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Landowners only granted permission to visit these sites to the organizers of the original trips for the designated dates of the conference. It is your responsibility to obtain permission for your visit. Be aware that this permission may not be granted.

Especially when using older guidebooks in this collection, note that locations may have changed drastically. Likewise, geological interpretations may differ from current understandings.

Please respect any trip stops designated as “no hammers”, “no collecting” or the like.

Consider possible hazards and use appropriate caution and safety equipment.

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NEW ENGLAND INTERCOLLEGIATE GEOLOGICAL EXCURSION

Littleton, New Hampshire, October 10, 11, and 12, 1936

Second Notice

GENERAL FEATURES OF AREA: (1) paleontology; the chief Silurian and Devonian fossil localities will be visited, but there will be little opportunity to collect; (2) stratigraphy; chief stratigraphic units of the Ordovician(?), Silurian, and Devonian rocks; (3) structure; localities showing minor folding (the major folds are entirely inferred from the distribution of formations); (4) igneous geology; concordant injections, which accompanied the folding, and the younger ring-dikes; (5) metamorphism; progressive increase in metamorphism toward the southeast.

HEADQUARTERS: Headquarters will be at Thayers Hotel, Littleton, where there will be a registration and information desk for the excursion. This desk will be opened at 5:00 P.M. Friday, October 9th.

REGISTRATION: It will greatly aid the committee if everyone attending the excursion will register and indicate which of the various trips they wish to take.

HOTEL ACCOMMODATIONS: Traffic over the weekend of October 12th will be unusually heavy this year, and it is advisable to make hotel reservations in advance. Write directly to hotel.

The largest hotel is Thayers Hotel (Kenneth W. Foley, mgr.) with the following rates:

Double bed and running water	\$1.25 per person
Single room and running water	1.50 per person
Double bed and bath	1.50 per person
Twin beds and bath	2.00 per person
Single room and bath	2.00 per person

This hotel has just been renovated and the rates are about as reasonable as can be obtained in tourist cabins and tourist homes.

Accommodations may also be obtained at Lee's Hotel and Gray Tourist Camps. In addition there are numerous small tourist homes.

RESTAURANTS: There are numerous restaurants in Littleton, including Thayers Grill (part of Thayers Hotel), Lee's Restaurant, Hollywood Restaurant, White Mountain Cafe, Premier Cafe, and Littleton Diner (open 24 hours a day).

GENERAL PLAN FOR TRIPS:

Saturday, October 10. Only one trip starting at 8:00 A.M. is planned for this day. This is Trip A, led by Marland P. Billings and Arthur B. Cleaves, to see the stratigraphy and structure of the Ordovician (?), Silurian, and Devonian rocks of low-grade metamorphic character in the Littleton quadrangle and northwest corner of the Moosilauke quadrangle. Fossil localities will be

visited. This is an automobile trip, with no locality over one-quarter mile from the road.

Sunday, October 11. Two alternate all-day trips are planned for this day, Trip B led by Marland P. Billings and Trip C led by Charles R. Williams. Trip B is an automobile trip, and no locality is over one-quarter of a mile from the road. This trip is in Moosilauke quadrangle and is to see the progressive increase in the metamorphism of the Paleozoic sediments toward the southeast and the appearance of great, concordant igneous intrusions. Trip C is a rather strenuous mountain-climbing trip, and automobiles will be used only to get to the foot of the mountain. The purpose of the trip is to see the ring-dike structure, including the associated Moat volcanics, in the northeast corner of the Franconia quadrangle. In case of bad weather this trip will have to be modified or cancelled, in which case everyone could take trip B.

Monday, October 12. Three alternate, all-day trips are planned for this day, Trip D, led by Marland P. Billings and Arthur B. Cleaves, Trip E led by Charles R. Williams, and Trip F led by Jarvis B. Hadley. Trip F is an automobile trip, and no locality is over one-quarter of a mile from the road. Trips D and E are strenuous, mountain-climbing trips, and automobiles will be used only to get to the foot of the mountains. Trips D and E will be taken only if the weather is good, otherwise everyone could take trip F. Trip D is to give further opportunity for studying the lithology and structure of the Devonian sediments under conditions of high-grade (katezonal) metamorphism on Mt. Moosilauke; fossil locality in schists will be visited. Trip E is to see the Franconia Ridge ring-dike. Trip F, chiefly in the Mt. Cube quadrangle, will give opportunity to see stratigraphic units older than any of those seen in the Littleton and Moosilauke quadrangles; also, to see the great, pre-folding, laccolith-like domes which exerted a great influence on the folded structures of western New Hampshire.

ITINERARIES FOR TRIPS: Detailed itineraries for the five trips are enclosed.

TOPOGRAPHIC MAPS: Each car will be supplied with one set of topographic maps showing localities to be visited. In addition everyone interested should have his own set of topographic maps. Trips will be made in the following quadrangles: Littleton, Moosilauke, Franconia, and Mt. Cube. In addition the following visits are desirable: Woodsville, Rumney, Whitfield, Crawford Notch.

GEOLOGICAL LITERATURE:

1. Marland P. Billings. Geology of the Littleton and Moosilauke Quadrangles, New Hampshire. N.H. State Planning and Development Commission, 1935.
2. Marland Billings and Charles R. Williams. Geology of the Franconia Quadrangle, New Hampshire. N.H. State Planning and Development Commission, 1935.

3. Marland Billings and Arthur B. Cleaves. Paleontology of the Littleton area, New Hampshire. Am. Jour. Science, vol. 28, pp. 412-438, 1934.
4. Marland Billings and Arthur B. Cleaves. Brachiopods from mica schist, Mt. Clough, New Hampshire. Am. Jour. Science, vol. 30, pp. 530-536, 1935.
5. Randolph W. Chapman and Charles R. Williams, Evolution of the White Mountain magma series, Am. Min., vol. 20, pp. 502-530, 1935.

MEETING SATURDAY EVENING: At 8:00 o'clock Saturday evening an informal meeting will be held to discuss the geology of western New Hampshire. If the group is not too large, this meeting will be held in Thayers Hotel, but a change may be necessary.

September 22, 1936

Marland Billings
Dept. of Geology
Harvard University
Cambridge, Mass.

NEW ENGLAND INTERCOLLEGIATE GEOLOGICAL EXCURSION

Littleton, New Hampshire, October 10-12, 1936

TRIP A. Saturday, October 10, 1936

LEADERS: Marland P. Billings and Arthur B. Cleaves

AREA: Littleton quadrangle and northwest corner of the Moosilauke quadrangle.

PURPOSE: Chiefly to see the stratigraphy and structure of the Ordovician (?), Silurian, and Devonian rocks where they have undergone low-grade (epizonal) metamorphism.

LITERATURE AND GEOLOGICAL MAPS: Geology of the Littleton and Moosilauke quadrangles, N.H., by Marland P. Billings, published by State Planning and Development Commission, Concord, N.H. Paleontology of the Littleton area, N.H., Marland P. Billings and Arthur B. Cleaves, Am. Jour. Sci., vol. 28, pp. 412-438, 1934.

TOPOGRAPHIC MAPS: Each car, in so far as possible, will be furnished with copies of the Littleton and Moosilauke quadrangles showing the route to be followed and the localities to be visited.

LUNCHEON: Bring your own lunch and water, as we shall eat lunch ten miles from the nearest restaurant or store.

ITINERARY

Locality Mileage Time

Start	0	8:00	Cars gather on west end of Main Street, Littleton, about 1/8th of a mile west of the Post Office (new brick and marble building), heading west. Follow route 18 west.
--	0.3	--	Note terraces on southeast side of the Ammonoosuc River.
--	1.4	--	Turn left on to dirt road.
1.	1.7	8:15 to 9:15	Type locality and best fossil locality for the Fitch formation (middle Silurian). Also the type locality for the Highlandcroft granodiorite; unconformity between Fitch and Highlandcroft will be seen.
--	1.8	--	Take left turn.
--	2.6	--	Take left turn.
2.	3.7	9:30 to 10:15	DANGER: DUE TO THE OVERHANG AND LOOSENESS OF THE WALLS, THIS QUARRY IS DANGEROUS. Slates of the lower part of the Littleton formation and the volcanic member of the Littleton formation (lower Devonian).
--	4.1	--	Continue straight ahead.

<u>Locality</u>	<u>Mileage</u>	<u>Time</u>	
--	4.3	--	Turn left.
--	4.7	--	Continue straight ahead.
3.	4.9	10:30 to 11:00	Slates and sandstones of the middle part of the Littleton formation. Best Oriskany fossil locality. After visiting this locality we go back in the direction from which we came.
--	5.2	--	Continue straight ahead.
--	5.5	--	Turn left.
--	6.7	--	Continue straight ahead.
4.	7.4	11:15 to 12:15	Ammonoosuc volcanics, type locality. Bedded Chlorite schists and soda-rhyolite volcanic conglomerates and soda-rhyolite tuffs.
		12:15 to 1:15	Lunch period at Locality 4.
--	7.7	--	Turn left
--	9.6	--	Turn left.
--	10.5	--	Take right fork.
--	10.9	--	Turn left on to tar road.
--	11.3	--	Turn right on to dirt road.
--	11.8	--	Keep straight ahead.
5.	12.6	1:30 to 2:30	Turn left into farm yard. <u>Section across the Ammonoosuc volcanics, Clough conglomerate, Fitch formation, and Littleton formation.</u> After visiting this locality turn left on leaving farm yard.
--	13.4	--	Turn left on tar road. Note outcrops of Clough conglomerate (type locality of Clough).
--	14.6	--	1/4 mile to south is adit 1000 feet long through the Littleton formation.
--	15.1	--	Turn left.
6.	15.4	2:45 to 3:30	Albee formation on southeast side of the Ammonoosuc thrust striking directly into the thrust. Directly northwest of the thrust is an overturned slice of the Ammonoosuc volcanics, Clough conglomerate, and Fitch formation.
--	16.6	--	Turn right on to tar road.
--	16.9	--	Turn right on to dirt road.
--	18.9	--	Turn left on to tar road.
--	19.6	--	Lisbon; turn right.
--	19.7	--	Take left fork.
7.	20.8	3:45	

TRIP A - Page 3

Locality Mileage Time

7.	20.8	3:45 to 4:15	Park in field on right. <u>Ammonoosuc thrust</u> . Fitch formation thrust over Remick tonalite. Thrust plane silicified so that strike and dip may be measured. After visiting this locality we go back in the direction from which we came.
--	21.4	--	Note top of terrace, 100 feet to the right, and 150 feet above the level of the Ammonoosuc River.
--	22.0	--	Go straight over bridge.
--	22.1	--	Turn left on route 10.
--	23.3	--	Cobleigh Airport. Note terraces on right.
--	24.4	--	Take left fork.
8.	25.1	4:30 to 5:00	Park at Salmon Hole School. Ammonoosuc volcanics in mesozone.

End of trip. Take route 10 to get to Littleton, 7 miles to the northeast.

NEW ENGLAND INTERCOLLEGIATE GEOLOGICAL EXCURSION

Littleton, New Hampshire, October 10-12, 1936

TRIP B. Sunday, October 11, 1936

LEADER: Marland P. Billings.

AREA: Moosilauke quadrangle.

PURPOSE: To see the stratigraphy and structure of the Ordovician(?), Silurian, and Devonian rocks where they have undergone middle-grade (mesozonal), and high-grade (katazonal) metamorphism. Also plutonic bodies that accompanied the deformation.

LITERATURE AND GEOLOGICAL MAPS: Geology of the Littleton and Moosilauke quadrangles, N.H., published by the State Planning and Development Commission, Concord, N.H.

TOPOGRAPHIC MAPS: As part of the Trip A each car was provided with a copy of the topographic map of the Moosilauke quadrangle showing the route and localities for both Trips A and B.

LUNCHEON: Bring your own lunch and water. At Swiftwater, where we will have lunch, there is no restaurant, but there is a general store where bread, crackers, jam, etc. may be purchased.

ITINERARY

Locality Mileage Time

Start	0	8:00	Cars gather on the west end of Main Street, Littleton, about 1/8th of a mile west of the Post Office (new brick and marble building), heading west. Follow route 10 toward Lisbon and Woodsville. Continue on concrete for five miles.
--	0.4	--	Note terraces both sides of Ammonoosuc River.
--	3.8	--	Outcrops of Bethlehem gneiss on left in Ammonoosuc River.
--	5.0	--	Turn left on to tar road.
--	5.1	--	Turn left over bridge.
1.	5.2	8:15 to 9:30	<u>Rock Pool Club</u> . After parking, cross the Gale River on the railroad bridge. See Fitch formation (mezozone) along Ammonoosuc River; crinoid columnals and calyces in marble. Return over railroad bridge, and study section along the Gale River. Volcanic member and overlying mica schists of Littleton formation (mesozonal but showing some retrogressive effects).

Locality	Mileage	Time	
--	5.4	--	Turn left on leaving Rock Pool Club.
--	5.5	--	Turn left upon crossing bridge.
--	8.0	--	DANGER. Enter concrete highway cautiously.
--		--	DANGER. After crossing steel bridge over the Ammonoosuc River, go about 0.1 of a mile and turn left on to the Sugar Hill road. Crossing traffic is dangerous! Follow tar road for 4.5 miles.
--	12.5	--	Take sharp left turn.
2.	13.6	10:00 to 11:30	Park at the four corners. First see Fitch formation, including Northey Hill quartzite member, and the underlying Clough conglomerate, both in the mesozone. Glacial polishing, striations, and crescentic fractures. Second see the staurolite schists of the Littleton formation (mesozone). After leaving locality, we go back in the direction from which we came.
--	14.7	--	Turn sharp right on to tar road.
--	19.2	--	Turn left on to concrete highway; continue for nine miles, passing through Lisbon and Bath.
--	28.6	--	Immediately after crossing bridge over the Wild Ammonoosuc turn left on tar road toward Swiftwater and Lost River.
3.	29.9	12:00 to 12:20	Ammonoosuc volcanics (mesozone). Well-bedded basic crystal tuffs, now metamorphosed to amphibolites. Continue up the river.
4.	30.8	12:30 to 1:30	Lunch at Swiftwater.
		1:30 to 2:00	After lunch study the Ammonoosuc volcanics, (mesozone), showing soda-rhyolite tuffs and breccias and "stretched pebbles". Continue up the river.
--	32.1	--	Take dirt road straight ahead instead of following tar road where it takes sharp bend to right.
--	32.9	--	Bethlehem gneiss on the right.
5.	33.2	2:15 to 2:45	Bethlehem gneiss, showing foliation and linear features. Continue southeast.
--	34.0	--	View of Kinsman Range (left) and Mt. Moosilauke straight ahead. Note mature valley stage of Wild Ammonoosuc River, 300 feet above the bottom of the present V-shaped stream.

Locality Mileage Time

--	34.5	--	Continue straight ahead.
--	35.4	--	Continue on tar road.
--	35.8	--	Continue straight ahead.
--	36.0	--	Take left fork.
--	37.5	--	Outcrops of Bethlehem gneiss under bridge Immediately upon crossing bridge turn right toward Lost River.
--	38.4	--	Continue straight on route 112.
--	38.7	--	Continue straight on tar road.
--	41.5	--	Foot of Kinsman Notch.
6.	43.0	3:15 to 4:30	Park at Lost River. Kinsman quartz mon- zonite and Littleton formation (katazone).

NEW ENGLAND INTERCOLLEGIATE GEOLOGICAL EXCURSION

Littleton, New Hampshire, October 10-12, 1936

TRIP C. Sunday, October 11, 1936

LEADER: Charles R. Williams.

AREA: Mt. Hale, northeast corner of the Franconia quadrangle.

PURPOSE: To study the structure and lithology of the Mt. Garfield ring-dike, associated Moat volcanics, and the adjacent formations.

LITERATURE AND GEOLOGICAL MAPS: Geology of the Franconia quadrangle, N.H., by Marland P. Billings and Charles R. Williams, published by State Planning and Development Commission, Concord, N.H. Evolution of the White Mountain magma series, by Randolph W. Chapman and Charles R. Williams, Am. Min., vol.20, pp. 502-530, 1935.

TOPOGRAPHIC MAPS: Franconia quadrangle essential; Whitefield and Crawford Notch desirable.

STRENUOUS TRIP: This is a rather strenuous trip, although not quite as severe as the Mt. Moosilauke and Franconia Ridge trips. It involves ten miles of walking and climbing 2500 feet. Trails will be followed most of the way, but there will be about one and one-half miles through woodland without trails. This trip will be taken only if the weather is good.

LUNCHEON: Bring own lunch.

ITINERARY

Cars gather at post-office, Franconia, at 8:00 A.M.
(Franconia is about a 20-minute drive from Littleton).

Mileage

Start	Take route 13 toward Franconia Notch.
0.6	Note view of Franconia Notch straight ahead; Mt. Lafayette to left, Profile Mtn. to right.
2.1	Turn left on to Butter Hill Road.
3.2	Take right fork (Road to Twin Mountain)
3.7	Turn left on to U.S. Route 3. Continue on this route for nine miles.
12.2	View of Presidential Range directly ahead.
12.8	100 yards beyond Rest Haven tourist camp turn sharp right on to dirt road.
13.3	Continue straight.
13.7	Take right fork
14.0	Continue straight
14.1	Park Cars. Take trail up Little River.

Locality 1. (8:45 to 9:0). Bickford granite (New Hampshire magma series). Structurally this granite is intrusive, probably

sill-like, into the southeast flank of an anticline that has been traced from Grantham to near Randolph, a distance of about 75 miles

Go up trail about one mile; although there are no outcrops along the valley-bottom here, outcrops on the adjacent hills permit mapping the rock as Kinsman quartz monzonite.

Locality 2. (9:30 to 10:10) Mt. Garfield porphyritic quartz syenite composing the Mt. Garfield ring-dike. In addition to this locality, this same rock will be seen at several other places along the trail and also at one point in the river. There is not sufficient time, however, to visit all the outcrops in the river.

Locality 3. (10:20 to 10:30) Talford schist (Devonian), with some intrusive rock.

About two miles from where the cars are parked, turn east on to trail up Mt. Hale. On climb up Mt. Hale (10:30 to 12:30) outcrops of the Talford schists will be seen.

Lunch on top of Mt. Hale (4077 feet) from 12:30 to 1:30).

Locality 4. Top of Mt. Hale (1:30 to 2:30). Moat volcanics dipping steeply to south. Largest outcrops on east slope of mountain, short way below summit.

From top of Mt. Hale go down west slope. About 1/3rd of a mile of bush-whacking.

Locality 5. (3:15 to 3:45). Angular unconformity between the Moat volcanics and the Talford schists. Although the exact contact of the two formations cannot be seen, there can be no reasonable doubt as to the stratigraphic and structural relations.

Follow brook down to the Little River (3:45 to 4:30) Outcrops of Talford schist abundant, but lack of time will not permit much detailed study.

Follow trail down the Little River to where cars are parked. (4:30 to 5:00).

NEW ENGLAND INTERCOLLEGIATE GEOLOGICAL EXCURSION

Littleton, New Hampshire, October 10-12, 1936

TRIP D. Monday, October 12, 1936

LEADERS: Marland P. Billings and Arthur B. Cleaves.

AREA: Mt. Clough and Mt. Moosilauke.

PURPOSE: To study structure and lithology of Littleton formation under conditions of high-grade (katazonal) metamorphism.

LITERATURE AND GEOLOGICAL MAPS: Geology of the Littleton and Moosilauke quadrangles, New Hampshire, by Marland P. Billings published by State Planning and Development Commission, Concord, N.H. Brachiopods from mica schist, Mt. Clough, N.H., Marland P. Billings and Arthur B. Cleaves, Am. Jour. Sci., vol. 30, pp. 530-536, 1935.

TOPOGRAPHIC MAP: Mt. Moosilauke quadrangle, N.H.

STRENUOUS TRIP: This is an all-day hiking trip. It involves at least eight miles of walking, and climbing over 4000 feet. Trails will be followed all the way, except for short side trips for geological observation. This trip can be taken only if the weather is good.

LUNCHEON: Bring own lunch. Water can be obtained from streams.

ITINERARY

Cars gather at Swiftwater at 8:00 A.M. (Swiftwater is about a forty minute drive from Littleton). We plan to start on the west side of Mt. Moosilauke, cross the mountain, and end up in Kinsman Notch. We want to leave some of the cars at Kinsman Notch (Lost River). After leaving the cars here, the whole party will go to the west side of the Mt. Moosilauke. There is now a road up Tunnel Brook as far as the foot of the Benton Trail. Cars will be parked here.

Walk up Glencliff trail for about 1 3/4 miles to first "slide" (avalanche) on the east slope of Mt. Clough.

Locality 1. (9:30 to 10:30) "Slide" about 700 feet high on east slope of Mt. Clough. Littleton formation (katazonal). Interbedded quartz-mica schist and sillimanite schist; dip essentially vertical. This is the locality where two brachiopods were found in the bed rock. Pegmatites cut the schists. Bethlehem gneiss at the top of the slide.

Now return half a mile down the trail to where the Tunnel Ravine trail begins.

Locality 2. (11:00 to 12:00) "Slide B" in Tunnel Ravine, to see lithology of Littleton formation in katazone, and overturned fold with axial plane dipping northwest.

Follow Tunnel Ravine trail as rapidly as possible, making a few observations whenever the leaders get tired of climbing.

Lunch at base of the "big slide" at head of Tunnel Ravine. (12:45 to 1:30)

Locality 3. (1:30 to 3:00). "Big slide", 1000 feet high, at head of Tunnel Ravine. The schists in general dip from 50° to 75° to the northwest. Minor folds usually indicate that a synclinal axis lies to the northwest.

From the top of the slide we follow the Benton trail to the top of Mt. Moosilauke.

Locality 4. (3:15 to 3:30) Top of Mt. Moosilauke.

From the summit take the Beaver Brook trail toward Kinsman Notch (Lost River).

Locality 5. (4:00) Head of Jobildunk Ravine, a glacial cirque.

Locality 6. (4:30 to 5:00) Between elevations of 3200 and 2300 feet on Beaver Brook are almost continuous outcrops of the Littleton formation (katazone), showing some folds.

NEW ENGLAND INTERCOLLEGIATE GEOLOGICAL EXCURSION

Littleton, New Hampshire, October 10-12, 1936

TRIP E. Monday, October 12, 1936

LEADER: Charles R. Williams.

AREA: Franconia Ridge.

PURPOSE: To see the Franconia Ridge ring-dike and the adjacent formations.

LITERATURE AND GEOLOGICAL MAPS: Geology of the Franconia quadrangle, by Marland P. Billings and Charles R. Williams, published by the State Planning and Development Commission, Concord, N.H. Evolution of the White Mountain magma series, by Randolph W. Chapman and Charles R. Williams, Am. Min., vol. 20, pp. 502-530, 1935.

TOPOGRAPHIC MAP: Franconia quadrangle, N.H.

STRENUOUS TRIP: This is a rather strenuous all-day hiking trip. It involves ten miles of walking and climbing 3500 feet. Trails will be followed all the way. For three miles the trip is above timber line. This trip will be taken only if the weather is good.

LUNCHEON: Bring lunch and water. From 12:00 to 4:00 no water will be available.

ITINERARY

Cars gather at parking space for The Old Man of the Mountains, about four miles south of Franconia, at 8:00 A.M. (About 40 minute drive from Littleton).

Take Greenleaf Trail up Mt. Lafayette.

Locality 1. (8:30 to 8:45). Franconia breccia; an intrusive breccia.

Continue up trail.

Locality 2. (9:30 to 9:45). Eagle Pass. Franconia breccia. Also good view of Profile cliffs, composed of Conway granite. Continue up trail.

Locality 3. (10:45 to 11:30). AMC Greenleaf Hut. Kinsman quartz monzonite (porphyritic gneiss of Hitchcock). Continue up trail.

Locality 4. (12:30 to 2:00). Summit of Mt. Lafayette (5249 feet). Type locality of the Mt. Lafayette granite porphyry of the White Mountain magma series. Also have lunch here. Superb views of the White Mountains.

Take trail south along Franconia Ridge.

Locality 5. (2:10 to 2:15) Half mile south of summit of Mt. Lafayette. Mt. Garfield porphyritic quartz syenite.

Continue south for three miles over Mt. Lincoln and Little Haystack.

Locality 6. (3:30 to 3:40) Kinsman quartz monzonite, part of a small screen between the Mt. Garfield ring-dike and the Franconia Ridge ring-dike.

Take trail down the mountain toward The Flume.

Locality 7. (3:50 to 4:00). AMC Mt. Liberty shelter. Spring. Mt. Lafayette granite porphyry.

Follow trail toward The Flume.

Locality 8. (4:30 to 5:00) The Flume. Conway granite cut by an echelon lamprophyres.

NEW ENGLAND INTERCOLLEGIATE GEOLOGICAL EXCURSION

Littleton, New Hampshire, October 10-12, 1936

TRIP F. Monday, October 12, 1936

LEADER: Jarvis B. Hadley.

AREA: Southern part of the Mt. Moosilauke quadrangle and the Mt. Cube quadrangle.

PURPOSE: To see the great igneous domes of western New Hampshire, and the stratigraphy and structure of Ordovician (?) formations older than those observed in the Littleton and Moosilauke quadrangles.

LITERATURE AND GEOLOGICAL MAPS: For that part of the trip in the Moosilauke quadrangle see Geology of the Littleton and Moosilauke quadrangles, by Marland P. Billings; for that part of the trip in the Mt. Cube quadrangle, which has been recently mapped by Mr. Hadley, no data have been published, but a one-color, sketch map of the geology is being prepared by Mr. Hadley to issue at the meetings.

TOPOGRAPHIC MAPS: Each car, in so far as possible, will be furnished with copies of the Moosilauke and Mt. Cube quadrangles showing the route to be followed and the localities to be visited.

LUNCHEON: Bring own lunch and water.

ITINERARY

<u>Locality</u>	<u>Mileage</u>	<u>Time</u>	
Start	0.0	8:00	Cars gather at North Haverhill near the monument at the junction of state highway number 10 and the road to Benton. (North Haverhill is about 28 miles southwest of Littleton and should take about 3/4 of an hour to reach.) Follow Benton road through Center Haverhill.
--	2.7	--	About 0.4 mile east of Center Haverhill keep straight ahead instead of following tar road to left.
--	4.4	--	Turn left into entrance to Transient camp Chippewas.
1.	4.5	8:20 to 8:35	See Fitch formation in abandoned lime quarries. Return to road and continue south.
--	5.0	--	Sugarloaf Mtn. on left. Note dip slopes of the Clough quartz conglomerate, dipping NNW. The Clough is repeated there at least three times by thrusting.
2.	6.0	8:45 to 9:45	Park at farmhouse on right. Climb 1380 hill east of road to see Ammonoosuc Volcanics and Clough formation, also excellent view of Owls Head igneous dome and a distant view of the thrust faults on Sugarloaf Mtn. Continue south.

<u>Locality</u>	<u>Mileage</u>	<u>Time</u>	
--	6.35	--	Take right turn at schoolhouse. Then next left.
3.	6.5	9:55	Park beside road. Sill of Owls Head granite.
		to	On leaving take right fork.
	7.8	--	Turn right onto state highway No.25 at East Haverhill.
	9.2	--	Enter Woodsville quadrangle.
	9.4	--	Turn left off main highway onto dirt road at Pike School. Take right fork.
	10.1	--	Four corners, continue straight. Abandoned whetstone quarries in Littleton formation.
	11.3	--	Four corners. Continue straight, not on road to Lake Tarleton. Outcrops are amphibolite sills in Littleton formation.
	11.8	--	Enter Mt. Cube quadrangle. Bear right.
4.	12.5	10:30	Park along right of road. Climb hill to east of road to see Blackberry schists,
		to	Hardy Hill quartzite abutting against the Northey Hill thrust fault, and rock types in the Littleton formation. Return to cars and continue south.
		11:30	
5.	13.0	11:35	Park along road at three corners. Climb hill to west of road to see stratigraphy of the
		to	Blackberry formation and Pike volcanics and Albee formation.
		12:30	
--	--	12:30	Stop for lunch at locality 5. Then to continue south.
		to	
		1:30	
--	14.3	--	Peaked Mtn. ahead, a mass of intrusive Amphibolite in the Albee formation.
	14.6	--	Take right turn at four corners.
	16.9	--	Piermont village; turn left on state highway No.10.
	19.5	--	Sawyer Mtn. on right across the Conn. River is Fairlee quartz monzonite immediately overlying the Ammonoosuc thrust.
	22.2	--	Bear right. Fairlee quartz monzonite ahead. Entering Orford.
	23.3	--	Turn left onto route 25A (marked 111 on the map) to Orfordville. Go nearly through Orfordville.
	26.0	--	Turn right onto dirt road at Gulf gasoline station.

<u>Locality</u>	<u>Mileage</u>	<u>Time</u>	
6.	26.8	2:00	Park in farmyard at top of hill. See sediments and volcanics in the Blackberry formation. Northward plunging structures of Salmon Hole syncline well displayed. Return to Orfordville and to state highway No.10.
		3:00	
	30.3	--	Take left turn onto highway No.10.
	32.2	--	Bear left on highway. Note eroded terraces in glacial lake deposits.
--	36.8	--	Take left fork to Lyme Center.
	37.0	--	On right gravel pits in extensive delta deposits in extinct glacial lake.
	37.3	--	Bear left and continue through Lyme Center to end of tarred road.
7.	39.9	3:30	Park along road right at fork. See Fitch, Clough and Ammonoosuc on northwest limb of the Mascoma igneous dome. Stretched pebbles in the Clough.
			Continue on right fork for 1.5 miles.
	40.8	--	Holts Ledge on right is Ammonoosuc formation and transition to Mascoma group of igneous rocks. Structure may be seen in upper part of cliffs dipping northwestward.
8.	41.4	4:15	Park at three corners. See Oligoclase granodiorite of Mascoma group, (igneous rocks of the Mascoma dome.)
		5:00	

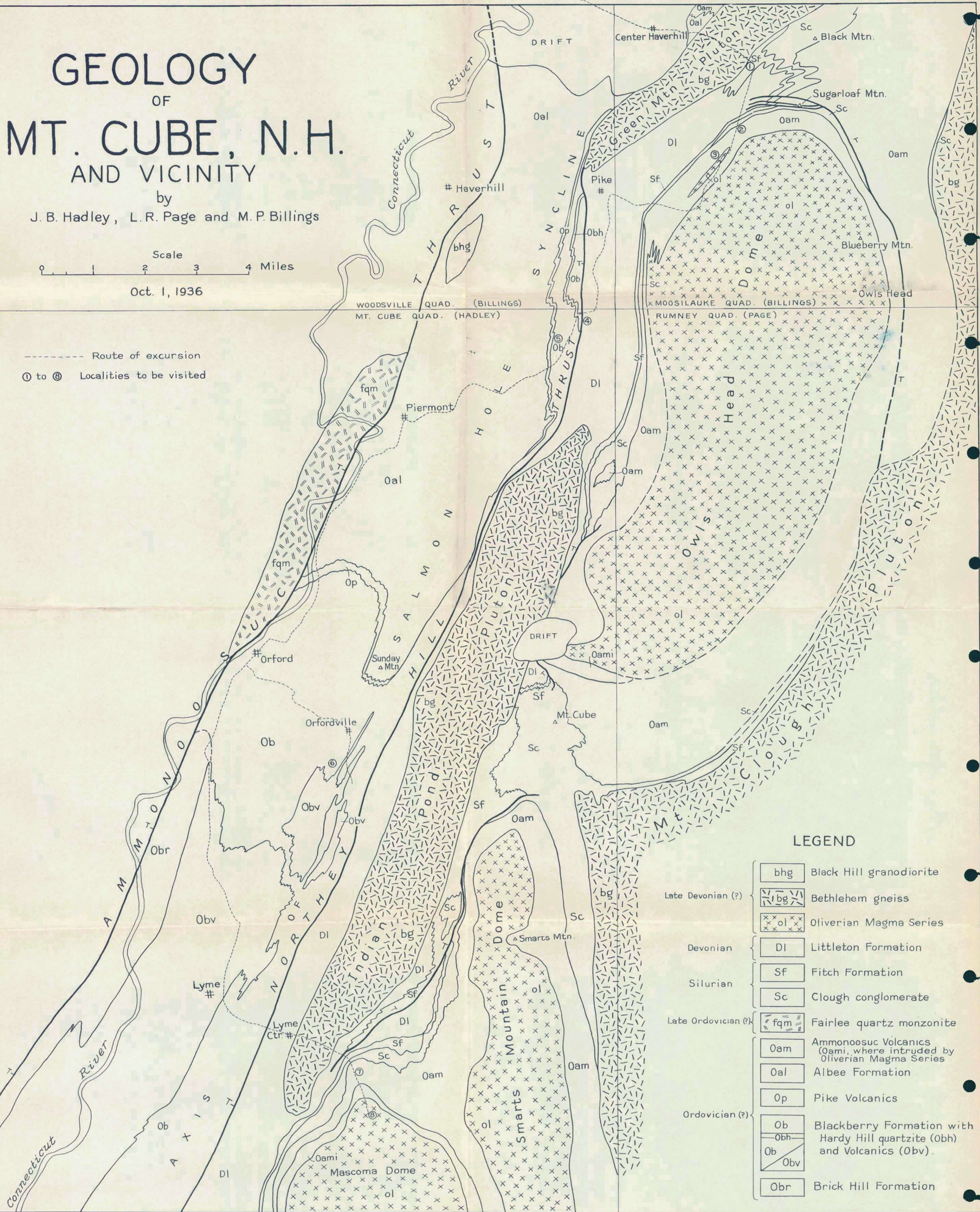
GEOLOGY OF MT. CUBE, N.H. AND VICINITY

by
J. B. Hadley, L. R. Page and M. P. Billings

Scale
0 1 2 3 4 Miles

Oct. 1, 1936

----- Route of excursion
① to ⑧ Localities to be visited



LEGEND

bhg	Black Hill granodiorite
bg	Bethlehem gneiss
ol	Oliverian Magma Series
DI	Devonian Littleton Formation
Sf	Silurian Fitch Formation
Sc	Clough conglomerate
fqm	Late Ordovician (?) Fairlee quartz monzonite
Oam	Ammonoosuc Volcanics (Oami, where intruded by Oliverian Magma Series)
Oal	Albee Formation
Op	Pike Volcanics
Ob	Ordovician (?) Blackberry Formation with Hardy Hill quartzite (Obh) and Volcanics (Obv).
Obh	
Obv	
Obr	Brick Hill Formation