

MICROSTRUCTURE OF A VERMONT SLATE, AN ADIRONDACK
GNEISS, AND SOME LABORATORY SPECIMENS

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The aim of this trip is to examine the microstructure of some naturally and experimentally deformed materials and to discuss the relationships between the observed structures and the deformations they represent. The microstructures at each stop will be described using hand-out photomicrographs. The trip is therefore not very suitable for future use by independent field parties. These notes will accordingly be brief.

Road Log*

Miles

- 0.0 Depart R.P.I. Field House. Proceed west on People's Avenue to second traffic light.
- 0.4 At second light, turn left on 15th Street (N.Y. Route 7) and follow south 3/4 mile to T-junction.
- 1.1 Turn right on N.Y. 7 and follow through Troy.
- 2.1 Still following N.Y. 7, turn left at light onto bridge over Hudson River.
- 2.5 West end of bridge. Turn right following sign for I 787.
- 2.7 Turn right at light following sign to I 787.
- 2.8 Turn right just past light onto I 787 south.
- 7.4 Leave I 787 following signs for I 90 west, to Buffalo.
- 11.5 Exit 4. Leave I 90 following signs for NY 85, to Slingerlands. Shortly after completing the exit loop...>

*People who omit the laboratory visit to S.U.N.Y.A. can pick up the road-log by proceeding directly to Fort Ann (mileage 83.6 on this log). For people following this plan, mileages from Fort Ann are provided in parentheses.

- 12.1 Take Exit 1. Leave N.Y. 85 following signs for Washington Avenue.
- 12.3 Merge and move toward left lane.
- 12.6 Bear left, following sign for Washington Avenue West.
- 13.0 First light on Washington Avenue. Thruway House Motel on right. Turn left at light on S.U.N.Y.A. campus.
- 13.1 Turn left on ring-road around campus. Continue on ring road 4/10 mile to pair of driveways on right. First driveway enters parking lot; second driveway leads west to main academic buildings. Turn right onto second driveway and
- 13.5 park at nearest building on left, Earth Science. (Avoid nearby buildings on right surrounding a tall square tower. These are dormitories.) Go to Earth Science Bldg., Room 241.

Stop 1. S.U.N.Y.A. Deformation Laboratory.

Experiments are conducted here in a deformation cell that operates at temperatures close to room temperature and pressures less than 300 bars. These restrictions allow the cell to be fitted with glass windows through which the deformation and associated microstructural adjustments in a thin sample can be observed continuously with a microscope. The experiments to be demonstrated are simple-shearing experiments on an organic material (paradichlorobenzene). The shearing is carried out at 47°C, which on the absolute temperature scale is within 2% of the melting point of the material. Dynamic recrystallization and recovery effects are observed. The relationships of foliations and other microstructural elements to the shearing direction and various strain directions will be demonstrated, as progress of the experiments permits.

- 13.5 Leave Earth Science Building and return to Thruway House intersection.
- 14.0 Turn left at Thruway House intersection, proceeding west on Washington Avenue.
- 14.8 Turn right at second light, following signs here and at several more points, for I 87 (the Adirondack Northway).
- 15.6 Enter I 87 and head North.
- 72.6 Exit 20. Leave I 87 and follow signs for N.Y. 149 and Fort Ann.
- *83.6 Fort Ann, intersection of route 149 and route 4. Head (0) north (left) on Route 4 toward Whitehall.
- 85.5 Just short of bridge over railway tracks, turn left off 4 (1.9) onto short access road connecting present Route 4 to new version under construction. Park at side of access road.

Stop 2. Quartzo-feldspathic gneiss

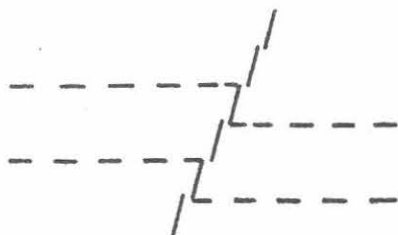
Exposure is mainly west side of new Route 4. Two small-scale features of interest occur here. The first is a quartz ribbon lineation trending east in the plane of the main southeast-dipping foliation. This is a common type of lineation in Adirondack gneisses, of obscure kinematic significance. The nature of this lineation will be discussed — is it transposed quartz layering? stretched quartz aggregates or grains? synkinematic secretion? or?

The second microstructure of interest consists of partial feldspar rims, in preferred orientation, around feldspar grains. The hypothesis that these are in-fillings of potential voids between rigid grains in relative motion will be discussed.

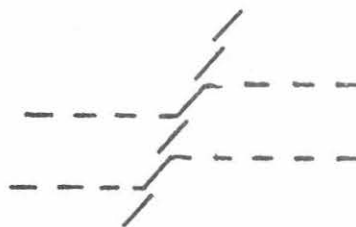
- 85.5 Continue north on Route 4 toward Whitehall.
(1.9)
- 94.8 Whitehall. Bear right at light, still following Route 4.
(11.2)
- 103.0 Exit 2. Leave Route 4 and follow Vt. route 22a to Fair Haven.
(19.4)
- 104.1 Approaching center of Fair Haven. Bear left around north end of town green. Turn left on Vt. route 4a East, and follow this to Hydeville.
(20.5)
- 106.1 Hydeville. Turn left just beyond Exxon station, following road on west side of Lake Bomoseen toward West Castleton.
(22.5)
- 110.0 Vermont State Campground on right; go straight ahead past campground entrance onto dirt road, soon turning east toward Lake Bomoseen.
(26.4)
- 111.4 End of dirt road. Park at base of path up to quarry.
(27.8) Please do not block access to nearby house.

Stop 3. Cedar Mountain Slate Quarry.

The quarry displays many structural features of interest, including variously shaped green spots and a large recumbent synform. The synform closes to the east (hinge-line subhorizontal, trending north); a folded surface is exposed on the west wall of the quarry and fold profiles are exposed in the north wall. The main cleavage that provides the slate is subhorizontal, axial-planar to this fold. On this trip, attention will be focussed on the crenulation cleavages which overprint the main slaty cleavage.



antithetic



synthetic

Crenulation cleavages

The crenulation cleavage is mostly an antithetic kink-like variety; it may be seen in places in two conjugate orientations consistent with shortening parallel to the (shallow) dip direction of the slaty cleavage. Puzzling features which will be illustrated and discussed are the less frequent occurrence of synthetic crenulation cleavage (perhaps suggesting extension in the dip direction of the slaty cleavage), and some dark layers enriched in "insoluble" material. In a few places these layers coincide with crenulation cleavage planes, but in many places the crenulations and the dark layers seem to be independent of each other — not parallel and not genetically related although close together in the rock.

- 111.4 Retrace steps to Fairhaven, but now proceed south along east side of town green, through town.
- 118.9 Bear left up hill following Vt. route 22a south.
- 131.3 Join N.Y. route 22 and turn left on it.
- 176.4 Turn right from N.Y. route 22 onto N.Y. route 7, toward Troy.
- 196. Going down final hill into Troy —

For Field House: turn left at light onto Burdett Avenue (blue HOSPITAL sign on right). Follow Burdett Avenue past hospital on right to intersection (Peoples Avenue). Turn left to Field House.

For Communications Center and main campus: go down hill past blue HOSPITAL sign on right, 3 blocks to next light (15th Street). Turn left on 15th Street and continue south to Armory building (red brick with conical turrets). At blinking light, turn right onto main campus and right again into parking lots. The nearest building is the Communications Center.