## TRIP D

# SOME MINERAL LOCALITIES WEST OF BOSTON

C.S. Hurlbut, Jr. - Harvard University

Mineral localities in the neighborhood of Boston have never been numerous, but as the city has expanded and the suburbs built up some have become inaccessible and others have disappeared beneath roads and apartment buildings. Moreover, as farming has been abandoned in the outlying area and cultivated land has returned to forest, even some of the more remote localities are difficult to find; and once located, the minerals that can be found are few. This excursion, therefore, cannot be considered a mineral collecting trip, but rather a visit to some mineral localities of historic interest.

The following itinerary begins at the junction of Routes 2 and 128 West of Boston as shown by the accompanying sketch map.

### Itinerary

EN ROUTE TO STOP 1, beginning at Route 2 and 128.

6.8 miles west on Route 2 to junction with Route 62

7.1 miles to Stow on Route 62

3.7 miles west of Stow on Route 117 (.7 miles beyond General Radio Corporation) to Stop 1.

### Stop 1. Bolton Lime Quarry

This is the largest and best-known of a series of quarries in the string of metamorphosed dolomitic limestone bodies which extends from Bolton twenty miles northeast to Chemsford. The limestone bodies are roughly lens-shaped and are encolsed in the biotite gneiss of the Nashoba formation (Carboniferous).

The limestone from this and the other quarries has been used intermittently in the manufacture of plaster, cement, and agricultural lime since colonial times, but except for a brief period of activity about 25 years ago, there has been no quarrying in the twentieth century. As a result of this long period of disuse, most of the outcrops and dumps are overgrown and are difficult to find.

### BEWARE OF POISON IVY

In the main quarry, however, exposures are still good, and a represen-

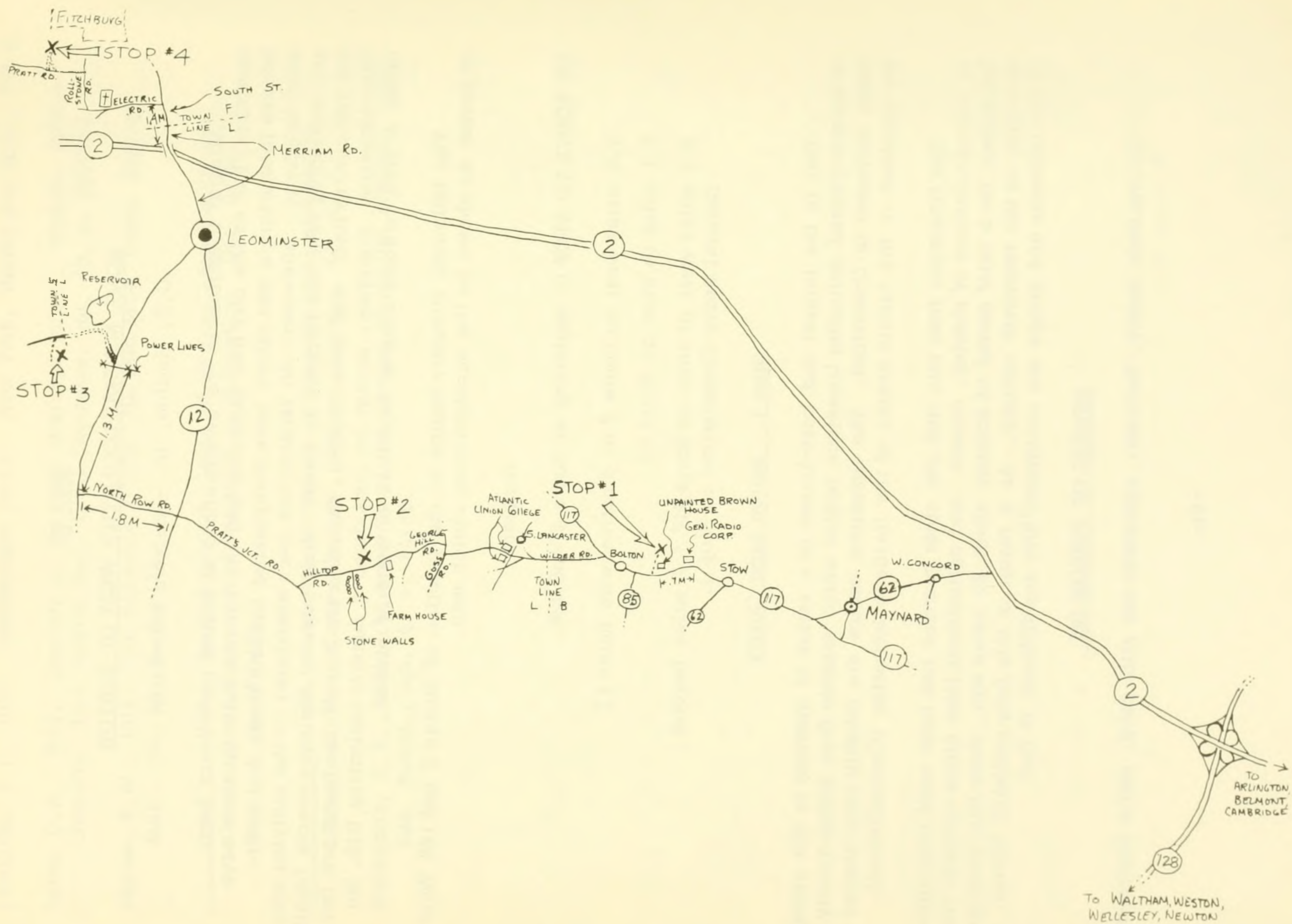


Figure 1. Stop locations for Trip D.

tative suite of the typical minerals of this classic locality can be obtained fairly easily.

Not clearly visible on the quarry face, but sometimes observed on single boulders, or even hand specimens, is the distinctive zoning described by Palache and Pinger (1923). Next to the gneiss is a layer, varying from a few inches to sixteen feet in width, of scapolite-rich limestone, then a layer of diopside and tremolite-rich rock, and finally a zone containing abundant olivine ("boltonite"), which grades into normal limestone.

Minerals

Scapolite - coarsely crystalline aggregates and single crystals, the latter being imbedded in quartz or calcite. Color varies from white to pinkish lavender. Crystals are generally rough, stout prisms, and have a distinctive silky luster due to the intersection of the prismatic cleavages.

"Boltonite" - actually a variety of forsterite. It occurs in the limestone as small gray to colorless grains, often altered to a yellowish color. Note the good pinacoidal cleavage.

Feldspars - chiefly microcline found in pegmatites associated with scapolite and phlogopite. Some andesine also present.

Diopside - abundant as light green grains and subhedral to euhedral crystals in the contact zone of the limestone.

Tremolite-actionolite - pale green to dark green blades and needles abundant in the border zone of the deposit.

Phlogopite - golden brown flakes. Scattered through limestone.

Sphene - in typical dark brown lens-shaped crystals dispersed in limestone, chiefly in the diopside-rich zone.

Garnet - small red grains associated with scapolite.

Chondrodite - yellow grains concentrated in olivine zone.

Apatite - bright blue-green grains and euhedral crystals up to three inches in length. Often associated with scapolite.

Spinel - small blue-gray octahedrons associated with chondrodite in the olivine zone.

Other accessory minerals identified at Bolton in small amounts: allanite, petalite, pyrite, graphite, rutile, arsenopyrite, chalcopyrite, pyrrhotite, fluorite, serpentine, and talc.

Reference: Palache, C. and Pinger, A.W., 1923, Scapolite Deposit of Bolton, Massachusetts: Amer. Min., 8: p. 153-157.

EN ROUTE FROM STOP 1 TO STOP 2

3.0 miles west on Route 117 through Bolton Center, bear left on Wilder Road;

3.5 miles to S. Lancaster (bearing left after crossing Route 110);

2.5 miles to Stop 2. From S. Lancaster pass through campus of Atlantic Union College to Goss Street at foot of hill. Turn right on Goss Street for a few hundred yards, then left on George Hill Road. Bear right on Hill Top Road, and go 1.3 miles to Stop 2.

## Stop 2. Chiastolite at Lancaster, Massachusetts

The first scientific discussion of this material appeared in the Boston Journal of Natural History in 1834. In his article, C.T. Jackson correctly hypothesized that chiastolite was a variety of andalusite. He incorrectly theorized that the typical cross-shaped pattern observed in the cross-section of the chiastolite was due to the aggregation of several separate crystals. It was later shown that the patterns resulted from the selective orientation of carbonaceous inclusions along certain crystallographic directions during the growth of the crystals.

The chiastolite occurs in aluminum-rich horizons in the gray slate of the Worcester phyllite. Sandy strata contain insufficient aluminum for the growth of the andalusite, and these barren sandy layers in the otherwise chiastolite-rich rock are conspicuous in the outcrops and stone walls of the Lancaster area.

Outcrops of the Worcester phyllite once numerous in the pasture land are now largely inaccessible and overgrown. The chiastolite can best be seen in the stone walls bordering the road along which we will pass.

CAUTION. In the past, over-enthusiastic mineral collectors have been guilty of tearing down the stone walls in their search for chiastolite. As a result, the local inhabitants are far from being sympathetic to the mineral collector. Thus at this locality please do more looking than collecting.

Reference: Jackson, C.T., 1834, An Account of the Chiastolite or Macle of Lancaster, Boston Jour. Nat. Hist., p. 155-62.

EN ROUTE FROM STOP 2 TO STOP 3

1.3 miles west on Hill Top Road, turn right on Pratt's Junction Road;

3.1 miles (crossing Route 12 and continuing on North Row Road to road intersection), turn right on road to Leominster;

1.3 miles turn left on gravel road under power line;

1.2 miles to Stop 3 (.2 miles beyond town line).

Stop 3. The Spodumene Boulder, Sterling, Massachusetts

This is the first locality for spodumene in the United States. The earliest mention of it appeared in an article by G.T. Bowen published in the American Journal of Sciences in 1824, the spodumene having been discovered the year before by a Mr. Nutfall. The boulder is a huge glacial erratic moved from a pegmatite which crops out on a hill more than a mile to the northeast. Smaller boulders containing spodumene are abundant in the woods and stone walls of the area. A boulder train of pegmatite containing spodumene has been traced several miles to the south.

Reference: Bower, G.T., 1824, Analysis of a Siliceous Hydrate of Copper from New Jersey, with a notice of the discovery of two localities of spodumene in the United States. Am. Jour. Sci. and Arts, 8: p. 118-121.

EN ROUTE FROM STOP 3 TO STOP 4

3.7 miles to Leominster Center; retrace route to paved road and turn left to Leominster;

3.7 miles turn left on Electric Road, Fitchburg - follow Merriam Road out of Leominster which becomes South Street in Fitchburg.

1.8 miles to Stop 4. Turn right off Electric Road to Rollstone Road; left on Pratt Road to top of hill.

Stop 4. Rollstone Hill Granite and Pegmatite, Fitchburg, Massachusetts

Rollstone Hill takes its name from a 112 ton glacial boulder of the Kinsman granite that originally stood on the crest of the hill west of Fitchburg and 400 feet above the town. When quarrying operations imperilled the boulder, it was blasted apart, removed from the mountain, and reassembled on the upper Common of Fitchburg on Main Street where it can be seen today.

At one time three quarries were in operation in the Fitchburg granite of Rollstone Hill, but none of these has been active for many years. Still observable is the pronounced sheeting parallel to the original contour of the hill. The granite, which was used for both dimension stone and concrete aggregate, is a medium-gray muscovite-biotite granite with feldspar grains up to 0.3 inches and mica flakes up to 0.2 inches. The feldspar is chiefly microcline and orthoclase, with subordinate amounts of oligoclase and albite. The quartz is generally light smoky and fractured. Accessories are garnet and apatite.

Of some interest are the abundant pegmatite stringers which cut the granite, especially near the crest of the hill. These pegmatites are generally of simple composition, the major constituents being microcline, quartz, mica, and black tourmaline. The tourmaline often occurs in radiating bundles. Minor accessories are garnet, allanite, beryl and apatite.

Reference: Dale, T.N., 1923, Commercial granites of New England: U.S. Geol. Survey Bull. 738, 228 p.