PETROGENESIS OF ANGLE-PLATED QUARTZ AND ASSOCIATED VOID-FILLING CALCITE, EAGLE AND PHENIX DAM SITE, COLUMBUS, GA

Information supplemental to:
GEOLOGICAL CONSIDERATIONS FOR CONSTRUCTING A RAFTING AND KAYAKING COURSE ON THE CHATTAHOOCHEE RIVER, COLUMBUS, GEORGIA by Hanley and Kinner.

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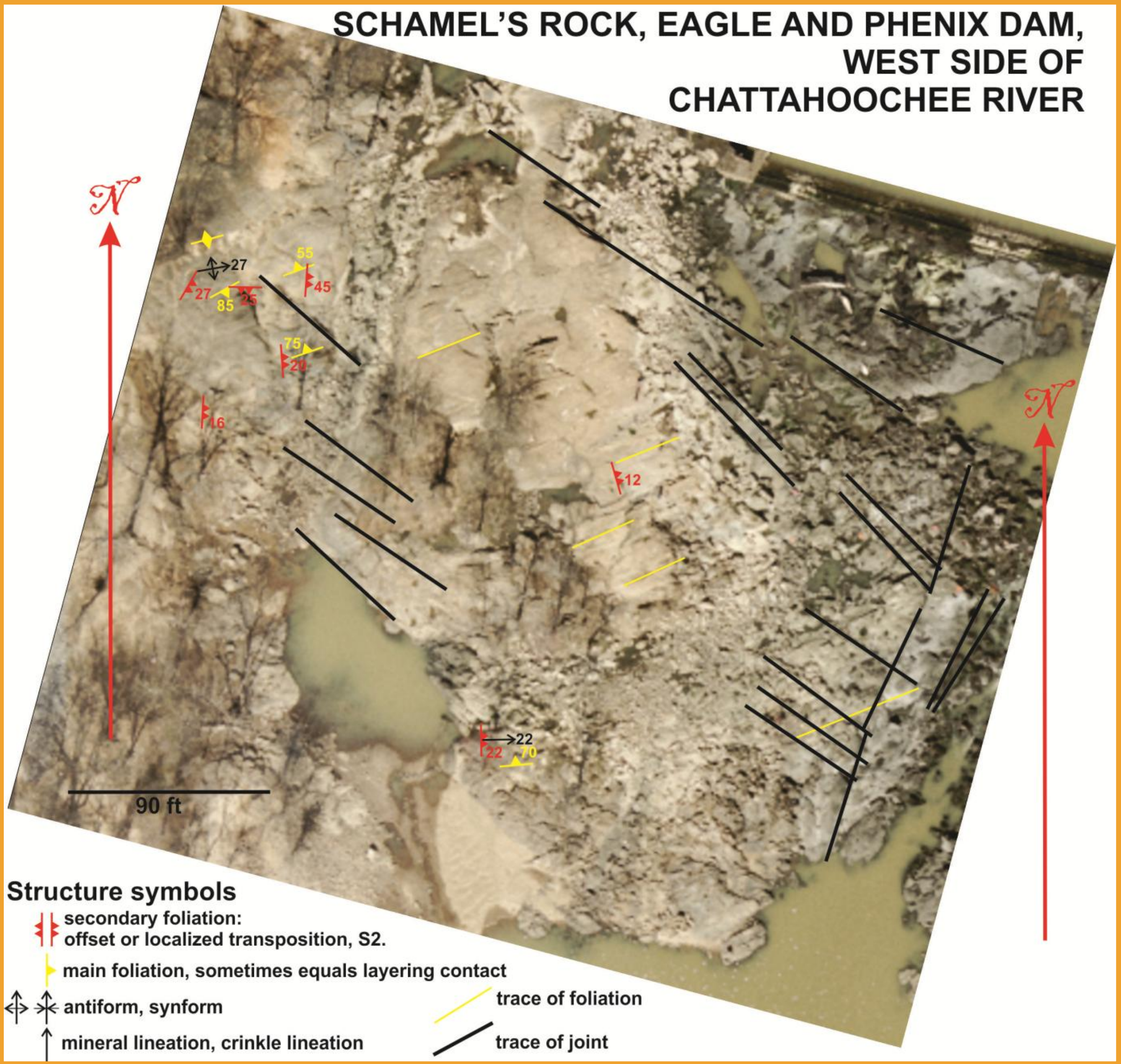
ABSTRACT

A quartz body that occurs within a N15E striking fracture zone in Phenix City gneiss in Columbus, Georgia contains angle-plated quartz; drusy quartz covers the plates; voids between the plates are partly filled with dogtooth spar calcite. The quartz body was discovered at the base of the Eagle and Phenix dam in Columbus by Ed Kinner during construction of a whitewater course. Foliation is developed in the fill in at least one of the fractures. Along strike, at least one of the fractures breaks into sub-fractures producing a fracture zone 6" to 8" wide. The mineralization extends into a pre-existing N45W set. A complex paragenesis involving fracturing, quartz mineralization, dissolution of country rock fragments and precipitation of calcite is suggested. Large quartz rich fracture zones are reported by Huebner and Hatcher (2011) northeast of Barnesville, GA in the High Falls GA 7.5 minute quadrangle. Large quartz bodies have also been recognized by Hanley southwest of Talbotton, GA. We hypothesize, as did Huebner and Hatcher, that the host fractures developed during the opening of the Atlantic in the Mesozoic; furthermore, we suggest that mineralization along the fractures may have been due to sea water circulating through the jointed seafloor perhaps accompanying mafic dike emplacement.

Schamel's Rock



Earlier foliation (yellow symbols) strikes NE; dips are generally steep except where they are deflected by later foliation (red symbols). Later foliation generally strikes N to NW, with shallow dips to the east. It may consist of mineral orientations or discrete zones of discordant foliation or zones to which layer is tangential.

Joints generally trend NW. A less common set strikes NNW. Thes less common joints are the ones that are mineralized.

Note that the Alabama Channel on the east side of Schamel's Rock is controlled by the NNE joints.

The Alabama channel was widened and deepened during construction of the whitewater course exposing the angled-quartz bearing mass of quartz at the bottom of the channel (below the date, lower right).

Mineralized fracture sub parallel and a little west of the Alabama channel, east side of Schamel's Rock. The N45W joint is the dominant joint set here.

Gray calcite in an orange matrix

Note foliation in the orange joint-fill material indicating movement; west is towards top of photo.

A mineralized N45W joint with herd of “horse tail” extensions oriented approximately N30W

Broken gneiss where fracture bifurcates

Fracture zone just west of the Alabama channel, east side of Schamel’s Rock. Though about 8 inches wide here, the zone is normally only one to two inches wide.
Visited 17 Oct. 2011.

Source of mineral samples collected 17 Oct 2011 from fracture zone. Some of these samples contain calcite.

Plates of angle plated quartz covered by drusy quartz. Spaces between plates are partially filled with dogtooth spar calcite.

Sample collected from white quartz mass at bottom of Alabama Channel

Photo by Julian Gray at Tellus Science Museum; magnification is 6.5X , field of view is 24mm.

Plate of angle plated quartz covered by drusy quartz. Spaces between plates are partially filled with dogtooth spar calcite.

Photo by Julian Gray of Tellus Science Museum; magnification is 12.5X, field of view is 12 mm.

Dogtooth spar calcite partially filling the voids in angle-plated quartz specimen. Note doubly terminated elongated calcite scalenohedron just below middle of image.

Photo by Julian Gray of Tellus Science Museum; magnification is 20x, field of view is 7.5 mm.

JULIAN'S OBSERVATIONS AND EXPLANATION (PARAGENESIS):

Hi Tom

Well after tormenting myself that this putative zeolite would be an optical mineralogy research project, I finally decided to buckle down and do the work. Quick macroscopic observation told me this wasn't a zeolite. It is calcite!

The crystals are elongated, acicular and tapered to a sharp point; a common habit of calcite, but not zeolite. It effervesces in dilute HCl, has high birefringence, and rhombic cleavage. To nail it, I did a cursory check of lowest n_D and found it is close to 1.480. Easy! Most of the calcite was dirty with inclusions, but I found a large, clean piece for the optical work.

Photos forthcoming, but I made an interesting observation of what I'm calling the angle plate quartz.

So this was my original hypothesis of paragenesis:

1. Host rock is brittley fractured.
2. Quartz deposited hydrothermally(?) in fractures
3. Host rock weathered to leave geometric arrangement of tabular quartz, and in this case
4. Calcite deposited in open space.

So what I observed is a later stage growth of drusy quartz on tabular hydrothermal quartz; quartz crystal terminations growing into the open space, away from the hydrothermal quartz. Furthermore, in at least one instance one tablet ended in an open space and drusy quartz completely surrounded the plate. This is probably easily to explain in this paragenesis:

1. Host rock is brittley fractured.
2. Quartz deposited hydrothermally(?) in the fractures
3. Host rock weathered to leave geometric arrangement of tabular quartz (some ending in open space)
4. Tabular quartz overgrown by drusy quartz
5. Dogtooth spar calcite deposited in the open space.
6. (**Hanley's suggestion**) Remaining open space filled with calcite that engulfs dogtooth spar crystals.

What great fun. I will document the above in photos and send them along.

Cheers

Julian Gray

REFERENCES CITED:

- Huebner, Michael T., and Hatcher, Robert D., 2011. Evidence for sinistral Mesozoic inversion of the dextral Alleghanian Towaliga fault, Central Georgia, in Georgia Geological Society Guidebook, v. 34, pp. 55-72