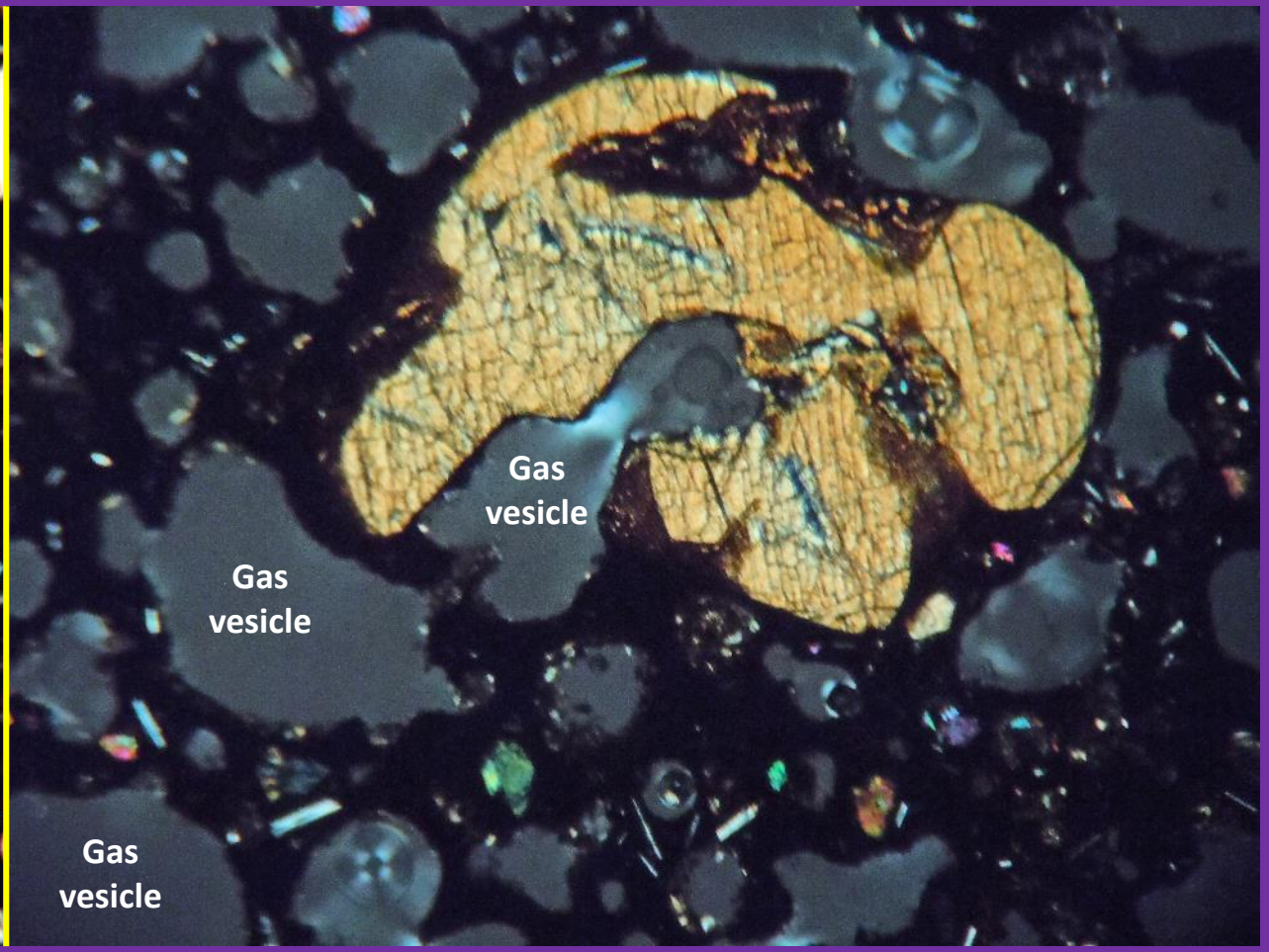


Plagioclase (labradorite)

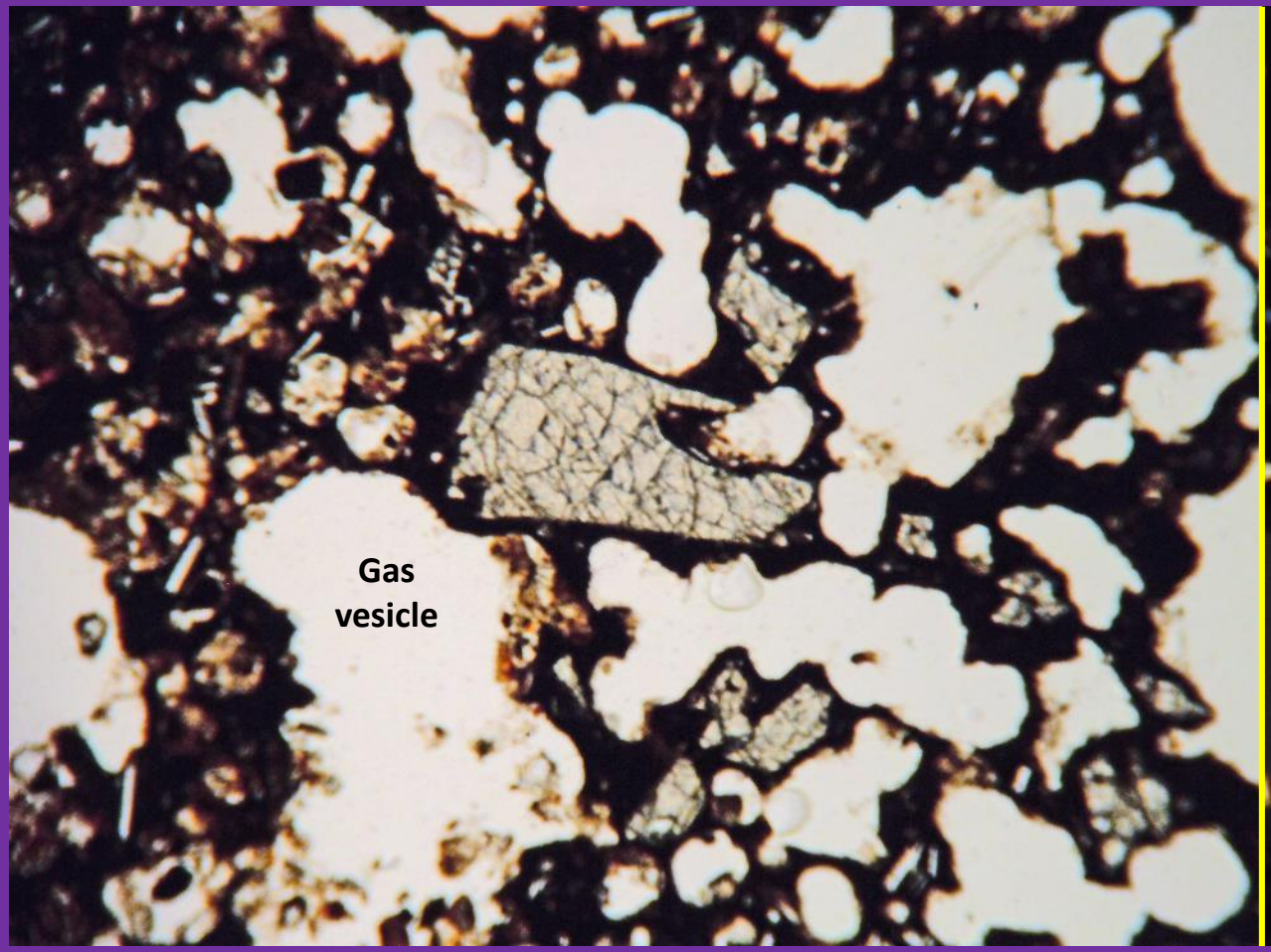
Olivine phenocrysts

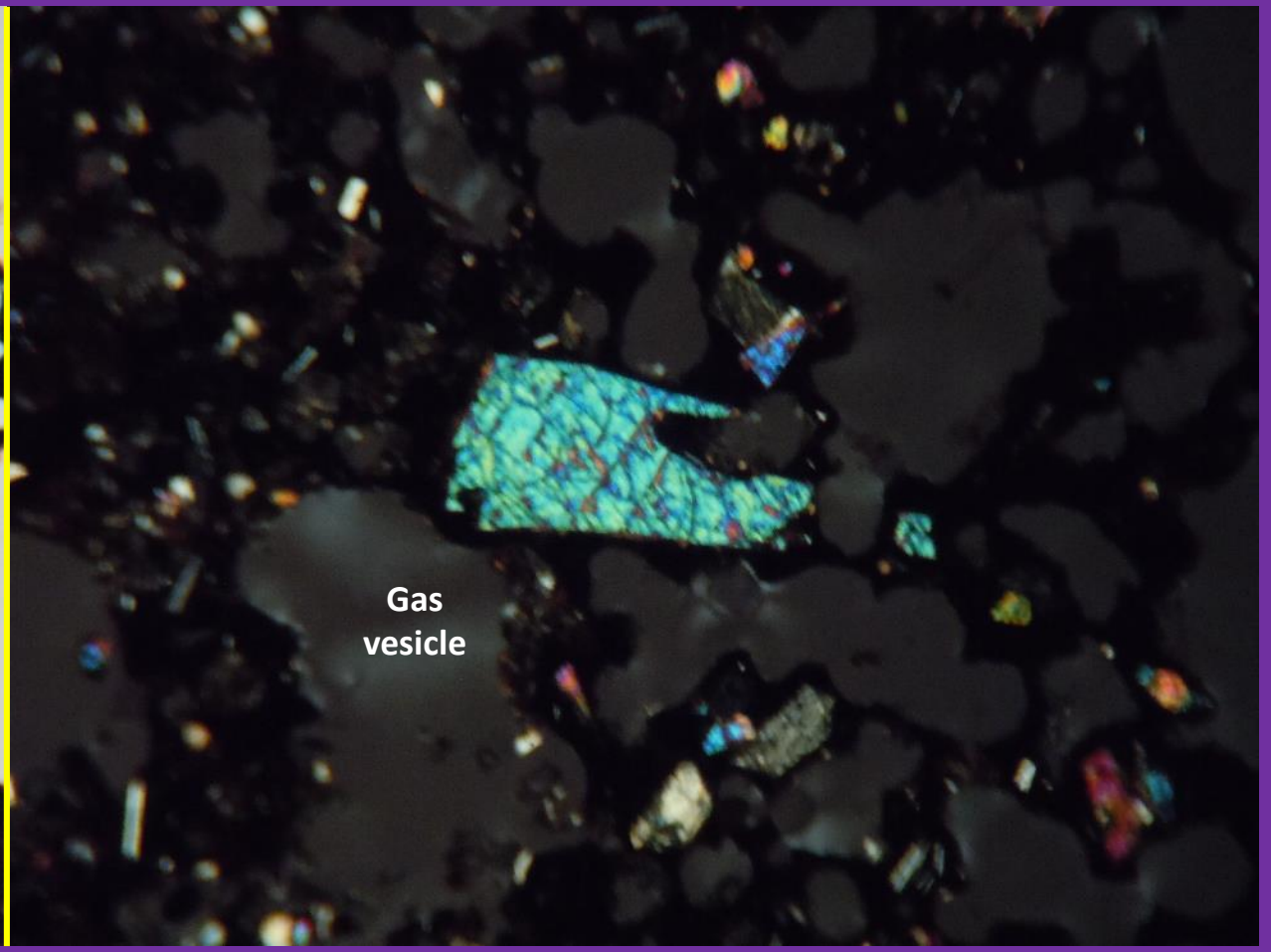
Apatite in Pyroxene



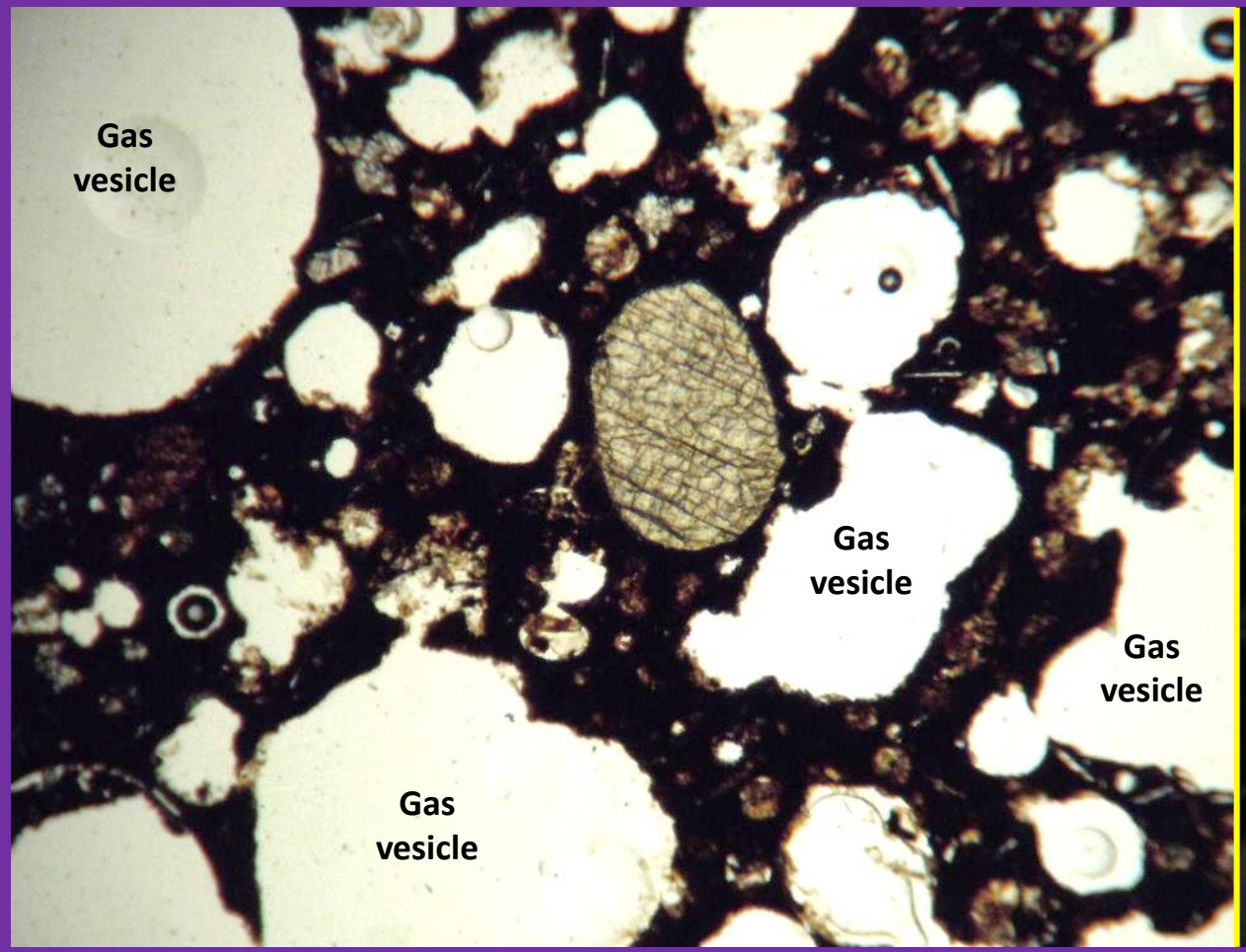


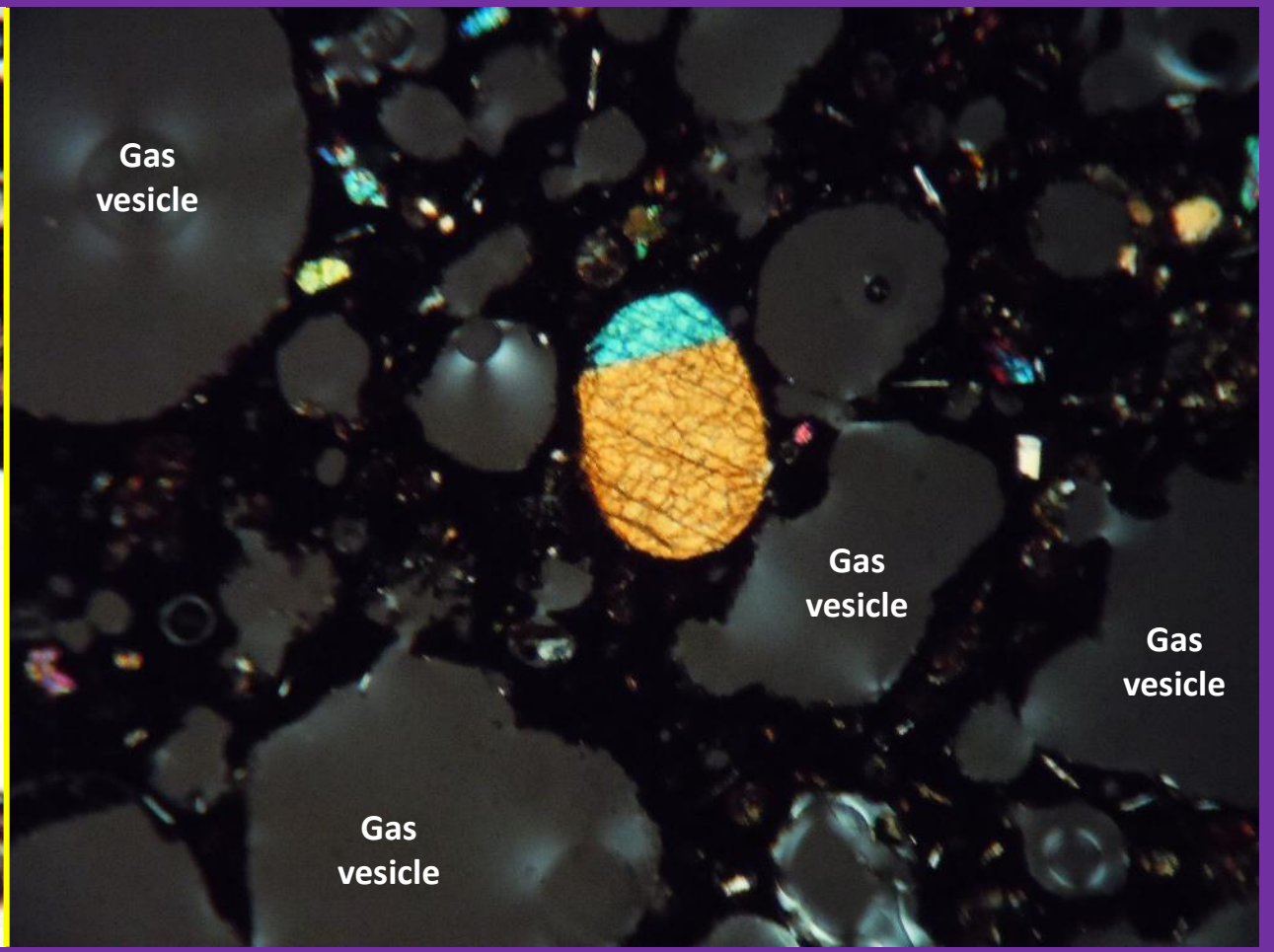
Vesicular (Scoria) Lapilli: Note large, embayed Pyroxene (Augite) –cleavages @93° & 87°



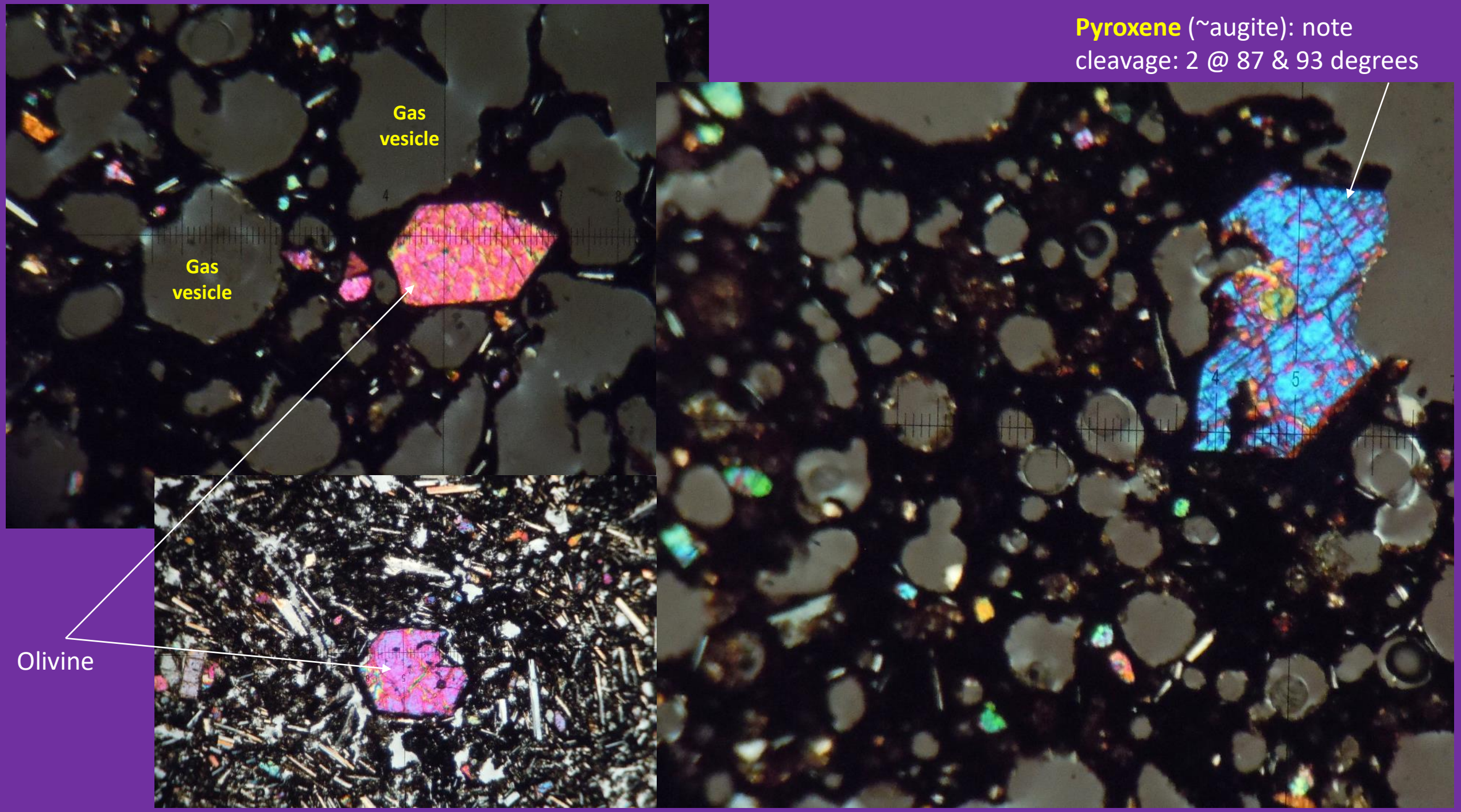


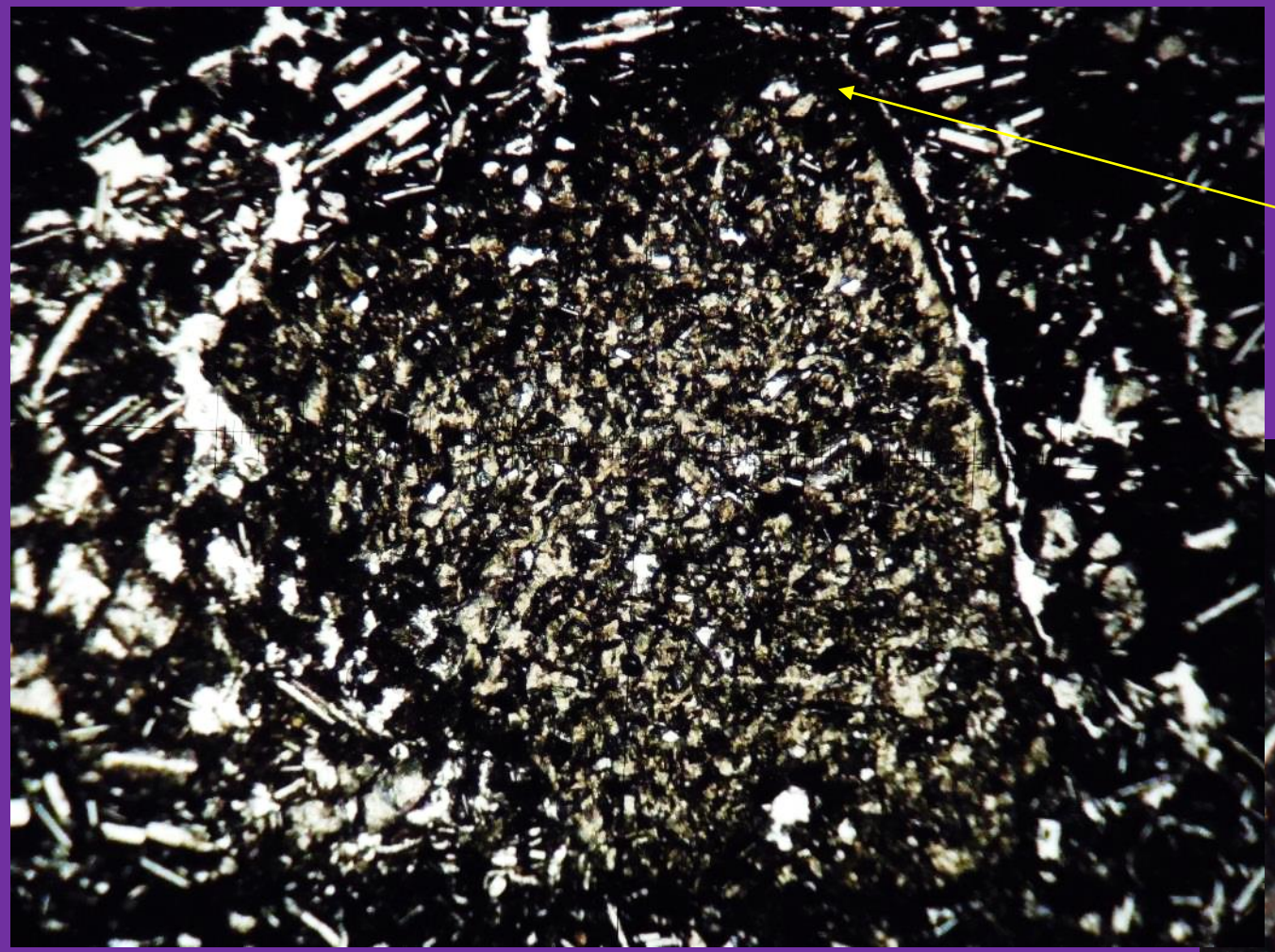
Pyroxene (Augite)



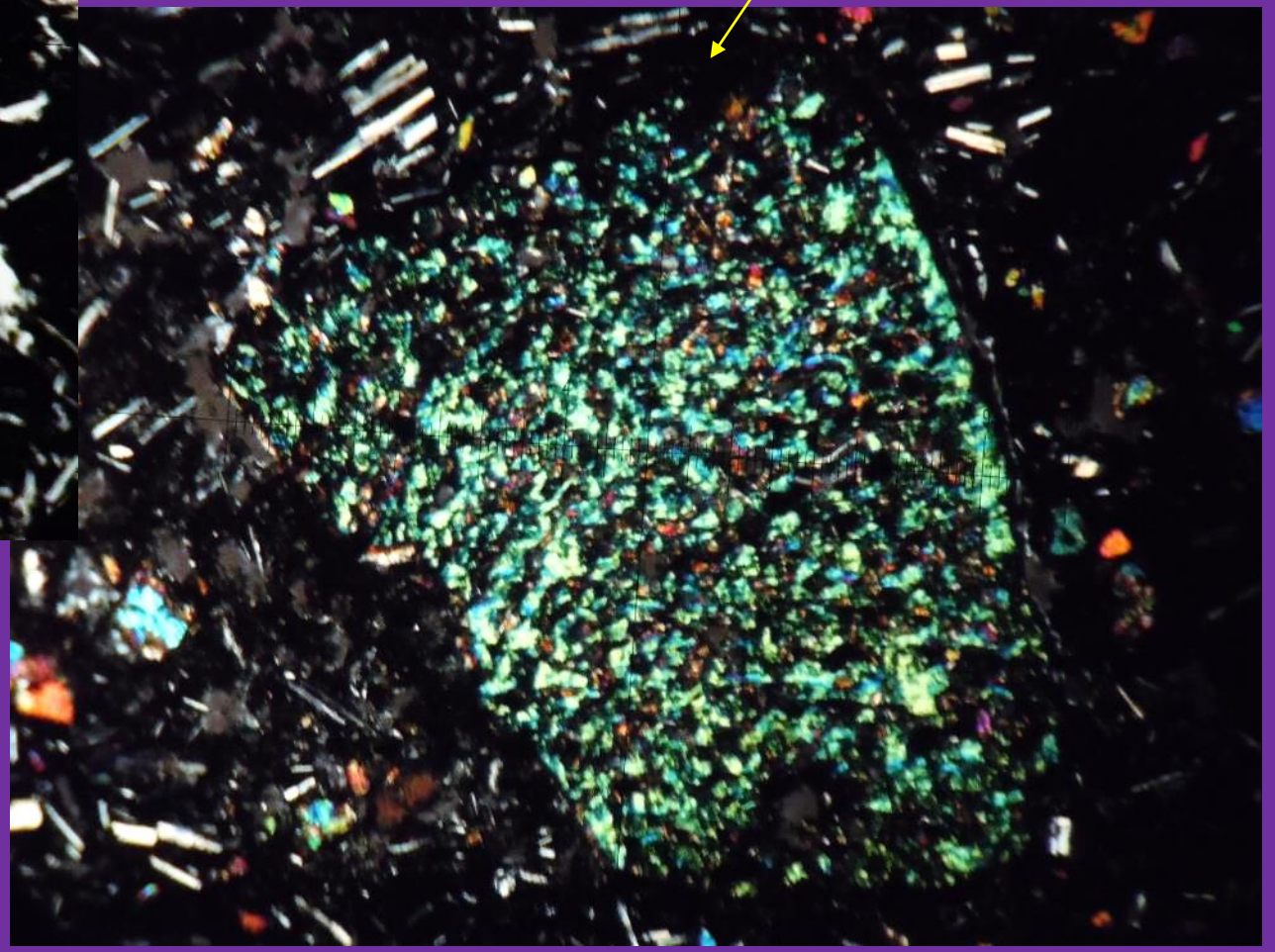


Twinned Pyroxene (Augite) Phenocryst, note rounding during transport in magma

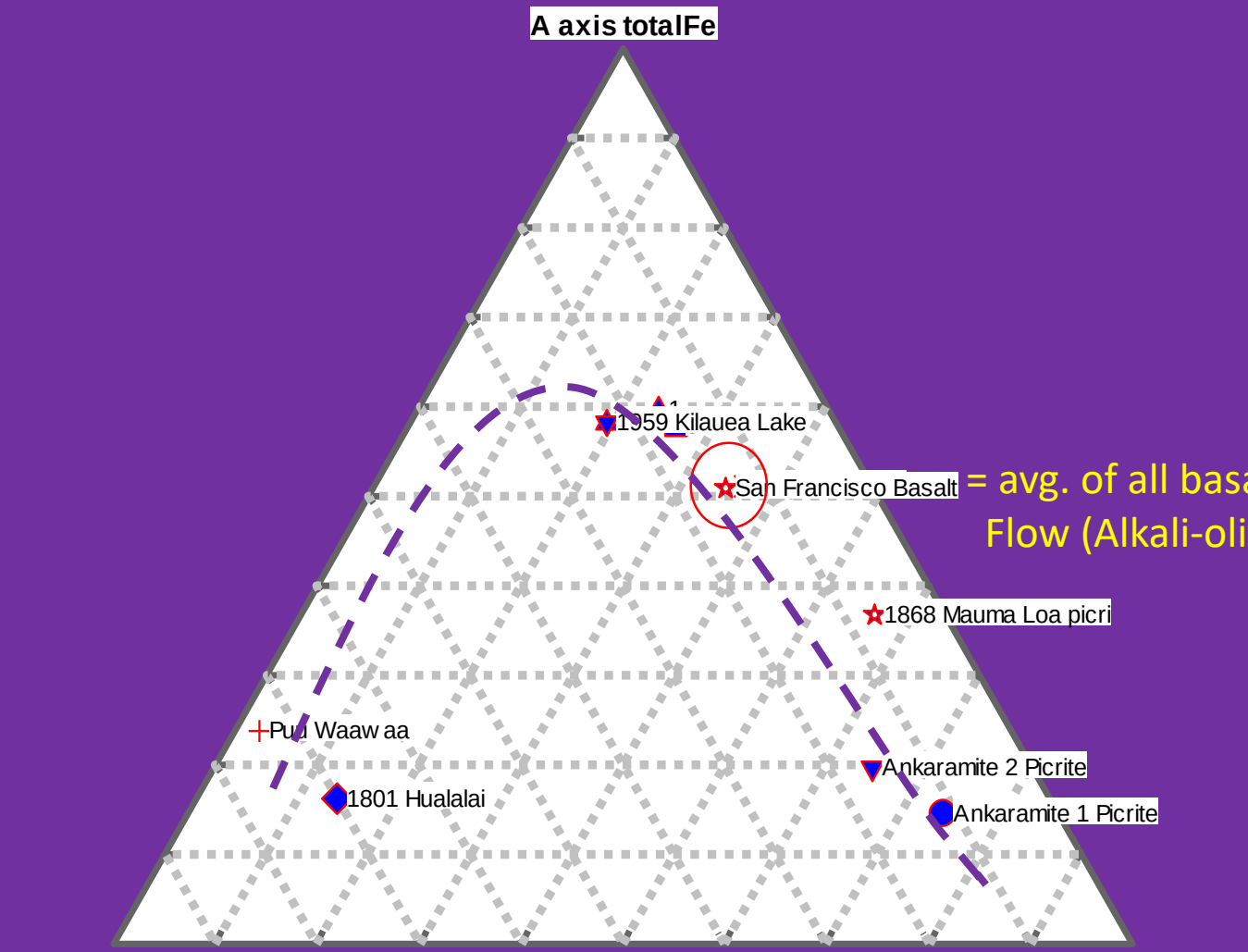

Pyroxene (~augite): note cleavage: 2 @ 87 & 93 degrees
Gas vesicle
Gas vesicle
Olivine



Clinopyroxene exsolving &
forming an Fe+ oxide rim



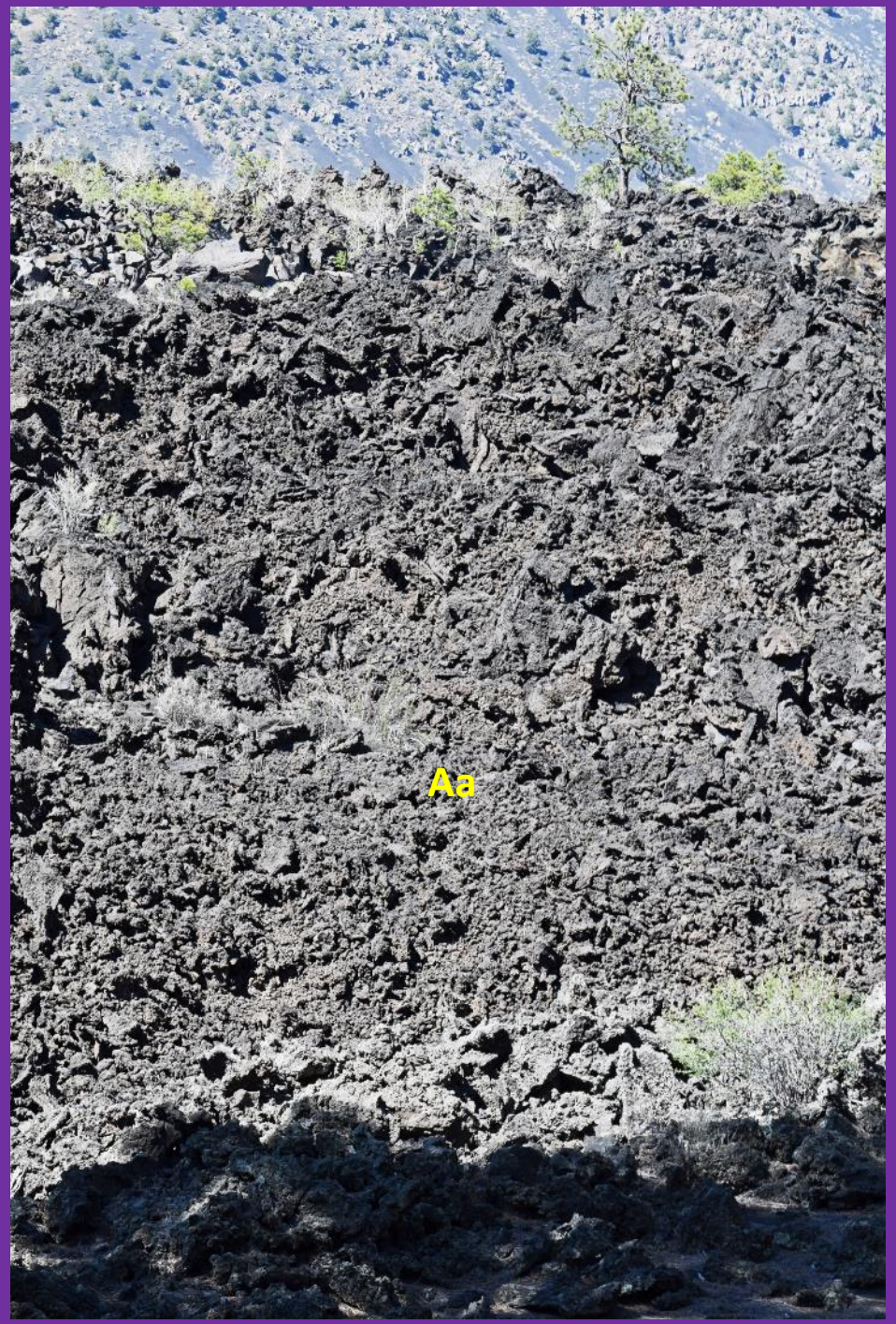
Triplot AFM Diagram San Francisco 950 year old basalt flow of Sunset Crater/Bonito Flow; compared to Hawaiian Volcanics



= avg. of all basalts & Bonito Flow (Alkali-olivine basalt)

BONITO LAVA FLOW

Aa



Ropey spatter on Hornito

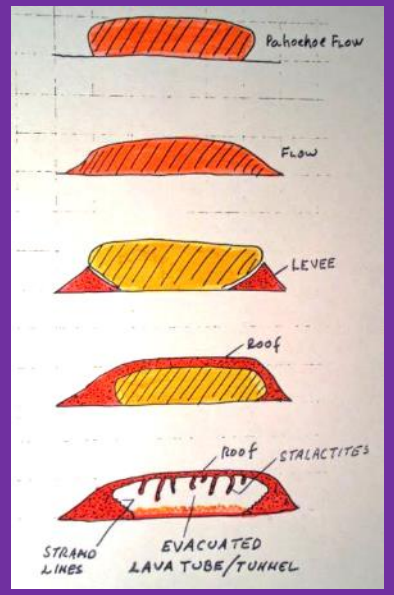
Pahoehoe

Gas vesicles: on left, stretched during flow; on right, lined with green glass.

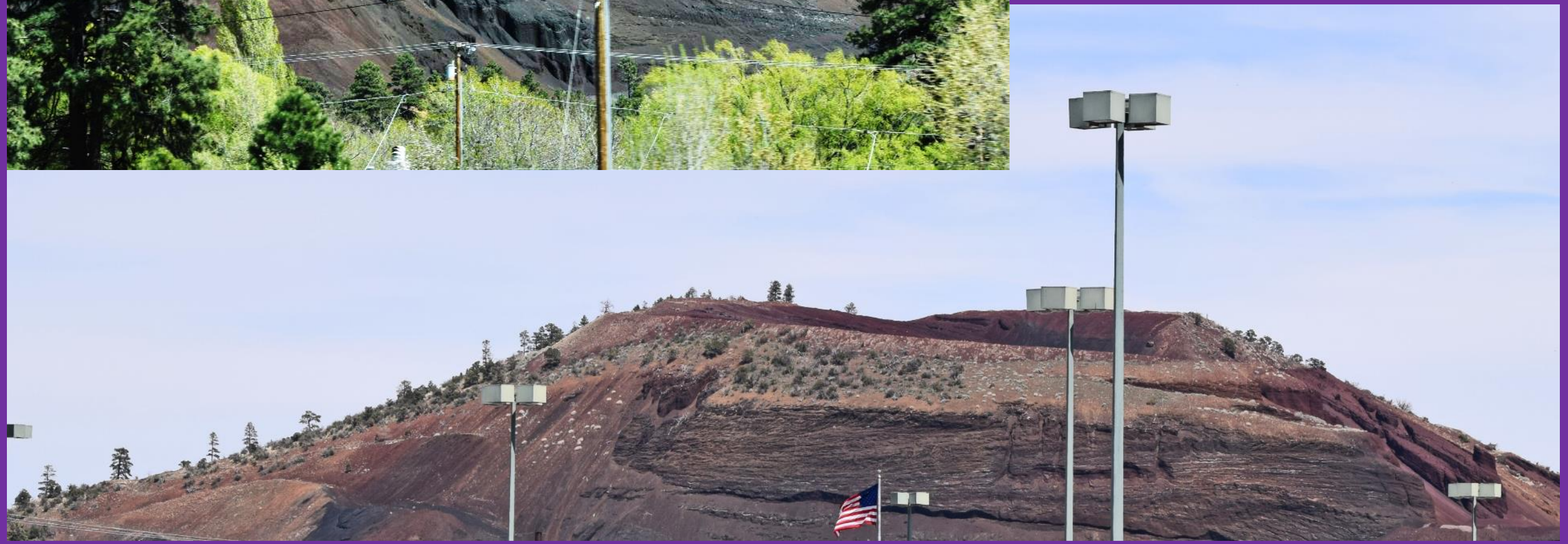
Aa

Lava Tube: evacuated and roofed-over flow lobes; NPS fills with blocks of basalt to prevent entrance

Lava Tubes


Pahoehoe Flow
Flow
Levee
Roof
Roof
Stalactites
Strand Lines
Evacuated
Lava Tube/Tunnel

Older O’Leary cone N. of Bonito Flow

Squeeze-up

Layering in nearby cone exposed by quarrying: not a single eruption, but many!