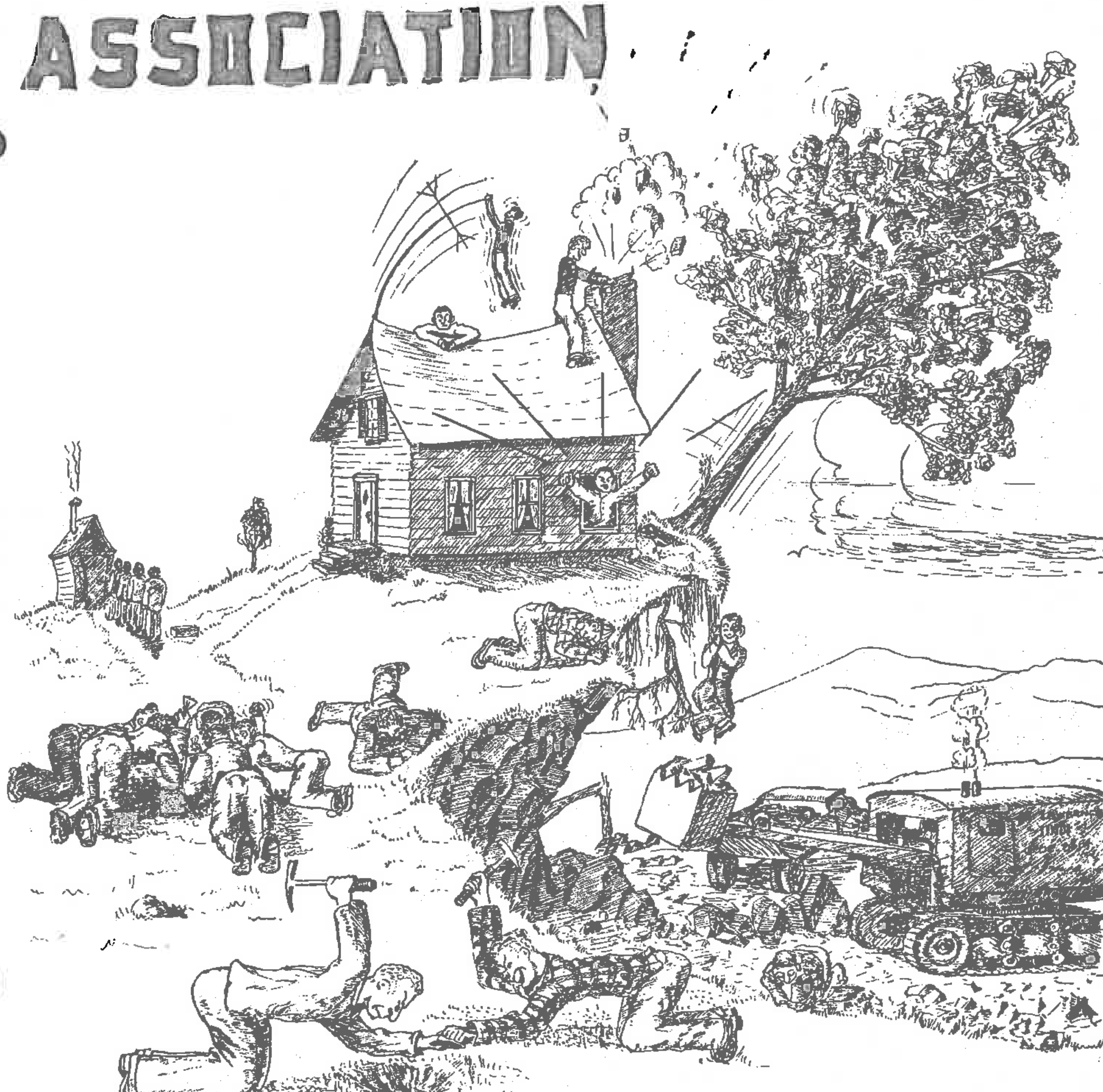
N.Y. STATE GEOLOGICAL ASSOCIATION



25th ANNUAL MEETING MAY 1-2

CANTON, N.Y.

Foreword

The St. Lawrence University is pleased to welcome you to the 25th Annual Meeting of the New York State Geological Association. We hope you will be comfortable and that your visit is a pleasant experience.

We are grateful to:

Mr. Norman Donald of the St. Joseph Lead Company for the very large part he has contributed to the program.

Dr. John Prucha of the New York State Geological Survey for his cooperation and participation.

Numerous property owners for permission to trespass.

Program

Thursday Afternoon and Evening

April 30, 1953

1. Registration, Men's Residence.
2. Pre-field Trip Talks, 8:00 P. M., Hepburn Hall, Room 38.

   John Prucha, Adirondack Geology.

   Norman Donald, Geology of the Zinc-Talc District.

Friday, May 1, 1953

1. Trip to Balmat and Benson Mines Districts.
2. Dinner, 7:00 P. M.

Saturday, May 2, 1953

1. Outcrop Trip.

Summary of Regional Geology

John James Prucha

New York State Science Service

The Adirondack region encompasses nearly 10,000 square miles of Precambrian rocks bounded by the St. Lawrence, Black, Mohawk, and Champlain-Hudson valleys. The central and eastern parts of the region are mountainous with 46 peaks over 4000 feet above sea level. Toward the northwest the elevation and relief decrease gradually to the Grenville Lowlands along St. Lawrence River.

Ebenezer Emmons, geologist of the Second Geological District of New York, published in 1842, the first systematic description of the rocks of the Adirondack region. Fifty years later, under the auspices of the New York State Museum, systematic studies of the geology by townships and counties began. During this period, Kemp, Smyth, Cushing, and Newland made valuable and lasting contributions to the geology of the region. In 1905, a quadrangle report by Ogilvie was the first such report published by the State Museum. Detailed geologic mapping on a quadrangle basis has continued to the present. Although a complete listing of the workers in the Precambrian of the Adirondack region is hardly necessary, some mention might be made of Dale, Martin, Miller, Reed, Alling, Balk, Buddington, and

Engel. Each of these men have made significant contributions to our knowledge of the geology of the region. Detailed studies of the economic geology, stratigraphy, geophysics, geochemistry, petrology, glacial geology, and areal geology of the region currently are being carried on by private companies, the U. S. Geological Survey, several universities, and the New York State Science Service. That which is now known about Adirondack geology is but a small fraction of the knowledge which yet remains to be achieved before our understanding of the area is adequate.

The core of the Adirondacks is a large body of anorthosite and gabbroic anorthosite underlying an area of about 1500 square miles in the eastern part of the region. Locally with the core there are small bodies of gabbro related to the anorthosite and small bodies of metasedimentary rocks and rocks related to the younger quartz syenite series.

Between the core and the predominantly metasedimentary rocks on the northwest and south there is an igneous complex, with some metasediments, which comprises the greater part of the Adirondack massif. The bulk of these rocks is granitic in composition, but two principal groups are recognized - the older quartz syenite series and the younger granites. The first group is differentiated into types ranging from ultramafic layers and shonkinite, through pyroxene syenites and quartz syenites, to granite and alaskite. The second group, the granite series, is dominantly composed of hornblende-microperthite granite with subordinate amounts of related microcline granite, alaskite, and soda granite.

Flanking the Adirondack massif on the northwest and south are broad belts of dominantly metasedimentary rocks which are regarded as part of the Grenville series - the oldest rocks of the region. Relatively little is known about the Grenville rocks in the southern belt because of scanty outcrops and inaccessibility. The northwest belt, on the other hand, between the igneous complex on the southeast and St. Lawrence River on the northwest, is well exposed and has been studied in some detail. It is a lowland belt about 30 miles wide in which the Precambrian Grenville metasediments and mixed rocks are predominant over intimately associated granitic rocks and comprise almost three-quarters of the terrane. Along St. Lawrence River there is an extensive cover of nearly horizontal Cambrian Potsdam sandstone lying unconformably upon the Precambrian surface. Many small outliers of the Cambrian sediment are found throughout the belt. Glacial deposits are well represented in the region but are generally thin and afford no continuous cover on the bedrock.

With but few local exceptions, the rocks of the isoclinally folded Grenville series possess a marked foliate structure parallel to the northeast regional trend of the lithologic units and major folds. The dips of the Grenville rocks progressively change from northwest through the vertical to southeast in passing from southeast to northwest. The Grenville series, thus forms a great wedge lying between the large igneous complex on the southeast and the granites of the Frontenac Axis on the northwest.

The total thickness of the Grenville in the northwestern belt is about 16,000 feet. In the absence of the usual criteria for ascertaining tops and bottoms of beds in this metamorphic terrane, there is some disagreement among workers as to top and base of the series. However, progressing from southeast to northwest across the belt of sequence (generalized) is as follows:

		Thickness
Southeast	Biotitic quartz-microcline gneiss	1000'
	Marble (mostly dolomitic) with interlayered gneisses	4000'
	Quartz-biotite gneiss with abundant interlayered granite and pegmatite, and occasional layers of amphibolite and marble	3000'

	Marble, with some interlayered quartzite and feldspathic gneisses	4000'
Northwest	Mixed rock belt with interlayered marble, granitic gneisses, amphibolites, and quartzite	4000'

There are two general types of granite within the Grenville belt. These are (1) the Alexandria type, a medium-grained, equigranular alaskite occurring as phacoliths; and (2) the Hermon type, a medium-to course-grained rock varying in texture from porphyritic granite to augen gneiss, with numerous local variations, and grading locally into syenitic phases. Both of these granites are younger than the quartz syenite complexes a few miles to the southeast and are usually referred to as the "younger granites" of the Northwest Adirondacks.

The transition from the predominantly metasedimentary rocks of the Grenville Lowlands on the northwest to the predominantly igneous rocks of the massif complexes to the southeast is strikingly abrupt. A northeast-trending line passing through Natural Bridge, Harrisville, Russell, and to the west of Parishville delineates this change in bedrock geology. Canton lies northwest of the dividing line between the two terranes.

Within the whole Adirondack region there is a marked zoning in the distribution of deposits of oxide and sulfide ores, as well as in the distribution of minor metals. The titaniferous iron ores (ilmenite-magnetite) are restricted to the core of the Adirondacks and are associated with the anorthosite. The principal deposits of nontitaniferous iron ore occur outside the core and are restricted to areas of granitic rocks with subordinate belts of metasediments. Out in the Grenville Lowlands, beyond the zone of predominantly igneous rocks, occur the pyritic zinc-culfide deposits of the Balmat-Edwards district. Possibly the belt of pyrite-pyrrhotite mineralization outside the zinc district represents a zone of still lower termperature mineralization.

With the exception of certain basic dikes, ores, pegmatites and, or course, the Paleozoic outliers, all of the rocks of the Adirondack region have undergone some degree of regional metamorphism. For the most part the metamorphism has been so intense that the nature of the rocks antecedent to those now present is largely obscured. Lack of fossils coupled with intense deformation and considerable reconstitution of the original rocks of the area make the task of solving the problems of Adirondack geology a challenging and difficult one. Naturally, at this stage there are widely divergent viewpoints concerning the nature and origin of the rocks of the region. The question of whether the "igneous" rocks of the region are truly magmatic or whether they were derived from sediments by processes of replacement and recrystallization is challenging. Only continued collecting of factual data and the fair and open-minded evaluation of them will ultimately yield the correct answers.

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General Geology of Balmat-Edwards Zinc District

N. H. Donald, Jr.
St. Joseph Lead Company

St. Lawrence County as a zinc producing district ranks approximately fifth in the United States. Production has been from three mines, Edwards, Hyatt, and Balmat. These are in a belt of metamorphozed Grenville qtzt. and dolomitic limestone sediments (often referred to as a marble belt) stretching 12 miles from Edwards on the northeast to Balmat on the southwest.

The sediments are conformable to the gneisses and granites which enclose them and have been subjected to high temperatures and pressures resulting in widespread formation of lime and magnesium silicates, mainly diopside and tremolite which later altered partially to serpentine and talc. Accompanying this was widespread plastic deformation forming various types of structure including some rather well developed plunging synclinoria and anticlinoria. A relatively minor degree of intrusion took place within this belt. Of interest is a rather widespread occurrence of anhydrite and gypsum and hydrogen sulfide with lesser quantities of methane and halite. It is believed that these products are syngenetic with the sediments in which they occur and they suggest that conditions of sedimentation similar to those of more recent geological periods may have existed in the early Precambrian, Grenville era.

Zinc mineralization is sphalerite accompanied by pyrite, lesser amounts of lead and occasional barite. It occurs only in the dolomitic limestone, quartzite, and silicated limestone series. It is of replacement origin and is in general conformable to the structure of the rocks in which it occurs. Where commercial zinc deposits have been developed, the axes of the associated structures have persistent and relatively uniform plunges in northerly directions at angles from 20 to 45 degrees from the horizontal.

Ore may be associated with plastic folds, the perimeters of rod-like masses of hard silicated rock and with certain types of plastic flow lines. Some preference of zinc mineralization for a few stratigraphic horizons in the relatively lesser deformed areas is evident. Within the limestone belt, unfavorable host rocks are tremolite, micaceous silicated limestones, gneiss bands and intrusive rocks.

It has been possible in the Balmat area to subdivide a 3000 foot stratigraphic section between the Median Gneiss and the upper Garnet Gneiss into

14 units. Further subdivision of some of these units is in progress.

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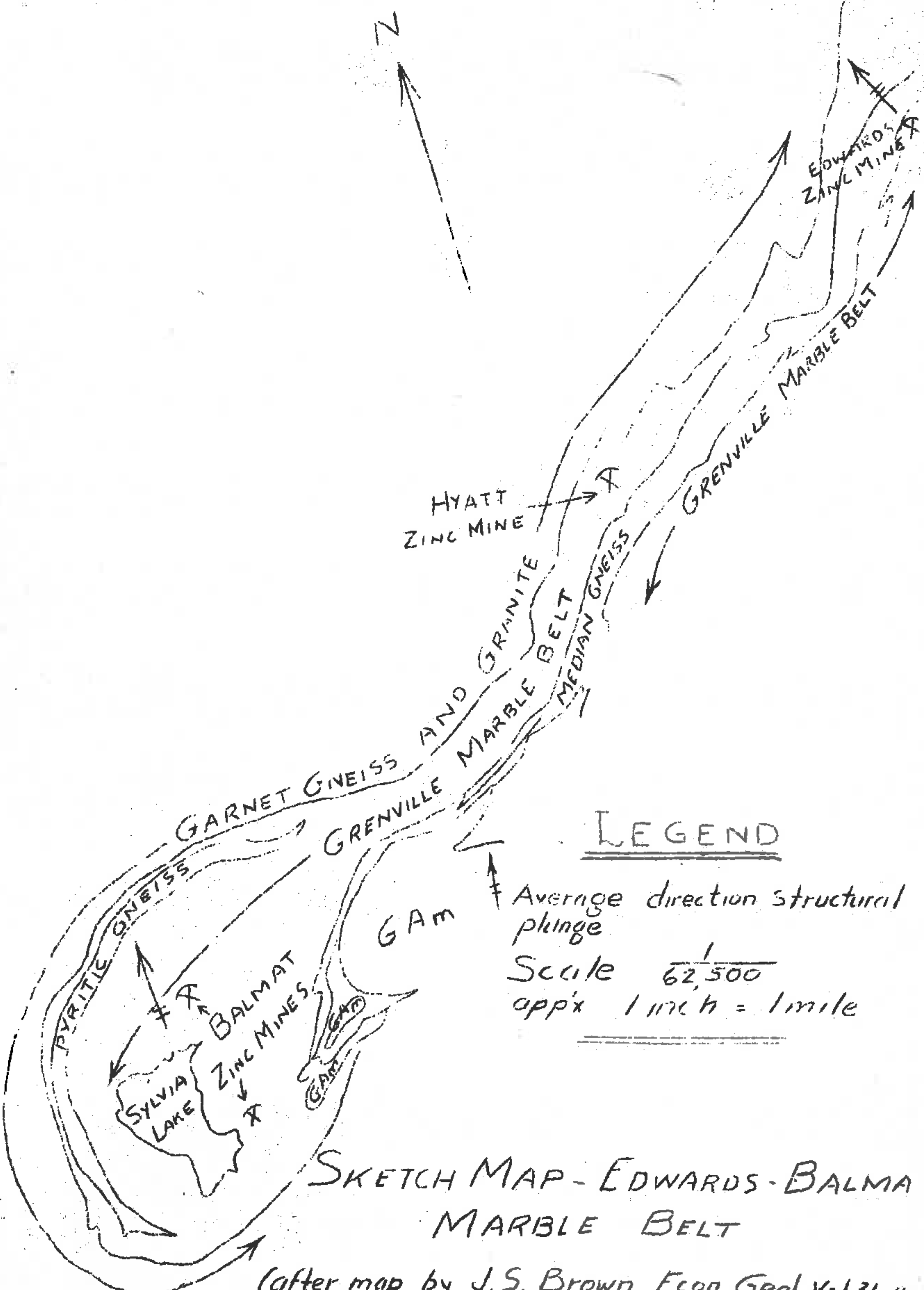
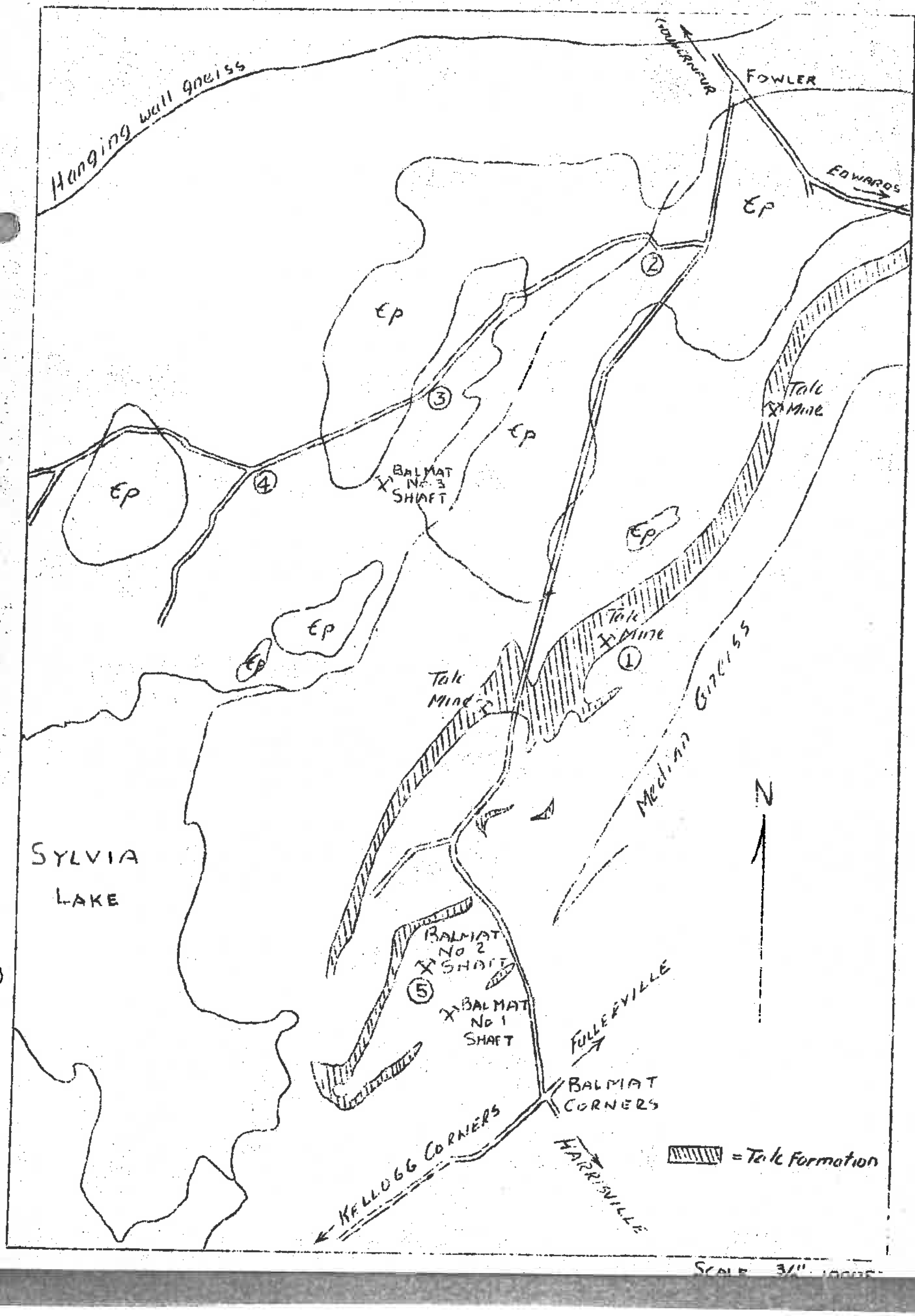
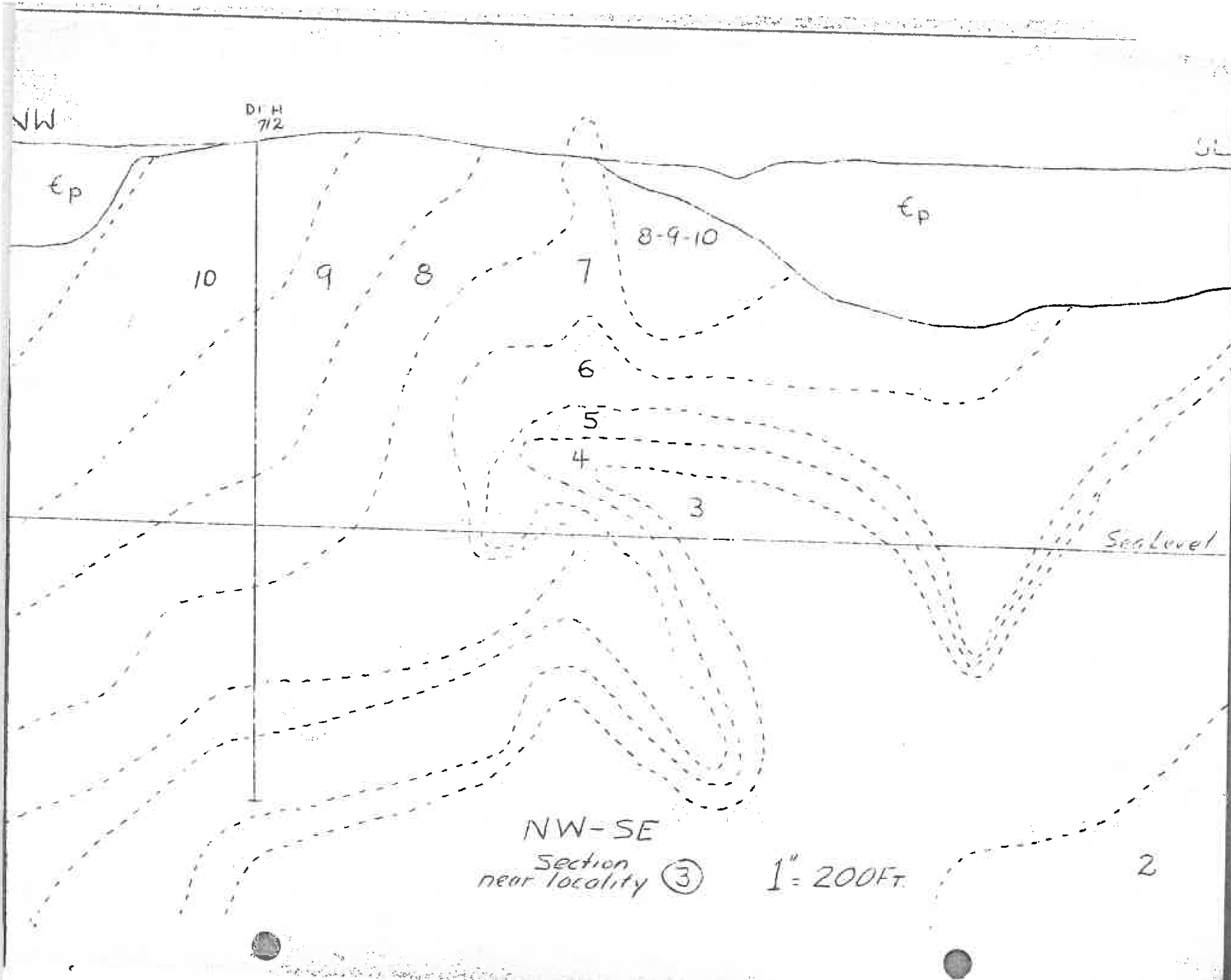


SKETCH MAP - EDWARDS - BALMA MARBLE BELT

(after map by J.S. Brown, Econ. Geol. Vol 31, 1


Hanging wall gneiss
GOUVERNEUR
FOWLER
EDWARDS
Ep
Ep
Ep
Ep
Ep
Ep
Ep
Ep
2
3
4
1
5
Talc Mine
Talc Mine
Talc Mine
BALMAT No 3 SHAFT
Median Gneiss
N
SYLVIA LAKE
BALMAT No 2 SHAFT
BALMAT No 1 SHAFT
FULLERVILLE
BALMAT CORNERS
KELLOGG CORNERS
HARRISVILLE
= Talc Formation

SCALE 3/4" [illegible]



NW-SE
Section
near locality (3)
1" = 200 Ft

Itinerary

Friday, May 1, 1953

Start: 8 A. M., Men's Residence, Park Street, Canton, New York.

Stop 1: 32.95 miles, St. Joseph Lead Company, Balmat, New York.

<u>Via</u>

U. S. Route 11 to Gouverneur.

Thence left (east) on N. Y. Route 58 to Fowler.

Thence right(south) on Balmat Road to St. Joseph Lead Company.

——————— Lunch ————

Stop 2: 31.5 miles, Benson Mines, Star Lake, New York.

<u>Via</u>

Balmat Road north to Fowler.

Thence right (east) on N. Y. Route 58 through Fine to N. Y. Route 3.

Thence continue east on N. Y. Route 3 through Star Lake to Benson Mines (Jones & Loughlin Steel Corporation).

Return: Canton, Dinner, 7:00 P. M.

<u>Via</u>

West on N. Y. Route 3 to Fine.

Thence continue west on N. Y. Route 58 to Russell Road 10.1 miles from Benson Mines.

Thence follow the signs to Canton.

Saturday, May 2, 1953

Start: 8 A. M., Men's Residence, Park Street, Canton, N. Y.

Stop 1: 1.65 miles, migmatite, Alexandria granite in Canton phacolith.

<u>Via</u>

U. S. Route 11, southwest.

Stop 2: 5.05 miles, cross-folding, skarn, marble-granite pegmatite contact.

<u>Via</u>

U. S. Route 11, southwest

Stop 3: 6.15 miles, amphibolite, granite intrusion, overturned anticline.

<u>Via</u>

U. S. Route 11, southwest.

Stop 4: 17.3 miles, Grenville quartzite, marble, quartz mesh (?), rheomorphic deformation, pegmatite.

<u>Via</u>

U. S. Route 11, southwest, 0.10 mile.

Thence, dirt road, 2.8 miles southeast to Pyrites Road.

Thence left (north) 3.5 miles to Russell Road.

Thence right (south) on Russell Road 5.6 miles to <u>Stop 4</u>.

——————— Lunch ———————

Stop 5: 28.6 miles, Hermon granite.

<u>Via</u>

South to Russell.

Thence Russell to Hermon.

Thence along road to Kents Corners.

Stop 6: 30.00 miles, Potsdam sandstone on Grenville quartzite, folded Grenville gneiss, Dekalb pegmatite.

<u>Via</u>

South to Kents Corners.

Thence right (north) to Stop 6.

Stop 7: 35.1 miles, Potsdam conglomerate.

Via

Northwest 1.2 miles to U. S. Route 11.

Thence left (south) on U. S. Route 11 to N. Y. Route 87.

Thence right (north) on N. Y. Route 87 to Stop 7.