GeoNote 25

Walking Field Trip in the Tubbs Hill Mylonites, Coeur d'Alene, Idaho

The rocks in northern Idaho consist of low- and high-grade metasedimentary rocks of the Precambrian Belt Supergroup, pre-Belt high-grade metamorphic basement rocks, Paleozoic sedimentary rocks, and intrusive rocks of Cretaceous and Tertiary ages. Compression during the Cretaceous caused the formation of the Overthrust Belt in Montana and eastern Idaho and the Idaho batholith. During the late Cretaceous and the Eocene, regional extension affected central Idaho from the eastern Snake River Plain to Coeur d'Alene and into central British Columbia. This extension formed a series of core complexes separated by fault zones filled with volcanic rocks. Few effects of this extension are visible north of the Lewis and Clark line (represented by the St. Joe fault in Figure 1) and east of the Purcell Trench.

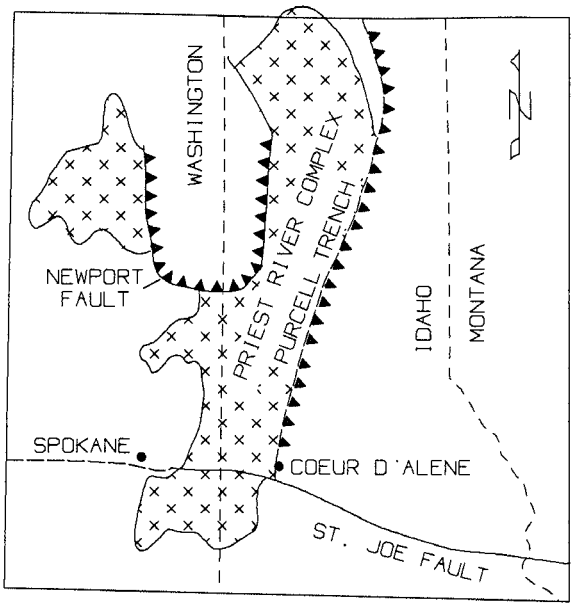

Figure 1. *Location of the Priest River Complex, Idaho and Washington.*

The core complexes generally contain a central mass of deformed metamorphic and plutonic rocks overprinted with mylonitic fabrics. The core is separated by shallow-dipping detachment faults from upper plate rocks, which lack the penetrative deformation of the core units. Of the several core complexes in Idaho and British Columbia, the Priest River crystalline complex includes the rocks at Tubbs Hill.

Tubbs Hill is an excellent place to see the types of rocks and structures formed during the uplift and unroofing of a core complex. The rocks show mylonitic fabrics typical of this type of extensional environment. S-C fabrics are common and can be used to determine tectonic movement directions in crystalline rocks.

Start Trip. Enter the Tubbs Hill walking trail at the northwest corner of Tubbs Hill. This trail goes around the hill and returns to the entrance point.

Stop 1 is at the first exposure of crystalline rocks (Figure 2). This outcrop is part of a granodiorite pluton emplaced synkinematically during metamorphic core complex formation in the middle Cretaceous. The rocks were converted to lineated protomylonite under amphibolite facies (high-T) conditions as the intrusion cooled. The granodiorite is the dominant unit in Tubbs Hill. A younger, mild protomylonite overprint under greenschist facies (low-T) conditions developed in these rocks, probably in the early Tertiary. S-C fabrics show that the upper plate rocks, now eroded, moved to the east during compression.

Stop 2 is halfway down the west shore of Tubbs Hill. Granite porphyry, which is younger than the granodiorite, has been converted to a low-T protomylonite. The age of intrusion is unknown but is later than the pulse of high-T metamorphism. S-C fabrics, both mesoscopic and microscopic, again indicate upper plate movement to the east; however, the movement was extensional rather than compressional.

Stop 3 is at the southwest promontory of Tubbs Hill. The outcrop is homoclinal muscovite schist that is injected lit-par-lit by granodiorite, thereby forming a variety of migmatite. The schist is a high-T mylonite overprinted by low-T protomylonite fabric. S-C fabrics show the same movement as at Stops 1 and 2.

IDAHO GEOLOGICAL SURVEY

MAIN OFFICE AT MOSCOW
MORRILL HALL, THIRD FLOOR
UNIVERSITY OF IDAHO
PO BOX 443014
MOSCOW, ID 83844-3014

BRANCH OFFICE AT BOISE
MATH-GEOLOGY, ROOM 223C
BOISE STATE UNIVERSITY
BOISE, ID 83725-1535

BRANCH OFFICE AT POCATELLO
PHYSICAL SCIENCE, ROOM 235
IDAHO STATE UNIVERSITY
CAMPUS BOX 8072
POCATELLO, ID 83209-8072

www.idahogeology.org 208-885-7991 email: igs@uidaho.edu
SINCE 1919, SERVING THE STATE THROUGH GEOLOGIC RESEARCH

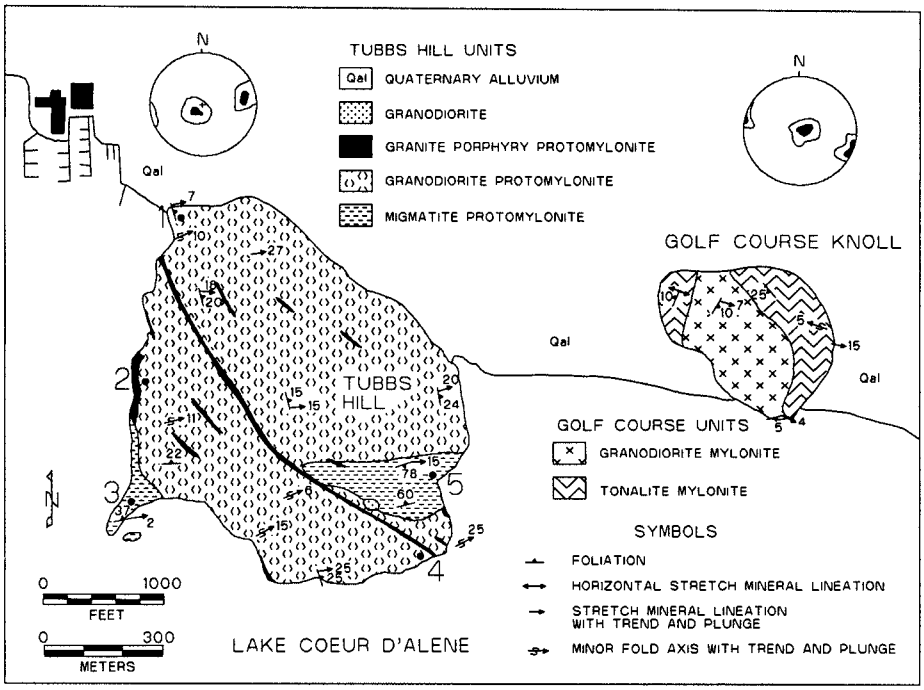

Figure 2. *Geologic map of Tubbs Hill, Coeur d'Alene, Idaho.*

Stop 4 is at the southeast tip of Tubbs Hill. A sheet of granite porphyry (low-T protomylonite) is well exposed and shows good S-C fabric consistent with "tops to the east" during movement.

Stop 5 is at the small bay in the southeast part of Tubbs Hill. Good exposures along the lake shore reveal folded tonalite-granodiorite migmatite. First, the tonalite protolith was converted to high-T mylonite, probably before granodiorite injection. Next, the granodiorite was converted to high-T protomylonite. Finally, both elements were overprinted by a low-T protomylonite fabric.

Return to the starting point along the northeast trail. Numerous outcrops of granodiorite are exposed along the way.

General Comments

Lineation changes trend systematically with foliation trends from northeast through east at Tubbs Hill, to southeast at the golf course knoll (Figure 2). The outcrops show a single linear element per outcrop surface, and the varied trends are randomly distributed across the area. The rocks at the golf course knoll, which were nearest to the detachment surface, are strongly mylonitized under both high-T and low-T conditions and show the only southeast lineation in the Priest River Complex. We interpret these data as showing counterclockwise rotation about a vertical axis during mylonitization due to movements in the Lewis and Clark line.

Prepared by Rolland R. Reid,
Head, Department of Geology and Geological Engineering,
University of Idaho. Coworkers on this project were
Craig Wavra (Sunshine Mining Company), Robert Fleck (U.S.
Geological Survey), Dennis Geist (University of Idaho), and
Charles Knowles (Idaho Geological Survey).

0593