Vermilion Iron Range: eastern portion: no. 4. No. 313 Summer of 1898

Bayley, William Shirley, 1861-1943
[s.l.]: [s.n.], Summer of 1898

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U. S. GEOLOGICAL SURVEY

FIELD SECTION BOOK

9-891

LAKE SUPERIOR DIVISION.

INSTRUCTIONS.

1. Ordinarily at least two pages of this book will be devoted to one section. On the left-hand page, place a map of as much of the section as has *actually been seen*. Denote rivers, lakes, marshes, etc., by the usual topographical signs. Denote the ledges of rock, when no structure is made out, by cross-hatching, making the cross-hatching cover as nearly as possible the areas occupied by the exposures. If the rock is a massive one, but still more or less plainly bedded, use the same sign with a dip arrow and number attached, showing the direction and amount of the dip. Denote a shaly or other very plainly bedded ledge by right parallel lines, and a ledge having a secondary structure by wavy parallel lines running in the direction of the strike, with dip arrow and number attached as before. The greatest care must be taken to avoid confusing slaty or schistose structure with bedding, and in all cases where there is the least doubt about the true bedding direction, indicate it by a query. To each exposure on the face of the map attach the number of the specimen representing it. In mapping the section count each of the spaces between the blue lines as 100 paces, and twenty of these spaces to one mile, or 2,000 paces. Usually the southeast corner will be placed at the bottom of the page, or at the first black line above the bottom of the page, and at the right-hand side. If, however, for any reason, it is desirable to show portions of an adjoining section, the southeast corner may be shifted up, or the map may be turned around and the north placed at the left-hand side of the page. The ruling of the left-hand pages is also arranged so that, if desirable, a larger or a smaller scale can be used, eight inches, two inches, one inch, or one-half inch to the mile. With the two-inch scale, the squares outlined in black represent sections, and those in red, quarter sections and "forties," while the space between the blue lines is 200 paces.

2. On the right-hand page place the notes descriptive of the exposures. Begin in each case with the number of the specimen, placing the number on the left-hand side of the red line, after which give in order on the right of the same red line the position of the ledges as reckoned in paces from the southeast corner of the section and the dip and strike when observable, the latter always being expressed from the north; for instance 4025, 250 *N.*, 300 *W.*, *Strike*, *N.* 78° *E.*, *Dip* 50° *S.* Then follow with a full description of the ledge. When topographical maps are used for locations this paragraph applies only in part.

3. Collect a specimen from every ledge, or wherever there is a change of rock on any one ledge, taking care to get fresh material, unless for a special purpose the weathered surface is desired. In case of trips made on foot or in canoes, for long distances, neighboring ledges, unquestionably of one kind of rock, need not be specimened. The position and extent of the ledges not specimened should be marked on the map, with notes that each is of a rock identical with specimen so-and-so. Under the same conditions small-sized specimens, trimmed to a uniform size of 2 x 2½ x ¾ inches will be allowed, but in all other cases *large-sized specimens*, trimmed to a size of 3 x 4 x 1 inches, must be selected, in accordance with section 3, chapter IV, p. 44, Regulations of the U. S. Geological Survey. Specimens should not be placed together without protection in the collecting bag, as the fresh surfaces, important in determining the character of rocks, are thus destroyed. They should be damaged by no temporary mark, but the numbers should be at once marked in at least two places upon the inclosing paper or cloth bags. Specimens may be permanently marked in camp by painting the numbers upon them in white upon a black background, using Silver White and Ivory Black oil tubes for color, with turpentine as a diluent.

4. On the last twenty-five pages of the book give, as may seem desirable, a general account of the examination of the region mapped in the previous pages, correlation of observations, sketches, cross sections, etc.

5. Forward this note book as soon as filled as registered mail matter to C. R. Van Hise, U. S. Geologist, Madison, Wis.

#313

Vermilion

Iron Range

Eastern Portion

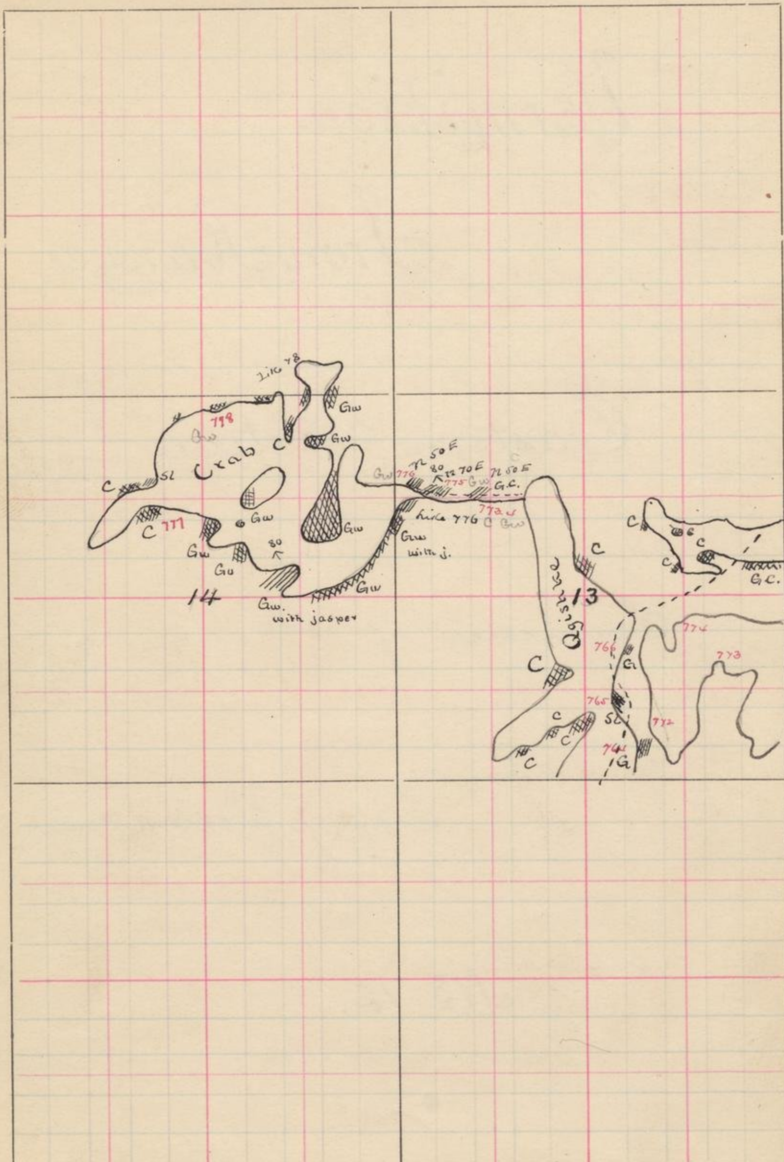
Summer of 1898

W. S. Bayley

Oscar J. Wells, Companion

No 4.

S. T. 65 R. 6



Like 78
Gw
778
Crab C
C
SL
Gw
N 50 E
80
N 70 E
N 50 E
776
775 Gw
G.C.
772
Like 776
C 777
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13
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C
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774
773
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G
765
SL
772
764
G

Depot 4.

Cut trail to Crab Lake from Ogishke and studied rocks in trail and on shore of lake.

C
29773
(aug) At 284 paces from Ogishke on north side of trail is a high bare bluff of greenstone conglomerate and tuff, striking N. 50°E. It is fairly fine grained and contains the usual pebbles.

Gw
29774
(aug) Interbedded with this is a finer grained, dense rock with bedding lines on weathered surface. The rock looks like a fine grained ash-bed.

Gw.
29775 At about 500 west in trail, the bedded rock is more like a slate. It is unquestionably interbedded with the greenstone tuff. The strike is N. 70 E and dip 75°-80° N.W.

? Gw. (Ab. tuff)
29776 At 575 W. we came upon dense and coarse graywackes forming bare ledges. They strike N. 50°E and contain here and there irregularly shaped patches of a coarse greenstone-tuff. Could not get the graywacke and the tuff in contact, but nevertheless think them interbedded

The rude bedding of the graywacke and the greenstone tuffs adds another difficulty to the problem of separating the formations in this part of the county. These observations make it appear that the sedimentary and the igneous rocks belong to same formation, and yet we find further East the Pasaquaqua granite cutting the greenstones and yielding pebbles to the sediments.

The only explanation of the phenomena appears to be this. Among the greenstones are graywackes. Above these is the Ogoshe conglomerate and above the conglomerate is the Kenjo Lake series of sediments. And yet this explanation does not quite satisfy. The S.E. shore of Crab Lake is surrounded by graywackes, some of which contain jasper pebbles which must have come from the greenschist formation.

The final explanation that will explain all the facts must be based on the assumption that the supposed

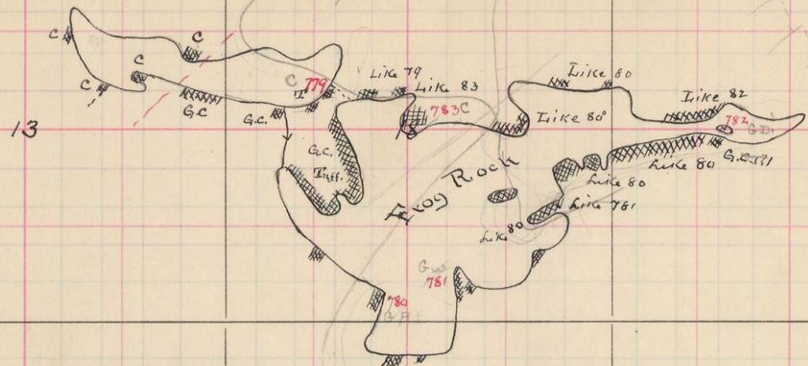
greenstones are in the sedimentary formation (the only indication that this may be so, being found among the tuffs and conglomerates of Kekekabic Lake) is that they are not greenstone tuffs at all. The microscope will probably settle this last point.

If greenstone-tuffs are in the sedimentary formation, then can find no means of separating the Kekekabic Lake series from the Dower and Ely rocks.

C 29777 On the South side of the SW bay of Crab Lake is a ledge of sedimentary conglomerate containing granite pebbles, and the same rock again appears on the point west of the N.E. bay. Between these two exposures are numerous ledges of graywacke and slate.

JWD 29778 Near the N½ post sec 14 these beds are contorted. They comprise numerous small folds pitching N 10° E at angles of 45° and dipping E at about 40° The strikes and dips of the axes are not uniform but are these examined pitch in the same direction.

6—747


C
C
C
C
G.C
G.C.
13
779
Like 79
Like 83
783C
Like 80
Like 80°
Like 82
782
G.C.
Tuff.
Frog Rock
Like 80
Like 80
Like 781
Like 80
781
780

S. T. 65 R. 5

The other ledges on the north side of Lake East of the conglomerate are of greywacke, beautifully exposed.

Town Line Lake.

Next visited Town Line and Frog Rock Lakes.

Greenstone conglomerates of the usual kind are found on some shore of Town Line Lake and a jointed, rugged weathering greenstone, probably a tuff on the East shore.

tuff? c
29779

From S. side portage trail into Frog Rock Lake. This is believed to be a greenstone tuff.

The west end of Town Line Lake a few ledges of conglomerate containing granite pebbles and a few jasper pebbles are met with

Frog Rock Lake

The west end of Frog Rock Lake like the Eastern part of Town Line Lake is bordered by greenstone conglomerates and tuffs.

The point immediately north of the

G.A.P
(P.H.)
29780

west meander corner of the South line of Sec 18 is a greenstone that weathers smoother than elsewhere. It is also more massive than the tuffs and more like an erupting. On fresh fracture it looks tuffaceous, and I see no reason for separating it from the more Archistose tuffs to the west. The greenstone further East, however, weathers like tuff.

Rock
29781

On the point opposite the last mentioned rock the rock is much jointed and porous. It is dotted with little holes irregularly scattered through it, as is often the case with tuffs. On fresh fracture it is a chloritic greenstone.

Rocks not unlike are those cutting East & East End of Lake, maintaining throughout a nearly uniform character.

H.S.
29782

From the little island in the Eastern arm of the Lake is the most Easterly greenstone examined. It may be a lava, but more probably is a massive tuff. There are no structural lines

in it, nor is it sharply marked off from the surrounding greenstones as would be the case were it a dyke.

The rocks along the north shore are similar in every respect to those on the south shore.

29782 is a schistose lift from point at camp Dec 18

29784 after 29771 Book No. 31V

Dept 5.

Mined by Gabarmichigamak

Depot 6

Lake Gabamichigamak

The South-east shore of Lake Gabamichigamak is composed of gabbro, the North and Northwest shores of grey wacke and other sedimentary rocks, continuous with those of Agamok and Fox Lakes, and with the slates and grey wacke in the passage from between Fox and Ogishkik Lakes.

The aspect of these rocks is certainly different from that of the Huronian Lake series. There are no cliffs surrounding the Lake except in the area of the gabbro and there are no sharp and rugged hills. The high hills north of the Lake are rounded and glen smooth topped.

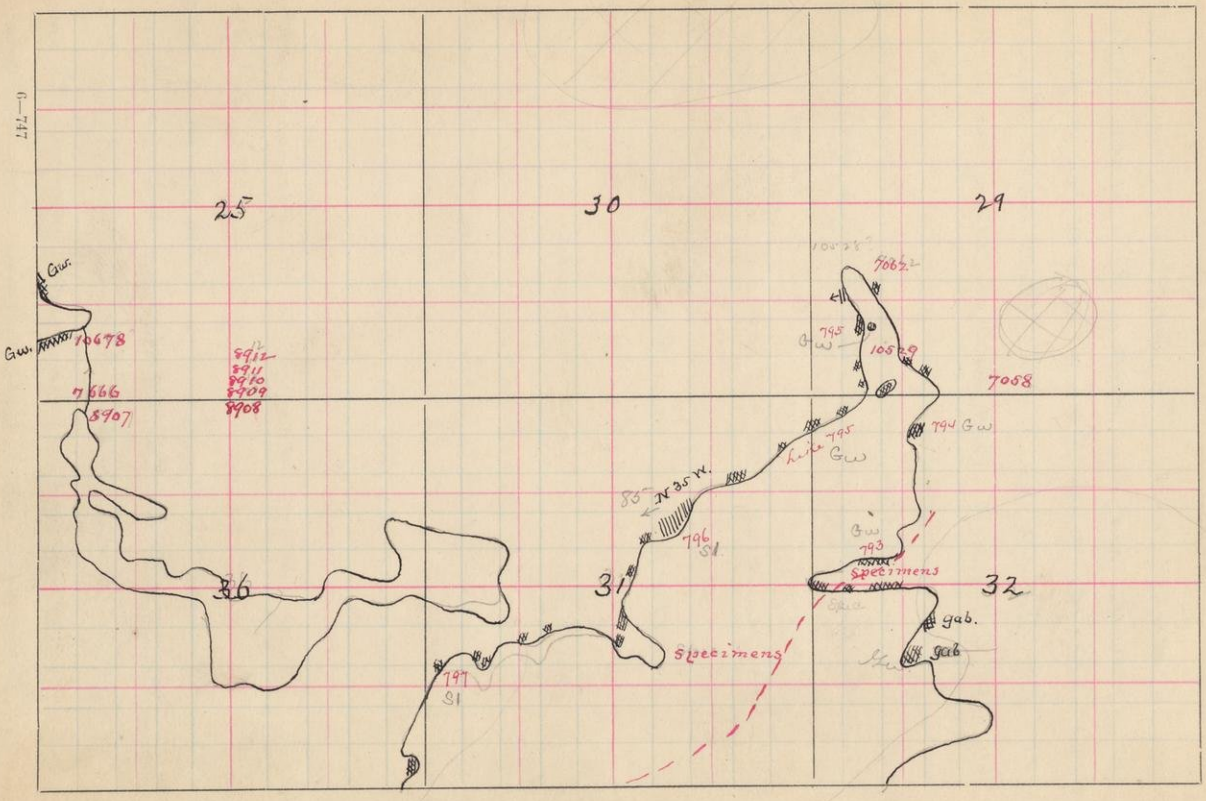
Winchell regards the rocks as Animikie.

Began at little point at W. ¼ post Sec 32 and Course North around Lake to S.W. corner.

On the North side of the first point in question is a massive medium coarse, quartzite-like rock that may be a quartz-gabbro or some similar

GW
29793
Muscovado

contact rock. The gabbro lies just
SW south jut on opposite side of point.
29794 At the next point north is a fine grain
muscovado ed quartzose rock that also looks like
a contact but which may be a sedi-
SW ment
29795 From little island in N.E. arm of
lake. This rock like all others in
vicinity appears like a fragmental
sediment. It is cut by siliceous veins
that weather in ridges on exposed
surfaces. These surfaces are also
pitted with holes so that weathered
surfaces are extremely rough. In
this respect the rock differs from the
SE graywackes of the Knife Lake series.
29796 About a half mile further S.W. the
rock is bedded with a strike N. 35° W
and a dip 85° S.W.
SE
29797 Same rock from near W. ½ line Sec
G.Di 31.
dolerite
29798 Same rock from NW side western
bay. Here the rock is much jointed
into polygonal blocks, and is traversed
by segregation granite veins. It is
probably not far from the gabbro.


S.
T. 65
R. 5 6
25
30
29
31
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Gw.
Gw.
10678
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7062
795
Gw
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7058
794 Gw
795
like
Gw
N 35 W.
796
Sl
Gw
793
Specimens
gab.
gab
Specimens
797
Sl

S Dr
29799
Dolerite

Lumbleeds rock. Think it originally the same as 29798 but near the contact with the gabbro it has assumed conicenabee Lumbleeds.

Do this like the Lumbleeds greywacke on the South side of Kanishewin river?

Gab.
29800

On the north side of Extreme S.W. bay flake found quartz-gabbro like the normal phase of the quartz-gabbro contact rock. It shows a banding but this is not conformable with strike of the sediments.

Peculiar mica gabbro! Study closely by better light!

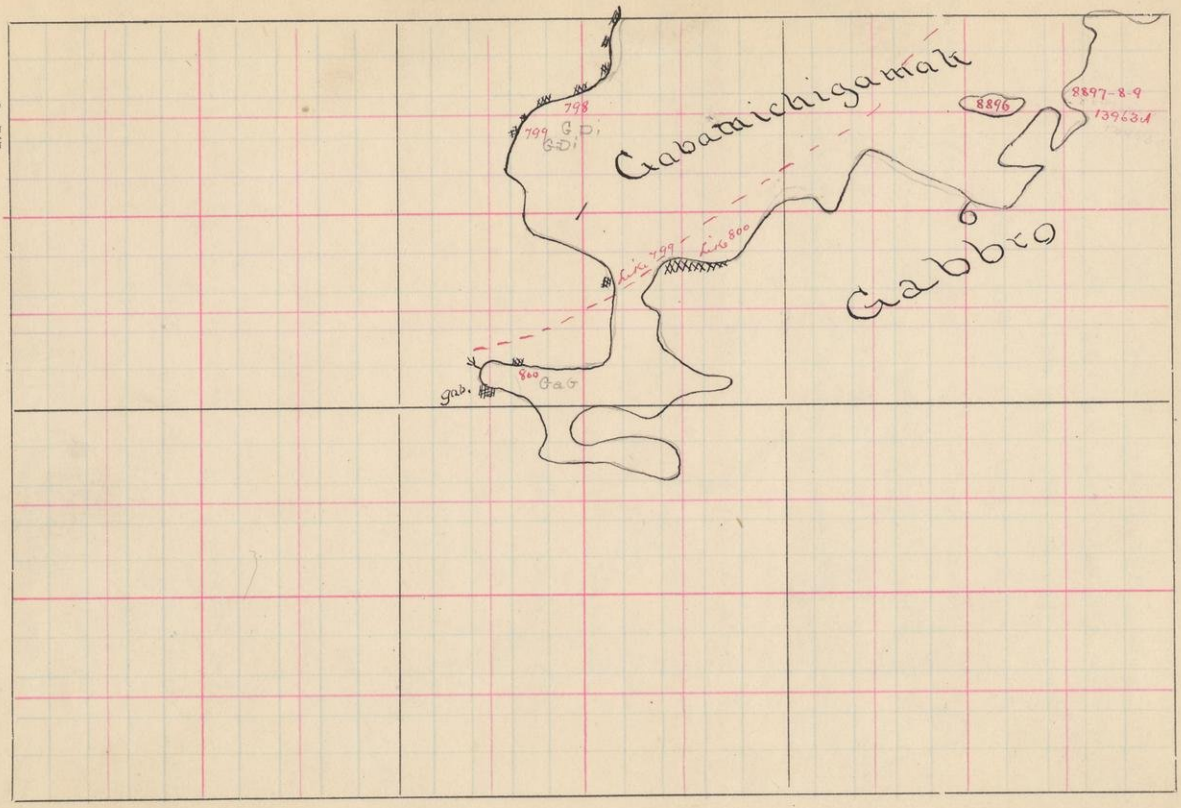
The other rocks in this bay are gabbros. Did not specimen the gabbro on the South side of the lake as this has been done quite thoroughly by Merriam.

Gab.?
29801

Returned to point from which started, and on South side took specimen of a micaceous gabbro

Contact phase. Read from thin section & sketch.

As many of Merriams numbers as could read from peat are inserted on maps. Some of them could not read because they are so badly blurred. There will suffice to enable the same theme of lake work subsequently mapped.



S. T. 64 R. 5. 6

Sept 8

Made a trip East to Pelée Lake and work between Pelée and Little Lake with in search of gabbro contact. Found nothing but gabbro, so am quite sure the contact is with Pelée Lake.

Had rain during most of time so was not prevented in making a more thorough study.

Sab.?

29802 is a fine grained, yellow gabbro.

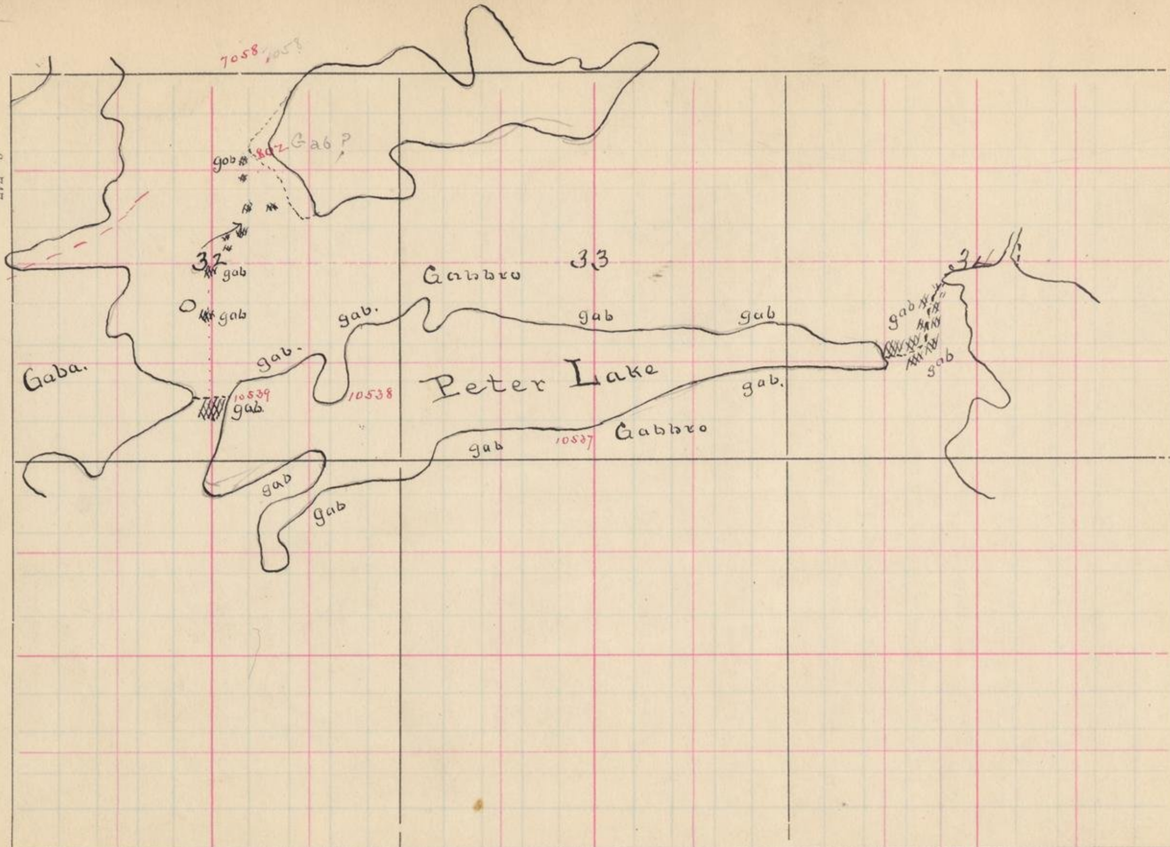
Probably the phase known by Winchell as muscovado, from west end of Little Lake in Sec 32 and 33

muscovado

Location of specimens on map, next page.

All along both North and South shores of Pelée Lake the gabbro is beautifully developed in cliffs.

No mineralogy was done here though its presence is indicated on Winchells' maps.



7058
Gab?
gab
32
gab
gab
Gaba.
gab.
gab.
10539
gab.
10538
Gabbro
33
gab
gab
Peter Lake
34
gab
gab
gab.
Gabbro
gab
gab
gab

S. T. 65 R. 5

6-747

Sept 9 & 10

From Peles Lake went to Jay Lake in Sec 25 T. 6 N. R. 5 W. Surveying water course not accurately enough mapped but recognizable.

Examined country along route in order to lay out work for party but did not collect specimens.

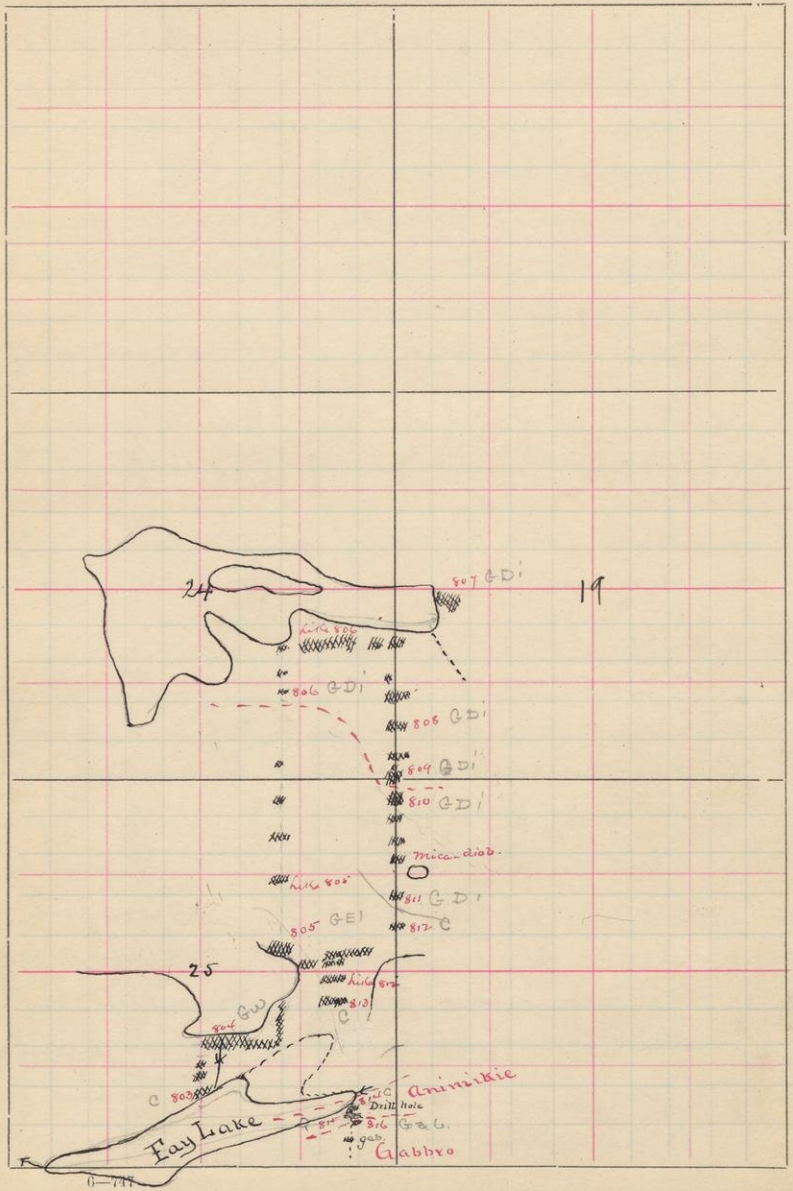
From Jay Lake ran north on 1/4 line Sec 25 to Lake in Sec 24 and returned on range line. The course of travel was interfered with a great deal by unplotted lakes.

For instance there is a large lake only 200 paces N of Jay Lake that is not mapped at all, while there is a large lake mapped in Northern part Sec 25 that could not find. It may be west of the 1/4 line.

C
29803
Mucorado

The lake is bordered on the North by a bluff of diabase about 100 ft high. This is a rock that is quite fresh and otherwise is like the Ammonike diabase; but am not sure that it is not one of the greenstone series. At any rate have taken specimens for comparison with undoubted ammonike.

S. T. 65 R. 5


24
19
25
807 GDi
806 GDi
808 GDi
809 GDi
810 GDi
mica diab.
811 GDi
805 GEi
812 C
804 Gw
803
Drill hole
Gab.
Gabbro
Gab.
Animikie
Fay Lake

Several other ledges of the same rock were observed in the next 300 paces, where unexpectedly met with a lake not in place.

SW 29804 Muscovado — The south shore of this northern lake is bordered by bluffs of fine grained, massive micaceous rock that looks like a micaceous diabase.

Went around this lake to the East, over same rocks and due north on line 600 W. of E section line.

N. El 29805 — On the north side of the hill is a very high hill of diabase, with steep slope south and gradual slope north. The rock in it is a fine grained diabase that is obscurely spheroidal

Location 600 W. 1100 N of S E. Cor Sec 25.

Other diabase ledges occur at intervals of 200 paces all the way to the lake in the center of Sec 24.

N. Dt 29806 — The southern part of Sec 24 is crossed by a great drift hill at the bottom of which are small north facing bluffs of a coarser diabase or greenstone

When struck lake in Sec 24 saw on opposite side bluffs of rock exactly like

B. Di 29807 that crosses on run.
At East End of this lake is a prominent hillock of practically bare rock, which when examined was found to be a Quartzitized Diabase., slightly Schistose in places. It differs from the Diabases near Jay Lake in being greener and less fresh

N. Di 29808 On run South crosses same rocks.
At 200 ft. N.E Cor Sec 24. Massive Greenstone

N. Di 29809 At 50 ft. N.E. Cor Sec 24. Diabase, like Jay Lake rocks. This particular ledge is Flaky

On plat furnished us from Madison Merridians line separating the greenschists from the Diabases is drawn South of 29806 and 29809. This is indicated by broken red line on map.
It is true that there seems to be a difference in topography North and South of this line. North of the hills are rough, rugged and hummocky with steep slopes on all sides. South of the line the ridges run East and West; their slopes are to the South

and long gentle ones both to the north. Numerous dikes, at any rate on the western part of the two runs, appear at intervals separated by areas in which no exposures occur.

In spite of this appearance am persuaded that the entire area traversed in this run is underlain by rocks belonging with the green-schist series. The fresher diabases may be younger than the main mass of the green-schists; indeed they may be Algonkian. If so however, they are probably intrusive and not interbedded flows. Search was made for sediments at foot of each cliff and in intervals between outcroppings of diabase, but none were found.

H.21
29810 Near O.E. Cor Dec 24. Fine grained diabase.

H.21
29811 1400 N of S E Cor Dec 25. Medium grained diabase.

For this distance north the exposures are so numerous as to constitute practically a solid ledge.

C
29812
Muscovado

At 1320 N of the camp corner is a ledge of what might possibly be a sedimentary rock. It is the only rock on the entire run that might be sedimentary.

When reached lake in Sec 25 T. 65 N R. 5 W and Sec 30 T. 65 N. R. 4 W ran west 400 paces, then south 200 paces, over diabase.

C
29813
Muscovado

At 800 N. 400 W of S E cor Sec 25 is a hillock of fine grained rotten "muscovado" like rock that may be either a decomposed diabase or a gabbro.

In afternoon ran south from the end of Jay Lake to contact of gabbro. Started at drill hole at east end of lake.

C
29814
Muscovado

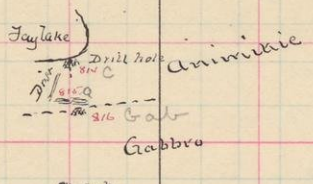
This drill hole was put down through quartzite & slate any iron that might underlie.

A little west of the drill hole is a ditch running south over the hill that borders the lake. In this are exposed rusty bedded quartzites and magnetites.

M.Q
Am.
29815

Further south on hill beyond the end

S. T. 65 R. 5



Sketch map of run South from E end Jay Lake
Scale —— = 50 paces

of the ditch the same quartzites and magnetites containing for about 50 steps from lake. The banding of the lines, probably indicating bedding, strikes nearly E-W and dips vertically.

Dob. 29816

A few paces south of this exposure is a ledge of magnetitic gabbro and 100 paces further south a ledge of gabbro.

In spite of vertical dip these rocks between the lake and the gabbro are unquestionably sedimentary.

Sept 11.

Examined rocks around Paulson's Nickel mine, situated a few hundred paces N of the little lake in D. 1/2 Sec 21. 65-4

Am. ore 29817 The ore mined appears to be a magnetite impregnated with nickeliferous chalcopyrite and with niccolite or some other nickel-sulphide

The magnetite is intimately mixed with quartzite and is impregnated with a yellowish green grammatar mineral that may be olivine

In both sides of the mine are hillocks of banded quartzite and magnetite striking about E-W and dipping 15° S in East hill and 75° S in west hill.

The rocks are contorted in many places, and otherwise show evidence of close folding not known in the associated rocks further East.

In many places the little folds pitch a little S of E.

Hab. 29819 South of the magnetite-quartzite zones is a mass of siliceous gabbro which forms a high hill to the west. It is about 50 paces wide.

To the South in a cut on the R. R.

dol
29820
Sill

The rock is coarse and fresh. It is black and apparently contains but little feldspar, except as phenocrysts. On the weathered surface it is seen that in places the plagioclase has developed into, usually as large phenocrysts, bluish-gray when fresh and white when weathered. Occasionally the crystals are small but generally they are quite large, sometimes measuring as much as 4 in. in diameter. On fresh fractures they do not show.

dol
29821
Sill

In other places patches of the feldspar have developed into irregular masses, consisting of clusters or aggregates of bluish gray plagioclase.

dol
29822
Sill

In the interior of the patches the feldspar is in coarse grains. Surrounding this coarse granular portion are zones of fine plagioclase, and around these are zones of fine grained gabbro. At the distance of a foot or more from the contact the gabbro has its normal characteristics.

South of the gabbro, on the railroad track, interbanded quartzites and magnetites

again occur dipping south. Followed by siliceous gabbro further south and the normal gabbro south of this.

It looks as though the quartzite were crystallized by the gabbro and in part impregnated with its material; that some of the gabbro substance was pressed in between quartzite beds as very thin seams of augite, and that the magnetite is a peripheral zone of the gabbro that has likewise penetrated the sediments? While the augite was obtained from the gabbro and remained as seams between the quartzite, the olivine penetrated the sediment and produced a quartz-olivine aggregate?

On the west and south-west sides of lakes the gabbro is well exposed in numbers of ledges. Near the railroad it is bedded with a southerly dip, but south of the lake it is quite massive and it presents its usual characters.

Walked west on railroad track to the old iron mine at Akeley Lake but could see very little. The shaft is boarded up and the drifts described by Chauvenet are overgrown with weeds.

c

29824 North of the railroad track a large high hill overlooks the lake. It is composed of a fresh black diabase.

museovado?

Immediately south of the mine is an equally high ridge of quartzites dipping about 75° S.

Was not able to do more here on account of lack of time. My object in looking over the district was to get an idea of the character of the Akeley Lake series and of the Animikie in this region.

Dept 12"

Made another run over the Animikie starting at the County bridge across the Cross River, on the road from Grand Marais (?)

Think the bridge must be in the center of Sec 26. Searched a long while for corrections, but the country is burned over so clean so could find none.

Specimens will have been located from Topographical map, if it be necessary to locate them at all.

On the railroad about 100 paces N. of the bridge is a ledge well exposing quartzites and green slates dipping about 12°.

In places the slates are ferruginized, so that the series consists of magnetized slate and normal slate (29823) about 250 - 300 paces S. of track here of sienitoid gabbro could be easily seen.

Am Sl 29823 Meta. Am.

Am Sl. 29825 Meta. Am.

On return run no rocks were crossed until had nearly reached top of hill next fence beyond about 500 N of

dol. 29826 sill dol? 29827 sill(selvage?) am. sl 29828 Met. am.

track. Here we find the contact between a coarse grained normal diabase and a fine grained black rock that also appears to be crystalline.

At this contact is an inch-wide band of ferruginous material.

Continued over hills sloping gradually both ways and steep to the north in step-like form, running with form of the decline across the Dawbooth mountains.

The valleys between the ridges are probably in sedimentary rocks, as sediments are found at the bottom of the north facing cliffs. The tops of the hills are composed of diabase. All the rocks dip south at from 15°-20°.

At 825-900 N of W dogs crossed valley and mounted another hill whose crest was found likewise composed of diabase. This diabase includes fragments or large irregular masses of white feldspar scattered through it. Some of these masses are rounded and some are angular. Many of them

look exactly like fragments. The larger ones have the typical diabasic texture in that between the grains of feldspar is a slight mesostasis of dark material.

The smaller areas are more or less radial in structure.

It may be that the supposed gabbro collected near Paulson's mine and in which white feldspar masses are present is also a diabase rather than a gabbro.

sol. 29828A sill (dup.) Weathered white inclusion in diabase

sol 29829 Sill Fresh white inclusion in diabase.

Did not have time to make more thorough examination of district. Spent the balance of the day in wandering over the hills in the section. The country will be gone over systematically later by Dr Clements and Mr Leith.

Pursue the detailed work carefully.

1st. Secs. 26. T.

South of Ogishke Manisee Lake. Every ledge should be pecked to discover, if possible, whether or not the N.W. striking rocks are unconformable upon the N.E. striking Knife Lake series.

2nd Secs 34 and 35. T. 65 R. 5.

Search for western end of Aminicka Lenose South of Fay Lake.

3rd. Detailed Examination of S.E. ¼ Sec 29. T. 65 R. 6 and E ½ Sec 32 of same township, in determining whether or not the conglomerates in Zeta Lake extend to Kekakabic

4th. Search for Sasaganaga granite outing Ogishke conglomerate in S.W. portion of Sasaganaga granite area

Cf. U.S. Geol: Amer. Geologist X. p. 8.

Also at N.W. corner of Sasaganaga Lake for same phenomena.

Cf. Lawson: Amer. Geologist. VII. p 624

5th. Examination of Wanderer Island in O. L. and Sasaganaga Bay for conglomerate in granite?
Cf. Alex Winchell: Geol. & Nat. Hist. Survey Minn. 16th. Ann. Rep. pp. 217-218
Wanderer Island is in Canada in what would be the center of Sec 3 T. 64 R. 4 if U.S. lines were extended
6th Boundary between green-schists and knife lake series. This boundary lies west of Moose Lake, but just where I have no idea. The microscope will decide very closely where the line should be drawn.
7th It may be that the greenstone-conglomerate are phases of the Ogishke Cong. I am believing that many of them are. Some are unquestionably intrusive with the typical Ogishke as in trail between Crag and Ogishke Lakes.

N. B. Since writing 4th paragraph have learned from Grant that the Sasaganaga granite does not cut the Ogishke, but that latter is younger

S. T. R.

Ham Jenner. This accords with our determinations.

Sept 13. 14-15.

On return to Ely followed boundary as far as west end Otter Track Lake. From this point went through Big Rock, Emerald and Castle Lakes in Canada to Birch Lake, all the way through graywackes slightly like those on Otter Track. Had no time to examine district carefully as were compelled to reach Ely at a given time in order to avoid loss of two days in waiting for trains.

It looks to me now very much as though the Geology of the Eastern part of the Penokee district may be Exactly analogous with that of Marquette

1. The oldest rocks are the greenstone schists cut by the Sacagaunaga granite, representing Archean. Or these are the ones. Though it is possible that the ore bodies that are worked may be upon these.

2. Following this series is the series of slates, gray wackes etc. underlain by the Ogishke and the Kekakabic conglomerate and cut by the Kekakabic and Brownbank, and probably by the Barnwood granite.

3. Upon these rocks unconformably is the Animikie, which South of Ogishke lake and East as far as Fay lake is highly tilted, but which East of this lake is more gently tilted

4. The white porphyry Dennis is probably older than the Ogishke series.

The detailed structure of the district cannot be worked out until I have

sections made of wind and moose
lake schists?