Notes on the geology of Lake Nepigon, Canada: [specimens] 40131-40203. No. 334 1900

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.

No. 3

No. 334

Notes on the Geology of Lake Nepigon, Canada.

1900

J. Morgan Clements.

August 11th.

Left camp this morning, but had strong head wind to contend with. In spite of it, coasted around the island and up east along the south side of Paint River Bay. Find the coarse gray granite outcropping along the coast. This granite is cut by dikes of dense gray granite and red pegmetite, and also a dike of Keweenawan basalt was noted. The gray granite is in places gneissosed, but nevertheless is clearly of ~~an~~ igneous origin, as it includes fragments of black hornblende schist
40126. like 40126. This would seem to indicate
tr. / that subsequent to its intrusion into the schist and inclusion of the complex it had been squeezed andthe gneissic structure had been produced. On the largest island near the head of the bay and southeast side of this island, I noticed a large dike of dolerite 30 paces across cutting the granite as well as a small one only a few inches wide. The gray granite continues on to Paint River.

Reference to Bell's map (c. f. Mono. 5, page 408, fig. 35) will show that his mapping does not correspond

to this. According to him the Keweenawan continues up until it joins the Huronian and back of both, that is, inland, lies the Laurentian. As a matter of fact only a portion of the ~~band~~ with an unknown eastern extension inland is all Keweenawan. The bay north of this is then made up of the granite gneiss (intrusive complex). Rowed up Paint River for about a mile and a half. The river is a large one with low banks. It empties into the lake through extensive flats and meanders through these in several channels. Did not consider that I was warranted in going farther up the river, so turned back and continued on north of the river around the bay. Just north of the main mouth of the river, on the east side of the small island (the easternmost of the three which lie here in an east and west line), I note a small exposure of dark hornblende
40131. schist. This is represented by 40131. This schist is cut by the gray granite. North of this island on the mainland there come outcrops of green chloritic
40132. schist represented by 40132. The schistosity of the rock strikes north 80 degrees east. These schists are well banded, but the differences in the

bands are not very well marked; the schistosity, however, is brought out very well by the veins of infiltrated quartz. They are cut by dikes of gray granite. They, theschists, may possibly be sediments which have been extremely metamorphosed by the granite, but could get no evidence of their sedimentary origin, and from their general appearance believe them to be merely schistose phases of the green stone. A comparison of specimen 40132 with 40131, the schist which lies to the south, and nearer the granite, well, are ~~sure~~ that this one nearer the granite is lit much darker than the one further away. Probably this difference is due to the fact that 40131 represents a more alterated phase of the greenstone. ~~It was noted in~~ observations made farther back along the shore that, as we passed from the greenstone to the granite, the greenstone became darker.

40132

show

This accords with

These green schists continue on along the north shore of Paint River Bay as far as the point indicated on the map. From here on a normal massive to slightly schistose greenstone begins,

and continues along shore as indicated on the map. Evidently the east-west Vermillion bay represents approximately the dividing line between the granite and the greenstone. There are no dikes of the granite seen in the greenstone, and but few of them in the schists, and that only on the south side of them, nearest the granite massive. Unfortunately most of the northeast shore of Paint River Bay is thickly drift covered, so that outcrops ~~of massive green stone~~ are comparatively rare. It may be noted here incidentally that well developed abandoned beaches were not noticed upon the shores of Nepigon Lake. Back of the point upon which the green stone is marked as ending, there is a bay with a long sand beach behind which, that is, east of which, occurs low ground. North of this low ground comes a high ridge of dolerite with here and there vertical cliffs. The dolerite shows fair columnar parting. The continuity of the north side of Vermillion Bay is here broken by a great "V" shaped bay with the apex of the V pointing to the north, with three small islands a little to the west side of the center

of the bay. The land immediately around the apex of the V is low, and did not seem a favorable place to look for exposures. Rowed directly a cross this large bay, touching the three dolerite islands which occur near the west side. Dolerite occurs on the mainshore, and continues very nearly up to the first southward pr o jecting point. Next to the dolerite a beach is developed with low ground back of it, apparently extending nearlyall the way across the point. Then upon the point I find an interesting series of rocks.

This is a series of extremely alterated evenly bedded sediments, striking in general N. 70° E, and dipp ing 80 to 85° N. As a result of the weathering, they possess, in general, a reddish color, although the different bands vary considerably. Bands of conglomerate up to 20 feet in width were seen. The pebbles of these conglomerates varied from small ones up to others at least 8 inches in length. The pebbles were of different kinds, and are noted below in order of quantity as well as this could be judged:

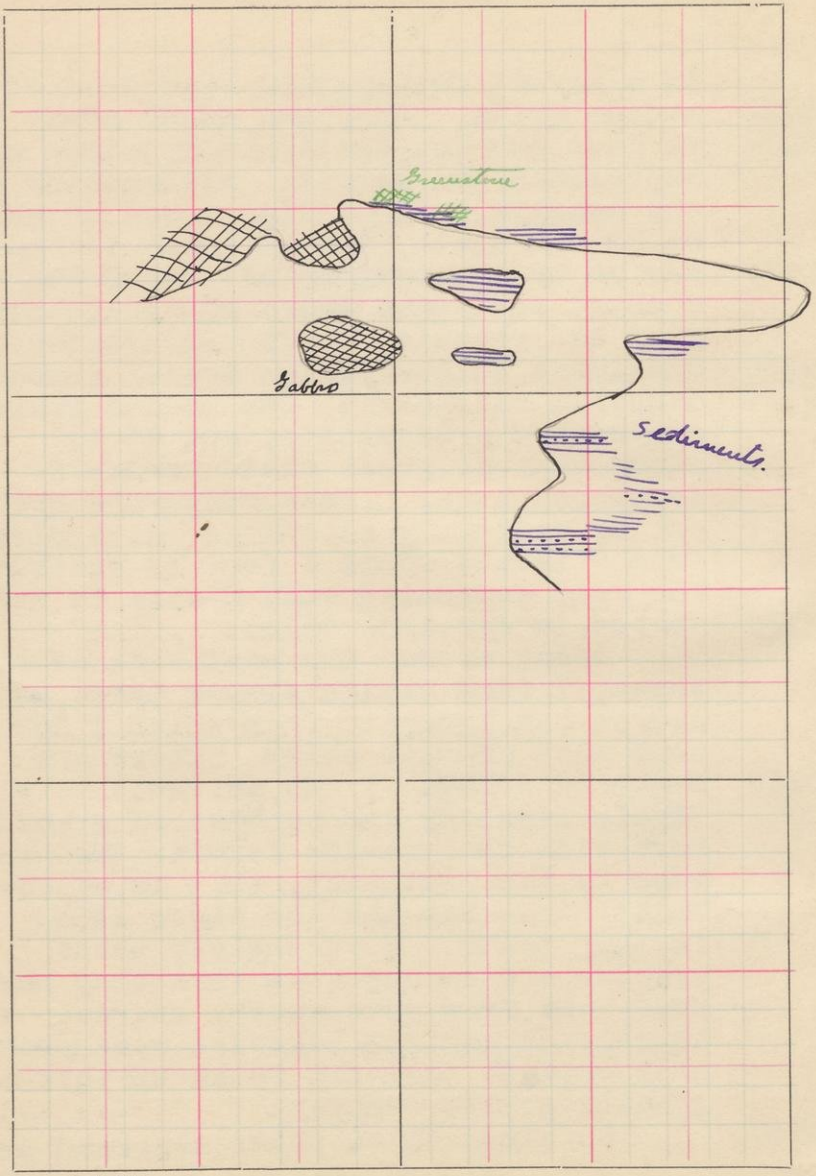
Granite, a hornblende schist, some doubtful slates (could not get specimens of these out of the flat surfaced rock exposure upon which they were seen), vein quartz. The matrix

is a normal feldspathic sandstone of
40133 medium grain. Specimen 40133 shows the
40134 various pebbles mentioned. Specimen 40134
represents the matrix. Alternating with
the conglomerate we find bands of gray-
wacke and slate, one of which is repre-
40135 sented by specimen 40135. With the un-
doubted sediments there alternate dark
gray and greenish bands represented by
40136 specimens 40136-7, which are of somewhat
40137 doubtful character. The medium grained
graywackes predominate, and it is
clear that no great slate series is
developed here. These sediments are
cut by extremely alterated basic dikes
from 6 inches up to 4 feet in width.
The rock composing such a dike is repre-
40138 sented in specimen 40138.

Going around the west side of the
point, I find welldeveloped there a
coarse conglomerate from which I took
some more granite chips. These are
40139 numbered 40139. I was not able to posi-
tively identify the pebbles of granite
here with the granite forming the great
mass to the Southeast, that is, along
Paint River Bay and the shore still
farther south. Nevertheless these
pebbles are so numerous that they must
have come from some nearby source. These
hornblende schists likewise were presum-
ably brought from the rocks of this same
granite schist complex.

40140 Specimen 40140 shows a normal gray-

S. T. R.



40141 wacke. Specimen 40141 represents a very common bright red weathering phase of the graywacke which one might take from its color perhaps for a granite. One of these beds of sediments is so extremely metamorphosed as to strikingly resemble upon the weathered surface a gneiss. This rock
40142. is represented in 40142. The entire series of rocks, graywackes and conglomerates, are interbedded and there can certainly be no mistake as to their sedimentary character.

Going north from the point into the bay (see large scaled sketch) we pass more sediments exactly similar to those already described. At one place there is an island of gabbro as shown on sketch, which is about 50 paces from the nearest point to the sediments. The strike of the sediments would carry them straight into the gabbro. Although the relation is not shown, one would naturally infer that the dolerite here cut up through the sediments or represents an uneroded portionof a mass overlying them. North of the gabbro and of the reddish sediments on the islands, I find upon the shore of the mainland and lying next to an imperfectly schistose greenstone, about three feet of grayish schistose sediments like 40137. The gray schistose clastic ~~fragmental~~ next to this green-

stone appears to be a schist conglomerate consisting of elongated fragments of greenstone. I could not, however, absolutely identify these fragments here with the greenstone lying to the north of it. The sediments have a dip which is slightly to the north, but it is so near vertical that no important relations can be based upon this dip. A slight overturn might at this place have very well thrown the younger sediment under the greenstone from which it was derived. Going west along the shore I find the dolerite comes in not more than about 50 paces from the greenstone, and separated from it by an interval of no exposures.

These rocks are very interesting, and it is unfortunate that their occurrence is so isolated, as to partially prevent their relations from being conclusively determined. The greenstone appears to be the oldest rock present here. Upon this, and derived from it, rest the sediments, although as a result of mountain-building forces, the beds here are now practically upon edge. The sediments are also younger than the granite, and the hornblende schists southeast of them, since they

contain fragments of both. Moreover, there are no dikes of granite seen in these fragmentals. Pebbles of granite are numerous. Moreover, since the hornblende shhist is presumed to represent metamorphosed greenstone, the sediments were formed after the greenstones became schistose, and so metamorphosed by the granite. Furthermore these sediments are cut by basic dikes which are extremely alterated. These dikes cannot be compared to the Keweenawan dikes for these latter are very fresh. Therefore the rocks were deposited and intruded by basic dikes before Keweenawan times. It may be remarked furthermore that the dip is very high for the dip of any Keweenawan rocks, although this extreme dip could be explained as the result of the intrusion of dolerites . The Keweenawan dolerite seems from its position to cut through these sediments, although they were not seen directly in contact with them at any place. This series of sediments is presumed to be a younger series than that series described as having been seen several days ago upon the lake shore, for the ones here described were not observed to be cut by granite, whereas those south of here, associated with the greenstones, and presumably interbedded with the greenstones, were cut by granite and quartz porphyry.

Here, as everywhere else, there is a noticeable difference in the topography between the area underlain by the old greenstone sediments and granite and that underlain by the Keweenawan dolerite. This last always forms great ridges and flat topped plateaus with high escarpments.

These plateaus seem to have a lakeward slope in most cases. Moreover upon this east shore thus far, a platy parting has been very common. This parting dips west of Northwest or Southwest, usually toward the lake. Does it agree with the dip of the Keweenawan lavas and with the sediments with which they are interbedded? As a result of this flat dip we find very commonly along the shore where the gabbro is exposed low gently sloping bare rock surfaces on the side toward which the parting dips. Where this parting dips away from the shore, cliffs are usually developed. From here on, as we continue west along the point, the dolerite is exposed. The gabbro continues to be exposed on along the shore up to the extreme point on which we camped for the night.

August 12th.

Left our camp on the end of the point at 7.00 A.M. and coasted Northeast. Dolerite continues for about one mile. It appears in flat rocks which are inclined at a low angle to the water. Just Northeast of the dolerite, in a little bay, a schistose amygdaloidal and ellipsoidal greenstone,
40143 specimen 40143, begins. The greenstone is in contact with the main dolerite mass, and this contact is exposed for about 15 paces. The line of contact cut right across the schistosity which is developed in the greenstone, and trends north 80° East.

There can be no question as to the character of the greenstone. The rock, though now more properly speaking, a hornblende or a mica schist, nevertheless shows some of the original structures so plainly that its original character cannot be mistaken. Amygdules are very distinct, and an ellipsoidal parting is very well developed. The ellipsoids have been elongated parallel to the direction of schistosity. This greenstone probably corresponds to that which was seen yesterday afternoon southeast of here on the point at a place that would be about 1 1/2 miles distant across the country. The shore line cuts across the schistosity of the schistose greenstone. Following along the shore we pass over a thick-

along shore we pass over a thickness of this schist, measured across the schistosity, of about 100 yards. On the shore there is exposed a dike of somewhat schistose red granite represented
40145 by specimen 40145, which cuts the greenstone. This, in places, follows in similar smaller dikes along the schistosity of the greenstone. The granite mass evidently has a very considerable extent here. It is exposed along this shore for a distance North and South of at least 100 yards, and its northern continuationis then concealed by the water. About 150 yards Northeast along the shore from the first place where the granite was seen in contact with the greenstone, I find a dike of dolerite about 6 paces in width, which cuts both the granite and the greenstone. It follows the trend of North 10° East. From this main dike, there is a small off-shoot 18 inches in width, which runs southwest, cutting through the granite but ending against the greenstone. Still farther along shore another dike of dolerite was observed cutting the granite and the greenstone. This dike shows a well marked selvage.

This granite is exposed for a greater width as we go along the coast. In fact, observations made during the continuation of our trip during the day show that it extends along the coast for a distance of about 4 miles. We have

evidently been following along the edge of a great boss of granite. The contact between it and the greenstone with the dikes of granite cutting the greenstone enable one to readily determine the relations of the two. The granite is not throughout massive, but shows occasional fine grained and schistose phases. These phases are very limited in extent, and relatively play an unimportant role. The granite is cut by dikes of fine grained aplite. Continuing east along the shore of this first bay, which runs approximately along the contact of the granite and geenstone, ~~There~~ good exposures show upon which the granite can be seen cutting and including the coarse but slightly schistose greenstone ~~like~~ 40144. This greenstone is similar to that referred to as occurring on the extreme southeast side of the ~~Portage~~ Bay south of Vermilion Bay. Referred to August 9th, page 39. Along here the granite sends a great number of small dikes in the greenstone. Their dike-like character is beautifully shown here. They split and intersect each other in quite an intricate way. At the extreme east end of the bay, greenstone cut by this same granite is exposed, On the north side of the bay, and from there on continuing in extensive exposures

40144

broad/

N.B.333/

The granite also occurs/

northeast along the shore for about 4 miles . This granite massive is cut in a number of places by dolerite dikes up to 30 feet in width. These show very ~~di~~ distinct selvage. They are presumed to be off-shoots from the main Keweenawan dolerite mass which apparently lies off to the northwest. Exposures of this granite continue to appear up to the point which is about half way to the Obabica Narrows (see map). Coarse dolerite is then exposed over an area 50 yards inwidth. In a bay behind and about 300 yards distant from the dolerite and to the northof it, there appears exposed along the shore for about 100 yards, a coarse pink arkose or sandstone . This is represented by 40146-7. This rock was very much broken and poorly exposed. Consequently I could not be sure of any bedding. I obtained a strike, however, which gave me N/ 10° E. with a dip of 80° to the west. This rock is just such an arkose or pinkish sandstone as one would expect to find associated with the granitewhich we have been passing. It compares very closely in general appearance with the sandstone represented by specimen 40129 which was collected some time ago, and was there observed lying below the dolerite with a flat dip. It is presumed that this is the sandstone of Keweenawan age, and that the abnormal dip is due to the intrusion of the dolerite.

40146
40147

After about 1/4 of a mile of no exposures, the granite again appears and continues along shore. It shows in places a somewhat gneissic character. It here and there contains inclusions of irregular blocks of dark hornblende schist. It resembles incharacter in general the so-called Laurentian of Bell, which was seen on the south side of Paint River Bay, and on the bay south of Paint River Bay, and which has been previously described.

Farther along the shore to the north a similar patch of dolerite appears, followed by greenstone which in its turn is followed by some of the Keweenawan sandstone which is only a few paces distant from the greenstone, and at this place is greenish from the chlorite derived from the greenstone,
40148 specimen 40148. A little farther along the shore the dolerite is seen in good exposure with a thin patch about five feet square of the sandstone lying upon it. The dolerite here has a noticeable selvage, and is without vesicular texture. Evidently the dolerite has been intruded in the sandstone, apparently all of the overlying sandstone having been removed except this, and possibly other small patches which were not seen. A little farther along the shore to the southeast of the round island, greenstone (hornblende schist) appears, and is here cut by

granite dikes. Beyond this comes in ~~then~~ the Keweenawan sandstone showing here horizontal bedding.
The two greenstone masses noted as outcropping along the shore in association with the granite and with the dolerite are presumed to be merely small remnants of greenstone which are included in the granite massive. In both cases only comparatively small exposures were seen, and the rock did not show its typical characters, but is properly spaaking a hornblende schist or an extremely metamorphosed phase of the greenstone which has resulted from the inclusion in and intrusion by the granite. From now onalong the shore for some distance I continue to find small exposures of dolerite alternating with exposures of the Keweenawan sandstone. This sandstone it may be well to state here, in places, is very hard, and has been changed to a quartzite. This quartzite usually lies in little beds in the Keweenawan dolerite, or else remains merely as a thin skim upon the dolerite. A number of places where the dolerite and the quartzite were in actual contact were found. Along the contact the dolerite shows a fine selvage and grows coarser and coarser away from the contact. The quartzite itself does not appear to have been very muchmetamorphosed by the dolerite. The quartzite is fine

grained and very much fractur ed for about 8 inches from the contact. There is a thin zone of reddened quartzite about 1/2 inch in width next to the dolerite, but forthis discoloration and this fracturing, the quartzite does not differ from that which is yards away from the cont act.

I noted at one place that the quartzite was penetrated by ramifying veins full of feldspar apparently with nothingelse associated with it. The rock here for a zone about 10 feet in ~~length~~ width seemed to be almost literally soaked with the feldspathic mineralizers. Dolerite is here in cont act with the quartzite but could not get the connectionbetween the dolerite and the veins of feldspar. They seem to have resulted as intimated above, from the mineralizers accompanying the dolerite intrusion.

In one place upon the shore north of the northernmost of the three islands lying off the shore along which we have been coasting, I noticed a rounded face of dolerite about 60 feet in height., which sloped over towards the shore and in front of which there occurred the quartzite. Ascended this hill, and could find here and there a skim of the sandstone remaining in cracks uponthis surface. Moreover the dolerite here showe d a platy parting which was

parallel to its rounded surface. It also showed a selvage next to the sandstone and grew coarser farther away from it. This mass of dolerite looked very much as though it was an enormous rounded boss which had forced its ~~self~~ way in the quartzite and had then cooled and had had developed in it the platy parting parallel to its cooling surface. I could not get a dip in the quartzite to see whether or not it had lifted the beds so that they wrapped around the dome or not.

The quartzite next to this dome of dolerite was full of large druses some of them being three feet indiameter, which were lined with small quartz crystals. In several places these druses were connected forming a series of large chambers.

This Keweenawan sediment varies in its character from what appears to be an arkose in which one can notice very distinctly the fragments of feldspar, into a clean quartzite represented by
40149 40149.

A little farther north along the shore both the quartzite and the dolerite are found intruded by a dike two feet inwidth of red rock (syenite)
40150 represented by specimen 40150. The relations here are perfectly clear. The dike cuts across the contact of the dolerite and the sandstone.

Somewhat farther on a somewhat different phase of the quartzite was seen next to the dolerite. This phase
40151 is shown in specimen 40151. It appears to have been more affected by the dolerite than that which we have thus far seen, and as a result has some green minerals produced in it. It may have differed very materiall y in original compositionfrom that which we have thus far seen, and this may explain the difference in present character.

This is the last exposure of the sandstone which we see for some time. The dolerite continues along this point and rises inland into a great ridge. We cut across this point at the narrows, and coast up the northeast side into Ombabica Bay, working against a strong head wind. This dolerite ridge extends on to the southeast end of Obabica bay, and beyond. Its extent was estimated and is shown upon the map. Southeast of the bay there extends an area of low ground which apparently goes to the east of the dolerite ridge and connects with the low ground seen yesterday bordering Vermilion Bay. No outcrops whatever were seen at the southeast end of Ombabica Bay. On the east side of the bay, however, on the first point reached after starting up the Northeast shore of the bay, I find a gray gneiss
40152 represented by specimen 40152, cut by

granite. The exposures here seem to indicate that we have just reached the beginning of the granite complex similar to that seen south of here in Vermilion Bay and still farther south of that place. Moreover the topography of this east and southeast side of the bay, as far as I could see from here, points towards the granite as the underlying rock. It is very low with rounded slopes as compared with the high hills with steep escarpments of the adjacent Meweenawan dolerite. We camped here at 4 o'clock, as it was raining steadily, as it has been doing indeed for some time, and it does not look as though it would let up this afternoon.

It may be noted here with reference to the dolerite that, although I have seen a great deal of it along the shore, in no instance have I seen anything indicative of its being a flow. Amygdules are totally wanting. The sheeting which is so common in large intrusive masses, is well developed in the dolerite. A porphyritic columnar structure is not uncommon, although not usually of extraordinarily good developement. The dolerite certainly does not correspond to the lava flows of the Keweenawan, and must either have been produced as great intrusive sills, or intrusive bosses and dikes.

August 13th.

Rained all day, and blew so that we were compelled to stay in camp.

August 14th.

High wind continued all forenoon, but were able to start at 3 o'clock. Continued rowing until 6.15, during which time we managed to cover about 12 miles of coast. All of the Northeast shore of the bay is low, and the outcrops are relatively scarce. Especially is this so as we get about midway up the bay. The exposures seen
40152 are a gray gneiss like 40152, and a darker hornblendic gneiss. This gneiss is cut by granite like 40145. The complex is similar to that seen on the south side of Paint River Bay, and on the big bay lying to the south of it.

Farther east along the shore, at the point which is almost due east of Ombabica Narrows, I find a reddish weathering dolerite exposed on an island, but showing no relations to the granites on the nearest exposures appearing upon the mainland. Specimen
40153 40153 shows the dolerite. Glacial striae with a strike of N. 60° E. were welldeveloped upon the flat surface of this exposure.

Farther on to the northeast a few granite exposures are seen. The land

back of the shore all shows the same monotonous low and level topography, and presumably is underlain by the granite gneiss complex.

August 15th.

Continued on around the north end of Ombabica Bay. Found very few outcrops. The 3 or 4 which were seen were of gneiss cut by granite. The rocks were similar to those already seen farther southeast along the shore. Reference to Bell's map will show a narrow strip of Huronian marked as touching the north end of the bay. I found no outcrops whatsoever, around the shore here. The large river Ombabica flows into the bay at this north end, and has formed a delta of considerable size through which it flows in a winding channel. The shoal continues a long distance from shore. The outcrops, if any, would only be reached after ascending the river some distance, and this I did not consider that I had time to do. The topography inland, to the north, as far as I could see, is the samd low topography which I have found thus far, in every instance where I have met with it on this lake, to be characteristic for the older rocksof Archean and Huronian.

On the northwest side of the bay, the

dolerite is exposed in a high cliff which forms the steep eastern escarpment of a high ridge. This high dolerite ridge with the steep eastern escarpment can be traced with the field glass a number of miles to the north, abutting in every case by means of the noticeable escarpment against the low-lying topography of the Archean and Huronian rocks. We turn now to follow down the southwestern side of the bay, and pass numerous exposures of the coa coarse dolerite which comes down to the shore very commonly in steep cliffs

There is a portage marked on the map as cutting across the long point which separates Ombabica Bay from the main part of the lake. We attempted to go over this portage, but found it much longer than is indicated on the map, and, after reaching the top of the water shed, found the trail went through a swamp which was practically impassible for us, with our heavy boat. We therefore return and continued on around the point. Dolerite in great numbers of places is exposed along its north shore. Passed through the narrows and camped on the end of the point.

August 16th.

Coasted along the southwest side of this point following now the main northeast shore of the lake. Gabbro is frequently exposed. When we reached the shore on the south side of White Pine Bay, I could see that the topography characteristic for the dolerite continued up around this bay. Therefore cut across to the island in the bay, and then from this island northwest to Negadina Point. The dolerite is exposed upon this point, and likewise for some distance along the shore north west of this point.

Negadina Point is the point on the east side of the large bay which has surrounding it for nearly all of its extent very low shore. This low shore especially on the north side of the bay extends inland for at least 7 or 8 miles, and throughout this extent remarkably low flat topography is developed. The land seems to have been reduced very nearly to a base level plain with Lake Nepigon as the base level. Several monadnocks stand up above this plain. One inparticular is very conspicuous. This is a hill which from the lake seems to be a very symetrical cone rising to a height estimated to be 800 or 900 feet above this plain. The plain on its east side

is bounded by the dolerite. Presumably this plain if followed far enough inland would be found to connect to the north around the dolerite with the plain which was observed north of Ombabica Bay . The river entering the northeast side of this large bay has a large delta deposit in front of it, and has brought down vast quantities of sand which have partially filled the bay so that now shallow water extends for a considerable distance away from the shore. As far out as 3/4 of a mile, the water was in places not more than 2 or 3 feet deep. When we reach the west side of the bay, I find upon the shore a number of large boulders of granite and gneiss. I do not find anything just here in place, but am pretty sure that the ~~common~~ rock, if exposures were found, would be this granite and gneiss. Shortly after we started across this bay, a heavy wind from the south ~~has~~ sprung up and we ~~have~~ found it difficult to cross with this wind on the side. By keeping inland behind some of the bars we managed to reach the mouth of a small stream on the west side of the lake, where we laid up for a couple of hours. This stream is small, but is full of trout. When the wind went down about 4 o'clock, we continued up along the shore. After leaving this stream I find exposures

country/

of granite and gneiss on the shore on a bare island. We camped upon the island, which is very nearly bare, fire having run over it quite recently, and upon which there are good exposures of this granite and gneiss. This rock consists predominately of bands of a
40154 hornblende mica gneiss, 40154, which
40155 is interbanded with rock like 40155-6.
40156 Theselast numbers represent some of the phases of what is apparently a very
feldspathic ~~plastic~~ form of the mica gneiss 40154. The banding in this gneiss is remarkably even over the entire area exposed upon the island. In places they are slightly wavy, but generally are straight and continuous. Strike of the banding is N. 70° E. and the dip is 50° to the south This regularity of the banding, and the alternationof bands of varying composition as represented by the specimens above mentioned, are the only indications which I can find which would point to this rock as having been of sedimentary origin. This gneiss complex is cut through by dikes of granite which vary from a fraction of an inch in width up to those five feet across. Specimen
40154 40154 shows upon it some of this granite from the dike. These dikes cut across the bands and have also been injected parallel to the bands.

This granite gneiss complex resembles very strikingly that seen in

Ombabica bay and at other points on the east shore of Lake Nepigon. This particular occurrence here is belived to be the direct westward continuation of that found upon Ombabica Bay, its continuity with that of Ombabica Bay being interrupted by the intervening lake basin, and by the great dolerite dike or Sill, which forms the point separating Ombabica Bay from the main lake.

~~According to~~ Bell's map as published in Irving's report, Monograph U. S. Geol. Surv. Vol. 5, page 408, Fig.35, does not show any granite or gneiss that is Laurentian, as occurring upon the west side of the lake.

August 17th.

The same granite gneiss complex which occurs upon the island uponwhich we camped last night is found uponthe mainland west of the island. It does not show, however, quite such even banding as that exposed in the small area of the island. I find the beds are contorted and the granite, specimen
40157 40157, is in much greater quantity. Here as upon the island, and as elsewhere along this shore, it cuts and includes the gneiss. The character also varies in grain from a fine grained granite to one which is sufficiently coarse to warrant our calling it pegmatite. The

same granite and gneiss complex continues to the west around the lake shore. It appears upon the points. The bays back of these points are sandy with no exposures, and inland the country shows the same monotonous low topography which I have learned to associate with the granite gneiss areas. These granite exposures and the low topography inland from them cease about 1 1/2 miles to the east of Sandy River. The low country abuts against the gray rocky point of dolerite with vertical columnar parting which seems to mark the beginning of that portion of the Nepigon area which is underlaid by the dolerite. On the small island about 1 1/2 miles to the southeast of this point, I find a
40158 basalt, 40158, which in places is slightly amygdaloidal. This basalt weathers rather peculiarly, in places showing a mammilated surface, in fact, over a great part of the area of the island on which it is exposed. These mammillae are oval and from about an
40159 inch in length on down. Specimen 40159 is a piece of the rock showing this
40160 mammilated character, and 40160 shows the mammillae.

Upon the north and east side of this little island, I find a rock at the water's edge which appears to be a

40161 granite, specimen 40161, and with it is some rock that looks like the
40162 hornblende schist, specimen 40162, or rocks which have been produced from this by contact with the basalt. A little bit higher than the granite, and very nearly , but not, in contact with it, occurs the basalt. This has, near where it is almost in contact with the granite, a few amygdaloidal cavities, but it is not scoriaceous. The rocks of which specimens have been taken may be either the granite and the schist metamorphosed, as I have above indicated, or they may be sediments of early Keweenawan age, which were derived from the adjacent granite and gneiss, and which have been intruded and metamorphosed by the Keweenawan dolerite. The exposures are small and poor, and the relations could not be determined with certainty.

After passing the knob of dolerite which forms the point northwest of this island, there begins a very extensive sand beach which continues for several miles around the shore as far as Sandy River. Near the river there are well developed sand hills which come down to the shore with very steep escarpments. These dand

hills are made up of very fine horizontally bedded sands of differing color, with very little clay . Upon the lake shore the banks are 50 feet in height. It was with extreme difficulty that we even reached the mouth of Sandy River owing to a very heavy wind from the south. When we reached this river, I took occasion to go up it for nearly a mile and a half. The ~~sand~~ sand hills which occur upon the lake shore were cut through by this river, and continued inland as far as we went. Along the river they reached a height of about 100 feet and appeared to ~~reach~~ have a very nearly uniform height. I considered these deposits as being old deposits left by lake Nepigon during the glacial period when the water was probably very much higher than it is at present.

Sandy River cuts through these sand hills, hence its name, but it follows pretty closely along a high ridge of dolerite. This dolerite comes down to the lake just west of the river, and keeps on around the shore as far ~~as~~ to the southwest as we traveled to-day. We camped for this night upon the beach back of the first two islands in the bay, about 4 miles southwest of Sandy River. Since starting this morning, we have been fighting nearly all the way against a strong head wind. This moderated a

little in the afternoon, so that we were able to continue our journey after having stopped for a while in Sandy River.

August 18th.

Followed south along the west shore, with steady east north east wind blowing. The dolerite appears in high bluffs which are immediately back of the shore, and with a very rough talus which reaches down to the shore. After we had traveled a couple of miles down the shore, passing dolerite outcrops, I find the outcrops of granite gneiss like specimens
40154 40154-5-6-7, beginning to appear. This
40155 complex is faulted, but, ingeneral, the
40156 banding of the gneiss is fairly straight
40157. with an east and west strike and a dip of 50° south, corresponding, as will be seen, in a general way, with the same bands seen in the rocks northeast of here. Close search was again made for traces of sedimentary characters which would put the origin of these rocks beyond dispute, but could find nothing. This granite gneiss complex seems to me ~~to be~~ must have been originally con - nected across the lake to the northeast with the granite on the other side. The separation of the two rocks being due

either to the fact that the dolerite has overflowed the complex and that it is concealed below it, lying in the basin of the lake, or else this dolerite has cut up through it and separated the two masses. We had not traveled more than a couple of hours before the sea became so high that it was impossible to land and study the exposures. I went on until I found a bay in which I could land, and then walked back along the shore to examine the rocks. We were compelled to wait here for the sea to go down, which it did about 1.00 P.M. Continued then on south passing numerous exposures of this granite and gneiss which appear upon the immediate shore of the lake. Inland, and in places not more than 1/4 to 1/2 a mile inland, rise the steep high bluffs of dolerite. In mapping the rocks the granite gneiss exposed along the shore would have to be put in as a very narrow belt bordering the shore, while inland from this, and probably overlying the country at least for a number of miles, would come the dolerite. The granite exposures end about 1/4 of a mile before we reach the point on the north side of Wabanosh Bay. The topography is such as to indicate that this granite gneiss continues ondown as is shown upon the map.

S. T. R.

View from Porch of Nelson House

Back of this, that is to the west, comes the dolerite. Rowed directly across Wabanosh Bay, touching at the east side of Moosonock or Inner Barrnn Island. This island is made up of coarse dolerite. It fomms a high plateau which rises from the lake with high precipitous cliffs. Touched at the point on south side of Wabanosh Bay, between that and English Bay. This point is made up of the coarse
40163 dolerite. Took a specimen,40163, from the second island south of this point/ The dolerite is exposed in the islands at the moutn of English Bay, both upon the north and south sides, and also upon the point on the south side of the bay. From this point I cut across to the island at the mouth of the bay, which attracted me onaccount of its bright red color, as this indicated something different from the dolerite which has formed the shores for some distance. This small barren island is made up of a bright red weathering quartz porphyry
40164 represented by specimen 40164. This same red porphyry is exposed upon the shore southwest of the island. Dolerite was seen at one place with the red rock on both sides of it, although separated from it uponeach side by a considerable interval. It was impssible to get the relations between them here. It will be well to recall here that upon the east

S. T. R.

View over Lake Nepigon
From Grounds Surrounding
Nepigon House.

side of the lake, a dike of redrock was found cutting the dolerite, specimen 40150. This redrock upon the west side o f Nepigon Bay is presumably also an intrusive in the Keweenawan dolerite. The redrock is exposed along the shore in a number of places southwest of Jackfish Island. We continued on down along the coast, reaching Nepigon House at 5.30, where we camped. This redrock forms high hills back of this post.

Nepigon House: Latitude 49° 53' 25" N.

August 19th.

Rain and head wind detained us here to-day. Was not especially sorry for the detentionas we have been moving pretty regularly and it gave me an opportunity to see the Indians from the vicinity who, considering us to some extent curiosities, visited us in considerable numbers.

August 20th.

Got an early start this morning. Murchison, clerk of the Hudson Bay Company, with whom I had a pretty good chance to get acquainted during our enforced stay yesterday, was asleep, and, after knocking several times and failing to arouse him, I left without thanking him for what he had done for us. It is very foggy. This ~~keeps up~~ condition continues until very nearly midday. Comes down so the fog

S. T. R.

Low-sloping Gabbro Beaches

thick at times that we can hardly see more than a half a hundred feet away from us. Continuing southwest along the shore, we pass numerous exposures of dolerite and basalt.

40165 Specimen 40165 is from the doleritic cliffs just south of Echo rock, the large point just southwest of Nepigon House.

The dolerites continue on along shore, being exposed at numerous places. Continuing around the north shore of Hay Bay, we find numerous exposures of dolerite. We cut across this bay from the north shore to the islands and thence to the south shore. From the Attickoosonock Point, took another

40166 specimen of dolerite, 40166. In the afternoon a light head wind arose which did not delay us very much. Consequently we have been able to make a good many miles. Estimate the distance to be something like 28 miles. Camped for the night onthe mainland to the southwest of the south end of Deer Island. The rocks which we have passed through the day have been dolerite and basalt, which have varied from the fine grained to the coarse grained forms apparently without any regularity whatsoever. At one point only did I notice a basalt which showed sparse vesicles. This graded into a coarser rock without amygdaloidal cavities.

S. T. R.

Low, nearly level Gabbro
Beaches with Spruce and Tamarack

This might have been the amygdaloidal border of a dike or sill, but was not scoriaceous enough to be considered the surface of a lava flow.

August 21st.

Left camp this morning with a northeast wind blowing. This continued rising, and gave us so large a sea that we were forced to follow close along the shore even on the deep bays in nearly every instance. We followed the coast upon which there were numerous exposures of basalt and of dolerite, and then turned into Chief's Bay. Chief's Bay really consists of two large bays which are connected by a straight. There is only an occasional exposure of the dolerite
40167 around Chief's Bay. Specimen 40167 was taken about 1 mile east of the northwest end of the straight between the two bays. The exposure from which the above specimen was taken is a flat stone which comes down to the water's edge. Upon the surface of the exposure there are cracks which are irregularly polygonal in shape. The surface of the exposure reminds me strongly of the surface of the sills which I have seen along lake Superior, and especially of that one upon which the Catholic Retreat is built, upon McKay's Mountain. This flat surface,

showing irregular partings, occurs quite frequently upon lake Nepigon, and I am inclined to believe that theyrepresent the upper surface of sills. Inland, back of this exposure of basalt, the country is low and looks as though it might be underlain by some sediment overlying the dolerite which has been eroded out.

About 1/2 mile farther northwest along the narrows, I saw an exposure, at the water's edge, of buff weathering dolomite. A similar kind of rock is again exposed a little farther on, and at this place the exposure is about 4 feet thick. This rock is exposed for this ~~distance~~ at the water's edge, but it can be seen to continue under the water for a number of feet farther. The dolomite occurs in layers varying from 2 inches in thickness up to 12 inches. Specimen 40168 shows its general characters. Upon fresh fracture it is light greenish, with yellowish streaks and upon weathered surface has a buff crust. This is probably one of the exposures described by Bell in "Report of Progress Geol. Surv. for 1867-69" page 346. He, however, finds that it is underlain conformably by beds of find grained black trap. I was unable to find these beds in contact, but presumably the trap represented by 40167 is underlain by the dolomite. Bell furthermore states

that he finds in the dolomite "small pear shaped bodies about the size of peas." These, he says, "weather out on the surface of some of the beds, but they show no organic structure, either outwardly or in sections examined under the microscope." A special search was made for these bodies, but I was unable to find them. Where I saw the dolomite it had a dip of about 10° to the S. S. W.

Just about the northwest end of the narrows , and about 350 yards west of the last dolomite exposure above described, there is another occurrence of basalt with surface like that described under 40167. These basalts are distinctly not scoriaceous. I am very much inclined to think that these exposures represent the upper surface of the sill which has been intruded at least approximately parallel to the bedding of the dolomite. Present occurrence of the dolomite at the water's edge between two exposures of the basalt could readily be accounted for by minor east and west rolls, which very probably exist in this region. Did not go up into the extreme west side of Chief's Bay,but turned now, and worked southwest. Dolerite continues on down the southwest shore of the bay, although it is exposed only upon a few of the points.

The hard wind which has been blowing all the morning, caught us broadside and almost prevented us from making the south end of the Bay. We reached a protected point in the bay near the south end at 1 o(clock, and had lunch here. After lunch went down to the extreme end of the bay from which the portage should lead south into Black Sturgeon Lakd. Could not find the portage into the lake, however. In fact, did not look very long for it, as I merely wished to use it for purposes of location. Ba salts were exposed at one or two places near the south end of the bay. On the east side of the narrow bay dolerite varying to fine basalt is exposed in a number of places. Especially on this side it forms a high ridge running approximately north and south which comes down to the shore in places, although elsewhere a huge talus is between it and the shore. On the east side of the bay about 1/4 of a mile south of where the long north and south bay divides into two north and south trending small bays, I find a buff weathering sandstone which, upon the weathered surface is fairly friable. More properly speaking, perhaps it might be
40169 called a buff to pink quartzite. 40169 shows the rock. I can see no bedding in it but it breaks off in blocks which

are in general rectangular, and well developed parting planes which possibly correspond to the bedding, have a dip of about 70° W. and strike north and south. There are about 30 feet of this sandstone exposed across the strike. Then comes, east of it, a narrow terrace, and to the east and back of this terrace, comes a nearly vertical face of dolerite. In places, the rock forming the cliff is very fine grained ~~a~~ phanitic basalt, with a ~~supplementary~~ fracture. This occurs on the face of the cliff, and it grades back, that is, to the east, into a dolerite represented by 40170. Bell reports, (Report of Progress Geol. Surv. of Canada, 1867-9, page 345), the occurrence, "about a quarter of a mile north of the extremity of Black Sturgeon Lake, beds of a coarse light gray sandstone, holding occasional pebbles mostly of white quartzite." He says these beds "are found lying against the said of a hill of gray~~ish~~ schistose felsite." The sandstone dips southwestward at an angle of about 40°, while the felsite dips in the opposite direction with an inclination of about 60°, l. c. page 345. This exposure I was not able to find, unless the one which I have already described corresponds

Splintery felsite / 40170

to this. In that case, the basalt lying back to the east of the sandstone is the rock Bell describes as the Splinter felsite. I see, however, no pebbles in the sandstone. I interpret the above described occurrence of sand stone as being the exposure of Keweenawan sandstone throu which a great sill of dolerite has been forced, ~~by~~ turning the beds and giving them their present high angle of dip. The ~~af~~ nitic basalt is merely a selvage of the dolerite sill, and this is the material described by Bell as his Splinter felsite.

alpha

The wind blew harder in the afternoon than in the forenoon, and was unable to get out of this nay, consequently camped on the point.

August 22nd.

Proceeded northeast along the southeast shore of Chief's Bay. The dolerite is the prominent rock along the shore. It frequently forms high precipices at the shore, and invariabl runs back inland into a high range of hills. On the southeast shore of the bay, about 1/4 of a mile north of the point where we camped, I find large blocks of rock represented by 40171, which are so large and angular as to preclude the idea of their having been brought from a distance. These

40171

rocks must be in place very close here, although the moss and herbage conceal the main ledge. About 1/4 of a mile farther up the lake shore, this same rock again occurs, but this time it is in a cliff, and has associated with
40172 it rock like 40172-3. Presumably these
40173 different kinds of rock are interlaminated in the cliff, but on account of the broken character of the face, and imperfect character of the exposure I cannot get the bedding planes. Behind this exposure, that is, to the east, and somewhat farther along the shore, there occurs a dolerite which is immediately next to rock like 40173. The dolerite has a selvage about 18 inches thick, of aphanitic basalt repre-
40174 sented by specimen 40174, which lies next to the rock like 40173. The rocks represented by specimens 40171-2-3, may possibly be sediments which have been me tamorphosed by the dolerite. To me, however, they look too crystalline for that. There is a possibility that these may be the beds to which Bell refers (Report of Progress, Geol. Surv. of Canada, 1867-9, page 345) where he speaks of alternating beds of argillite, felsite, sandstone and trap. I can hardly think that these are the ones referred to by him, however, and , in fact, I was unable to find any that could be identified with his description. I find a little farther northeast along the shore a rock which has a

spotted character, and is represented
40175 by specimen 40175. This rock forms
a cliff along the shore with dolerite
back of it, that is, inland, to the
southeast. All of these rocks,
40171-2-3-5, seem to lie right on a
face of dolerite, which has a surface
parted into irregularly polygonal
masses, which are afenitic, and very
probably represents the surface of
a sill or boss. The rocks seem to
have a dip of about 70° northwest,
although of this I could not be ab-
solutely sure, and a strike which is
approximately northeast- southwest,
corresponding with the trend of the
shore. I could not determine satis-
factorily the characters of these rocks
and while they are clearly older than
the dolerite, I could not determine
whether they were of Keweenawan age
or very much older. I am inclined to
consider them as very mucholder, and
possibly a part of the Huronian, or
even of the schists and gneisses of
the Archean. Whether they are crystals
schists or gneisses can best be told
after the microscopic study.

At one place along the shore,
where the afenitic cracked surface of
one of the sills appeared, I noticed
a number of red irregular areas and
stringers which cut through these.
This redrock intrusive in the basalt
40176 is represented by specimen 40176.

Is not this the same ~~quartz~~ acid rock as that which occurs in the vicinity of Nepigon House (H.B.Co's post), and a also on the northeast shore of the lake (c.f.specimen 40150 and 40164)?

40177 Specimen 40177 shows the basalt and the redrock in contact.

The dolerite continues to outcrop for a number of miles northeast along the shore. In some cases, the exposures show the ~~a~~fenitic cracked surfaces which I have noted as having been repeatedly seen. The hills inland on this southeast shore are very high. Upon the opposite, or northwest shore, the country is flat. It has seemed to me possible that this southeast shore has followed approximately the border of a great intrusive mass of dolerite upon whose surface an occasional patch of metamorphosed sediments still remain. Such sediments would then be represented by specimen 40171-2-3. On the north shore the rocks are flatter lying. There the sills were intruded approximately parallel with the beds. The dolerite very commonly shows a good platy parting which occurs so as to be approximately parallel to those cracked surfaces which I have taken to represent the tops of the bossesand sills. These plates are furthermore sometimes broken, or

parted into hexagonal columns, and in such cases these columns are perpendicular to the plates, that is, to the cracked surface of the sill or boss, if my interpretation of the meaning of these surfaces is correct. The dolerite continues to outcrop all along the shore, as far as the point indicated on the map, which is south of the islands at the mouth of the bay leading to the westernnmost portage across the point into McKyntire's, or Grand Bay. At this place, I find upon the south shore of the mainland, an exposure of well marked granite and gneiss. Speci-
40178 ments 40178-9-80-1 represent the differ-
40179 ent phases of the gneiss. The exposure
40180 appe ars as a low cliff upon the shore,
40181 the top of the low hill in which the rocks occur being covered by a mass of drift. Similar rocks continue to be exposed along the shore at intervals up to the bay which leads down into the port-
40182 age. Specimen 40182 represents the granite which predominates over the gneiss, and which cuts and includes the gneiss. This was taken from a good exposure on the west side of the mouth of the bay leading into the portage. It is noticeable here as elsewhere, that the country underlaid by the granite has low hills and contrasts strongly with the more marked topography of the adjacent dolerite areas. Inland, to the south-

east, of the narrow belt of Archean exposed along the shore, rises a strongly marked ridge of dolerite.

Instead of going due east across the bay, I coasted almost due north around the small island at the mouth of the bay, and then along the northward projecting point. Dolerite shows in numerous exposures along this point. Continued on around this point, and for a distance, about mile and 3/4, up the east side. We were unable to proceed any further on account of heavy head wind, so camped here. The granite gneiss occurrence along the shore ~~was~~ observed to-day, ~~as~~ is not noted in Bell's notes, and seems to have escaped him. Presumably this is the portion of one of the Pre-Keeweenawan belts which, if carried out to the southwest, would connect with those which are well exposed as ~~long~~ soon as the area of Keweenawan dolerite is passed.

August 23rd.

Continued ~~north~~ south along the point this morning, passing numerous dolerite exposures which come down to the shore in low flat exposures.

At the south end of the bay, out of which the portage goes, there are no exposures. The shores of the bay are low and flat. The bay itself is sandy and very shallow. Portaged our

boat and supplies across this portage, which is about 1/4 of a mile long, and continued east, following the north shore of McKyntire's Bay. Dolerite is the only rock exposed. After rowing a few miles along the shore, and finding everything dolerite, we strike out southeast for the islands between the north shore and Grand Bay channel, and from them upon which the dilerite also occurs, we continue southeast to the point which forms the east side of Grand Bay. Continue on around this, taking the specimen of dolerite,
40183 40183, at one place, about a mile and a half south of the narrows which leads into Grand Bay (McKyntire's). The dolerite continues all along the shore, and therefore we cut across the smaller bays cutting from point to point. Reached for our camp tonight, the largest one of the group of islands lying at the mouth of of Flat Rock Bay.

August 24th.

Broke camp early this morning, and rowed across Flat Rock Bay, passing along the islands, composed as usual of dolerite, and reached Flat Rock Portage. It is just two weeks and a half since we left this portage going north, and in that time we have gone entirely around Lake Nepigon, following the shore line very closely with the exception of a portion of the southwest part of the coast. We managed to carry our supplies and our boat across this portage which is 3/4 of a mile long. The following are some supplementary observations upon the rocks seen onthe portage: An observation of the direction of the glacial grooves showed that they had a strike of N.50° E. As already stated, the rock over the flat portage is a dolerite, with, in places, a dense aphanitic polygonal cracked surface now exposed. Specimen 40184 shows the fine grained basalt. About 200 paces northwest of the southeast end of the portage, I noted a great number of angular blocks of banded arenaceous dolomite, similar in general character to that shownin specimen 40103. I was not absolutely sure of the rock being in place, although I thank that it is in place. The general dip of the top of the basalt sill is low, ranging from 10 to 20° to South, Southeast . The portage has received

G. Note Book No. 333 left. 17 Sept.

Phia

40184

its name from the character of these rocks which give a very good firm and smooth footing ~~for the portage~~ over the greater part of its extent. The rocks exposed along the shore of Lake Hannah through which we pass after leaving the portage, are of dolerite. Stopped for lunch upon the first prominent point in Lake Hannah, which we make after leaving the portage, and here I notice several small dikes with a maximum width of 4 inches, of the red feldspar porphyry cutting through the dolerite. This dolerite occupies the shores of the lake farther east as well as the shores of Nepigon River southwest of Victoria Falls. Camped for the night at the foot of Victoria Falls.

August 25th.

Leaving Victoria Falls, we follow the east bank of the lake, passing exposures of dolerite ranging from a very coarse grained phase down to that which is sufficiently fine to be spoken of as basalt.

About 3/4 of a mile south of the foot of the Falls, I notice on the east shore a great number of angular fragments of a micaceous schist,
40185 specimen 40185. These fragments are spread along the shore for a distance of about 50 paces north and south,

and the dolerite occurs on both sides of them. This schist, I believe to be in place here, although there are no large exposures which would confirm
40186 this idea. Specimen 40186 was taken from the east shore of the river about 1/4 of a mile north of Pine Portage. At the north end of Pine Portage, I fou nd a fragment of the spotted iron bearing formation of the Animikie,
40187 specimen 40187, which is absolutely identical with that which one finds in the Animikie in the vicinity of Port Arthur, Gunflint and elsewhere. The drift ~~bands are~~ is heavy on the portage, N. end of forming marked drift topography, and it is possible that this specimen was brought down from exposures of the Animikie which lie farther to the northeast. Of this I have some doubt, however. It seems to me not at all improbable that this small piece might have been brought here and dropped by some traveller.

Dolerite continues farther south to a point between Hamilton's Pool and Cable Pool, south of the north end of the Pine Portage. South of the dolerite, staurolitiferous and garnetiferous mica schists begin to appear. Specimen
40188 40188 shows the characters of such schists. The strike of the banding of these schists is N.35° E. dip 80° E. to 90°. The river follows very

closely the course of these schists, and for some distance down the river the schist is exposed upon both banks. Js / The island over which ~~High~~land Portage passes is made up of these schists. 40189 Specimen 40189 was taken from this island. The schistosity agrees very with that / closely in its strike ~~east~~ of the banding, the strike of the banding is N. 35° east, dip of 85° to 90°. Schistosity is moreover well marked by small quartz veins which have been infiltrated parallel to the lines of schistosity. These same schists appear again on the west bank of the river, just at the foot of the channel which runs on the west side of the island. Here these schists are cut by coarse pegmatite dikes. Is not this Bell's Huronian, as shown upon the map reproduced by Irving in Monograph U. S. Geol. Surv. Vol. 5, page 408, Fig. 35? If so, what is his reason for making this Huronian whereas the schists which occur south of here on the river and upon Lake Maria, he puts as Laurentian? The schists referred to as occurring farther south on the river, are, it is true, cut through by great numbers of granite dikes, but the schists occurring here in the vicinity of Pine and Qa / ~~High~~land Portages, is also cut through by granite, although it is true that this is not so abundant as it is in the

vicinity of Lake Maria. I see no reason for considering the rocks of these two areas as being of a different age. Just below the last outcrop
/s/ of the schists south of ~~High~~land Portage, the dolerite begins forming both banks of the river. It thus appears to cut directly across the strike of the schists, and thus I think gives the true relations of the rocks. That is, I believe the dolerite is the younger intrusive which has cut across the strike of the schist. The dolerite appears on both shores of the river in hight hills which frequently come down to the river in vertical cliffs, occasionally with an enormous talus between the river and the cliff. Specimen
40190 40190 is the dolerite which occurs on Split Rock portage. In places, this dolerite splits up into very narrow sheets which cause it, from a distance, to look somewhat like a thinly bedded schist or sediment. It has been raining off and on all day. Shortly after
we pass Split Rock portage it began to pour, and continued to rain until we camped at 6.30. We would have camped earlier, but there was no place along the shore where we could conveniently pitch our tent, so were forced to continue until late.

From Split Rock Portage, the dolerite continues down the river for about 3/4 of a mile, coming down to the shore in cliffs. South of the dolerite, the shores begin to get low, although immediately back of them rise the high dolerite hills. Along these shores there occurs a succession of schists chiefly mica schists, in which the amount of mica varies very considerably. Specimens
40191 40191-2-3-4 represent various phases
40192 of these schists. They show distinct
40193 and very even banding which ranges
40194 in strike from north 55° east to North 75° and 80° east. The most constant strike is that of nearer North 75° east, and this probably is the one which indicates most correctly the true strike of the bands of the rocks. The dip is from 80° W to 90°. At various places these schists are found to weather bright red and are spotted, resembling some of the spotted contact rocks that we see on Lake Superior, on Pigeon Point. These spots vary in size from 1 1/4 inches in length and 3/4 of an inch in diameter, down.
40195 Specimen 40195-6-7-8 show the fresh
40196 forms and weathered phases of this
40197 spotted rock.
40198 At one place on the east bank of the Nepigon, and about 1/4 mile north of where the river empties into Lake Maria, I find an exposure of dolerite

with a selvage which cuts through and across the strike of these schists. A similar dolerite and these schists alternate in exposures along the river for a short distance, just at this point. Then these schists continue on to the south. This shows us clearly the intrusive relation which the dolerite bears to these older schists. On the east shore of the river, there were seen at one place dense gray bands of rock, such as that shown in
40199 specimen 40199, which varied in width from two inches up to two feet, and which ran parallel with the banding of the schists. These schists are like 40194. The strike of the banding in the schists and the trend of these lighter gray bands is N. 75° E. with a dip of 90°. Are not these bands acid intrusives?

Shortly after I began to find the exposures of these schists, I noted dikes of bright red weathering coarse pegmatitic granite which cut through th schists. These continue to occur becoming more and more frequent as we go farther south. They vary in size from a few feet up to 50 paces in width.
40200 Specimen 40200 shows very well the pegmatitic character of this granite. These dikes also occur finer-grained, as well as more numerous, as we go further
40201 south. 40201 represents a phase of the granite which occurs at the second point south of where the river empties into

Lake Maria, and on the east side of
40202 Lake Maria. Specimen 40202 is a
garnetiferous mica schist cut by the
granite 40201. These schists cut by
the granite are the series which Bell
has classed as his Laurentian. I
believe that the series is the same
as that exposed upon Pine and Island
Portages, and over a very narrow area
just south of Victoria, c. f. specimen
40185. If this is the Laurentian, it
differs from the rocks which Bell
classed as the Laurentian upon Lake
Nepigon. Here upon Nepigon River the
schist predominates greatly over the
granite, and the schist possesses good
banding, and this with the presence of
the contact minerals such as garnet,
and staurolite seems to indicate that
they represent metamorphosed sediments.
Camped for the night on sandy beach in
a small bay into which the stream comes
from the east.

August 26th,

Continued south down Lake Maria
following the east bank. The mica schis
and granite continue to appear. The
granite usually predominates on the
exposures which occur on the salients,
the schist apparently occupying the
intervening low ground forming the
reentrants. There are very few ex-
posures to be seen in Lake Jesse, which
we reach below Lake Maria. Especially

upon the west side the banks are all drift. About 1 1/2 miles above the north end of Camp Alexander Portage and upon the east shore of Lake Jesse high blocks of granite represented by
40203 specimen 40203 with very little schist associated with it, occur. Further south along this same shore the schist and granite continue to be exposed. The banding of the schist strikes pretty nearly with the exposures which the river gives, that is, a little to the East of north. The dip of the bands in the schist varies from nothing when they are found as in some cases lying horizontal to 50° to the east. This change in dip is probably due, as is presumably also the changes in strike and dip farther north of lake Maria and Little Nepigon River, to the intrusion of the granite. These exposures are cut through and through by granite which formost part is like 40203, but in places varies to a lighter colored and sometimes even slightly gneissose phase.

The country immediately bordering Lakes Maria and Jesse is very low with the illy defined topographic features which I have found very common in the granite and schist areas of Lake Nepigon. Back from the shore ranging in distance from a quarter to three miles, away from the shorecome in high cliffs which run

back into high plateaus which are pre sumed to be formed by the Keweenawan dolerite.

The schists are observed upon the east side of lakes Maria, Jesse and the Nepigon River are the same as that schist seen farther ~~south~~ north at Cameron's Pool. As the granite dikes have been found to increase considerably in quantity and in size as we go farther south, the presumption is that these schists would be found to be more and more metamorphosed as they are followed to the south, and that finally one would pass over an area underlaid by the schist granite complex into an area presumably underlaid by the granite alone . This portion of the river however was to be worked by Prof. Van Hise, so I made no observations from Camp Alexander south. I reached the north end of Long Portage at about 10 o'clock. Was not prepared to carry all of our supplies and especially not the boat over this long portage, and were compelled to wait until about noon when a party of New Englanders came along. From them I engaged three Indians to take the boat over. I had to wait their convenience, however, so that we did not get everything across the portage and reach camp Alexander where we stopped for the night, until 5.30.

6.

August 27th.

Knowing that there was no boat which would leave Port Arthur tomorrow, I decided to spend the day in fishing Cameron's Pool, which I did without any success.

August 28th.

Reach Nepigon before noon, and after settling my bills and getting everything packed, took an afternoon train to Port Arthur . Find that the first steamer which I can catch for Duluth leaves late in the afternoon of Thursday, day after tomorrow.

August 29th.

Spend the day with Professor Pumpelly, and Mr. White, of Harvard, in visiting Kakabika Falls.

August 30th.

Took the steamer Monarch this afternoon for Duluth.

August 31st

On account of fog we remained all last night anchored among the islands in Thunder Bay, and as a result of this delay did not reach Duluth until about 7 P. M.

The following information, concerning the occurrence of a conglomerate associated with an iron-bearing formation was contained in a letter to me, written by Mike Ralph of Minneapolis, a man who has done a great deal of prospecting in recent years on the east side of Lake Nepigon in Ontario.

This conglomerate, since it contains fragments of jasper, specimen 40326 is presumed to correspond in age to the Stuntz or Ogishke conglomerate of the Vermillion District of Minnesota. The jasper occurring in fragments in it, presumably has been derived from an Archean iron bearing formation, associated with the green stones, which occur abundantly on the east side of Lake Nepigon. See my notes on Lake Nepigon, for 1900. Note books 333 and 334.

'The conglomerate, specimen 40326 was found in places on the north bank of Sturgeon river on the east side of

Lake Nepigon. It occurs three miles from the mouth of the river, and 700 feet north of the first rapids of the river. It is exposed in a knob, which has a steep south face about 150 feet high, and slopes gradually to the north. The dip is to the north. North of the conglomerate and 1400 feet distant from it, occurs iron ore which is a hard banded red hemitite. Slates underly the conglomerate, and have a dip of 70 degrees to the north with a strike of 20 degrees N. of E.

A nice slaty hemitite was also found a mile and a half south of the Sturgeon river. The strike of this was also 20 degrees N. of E. , and it had a north dip.

I leave here for Sturgeon river, expect to be gone about 20 days.'

(signed) Mike Ralph.

Jan. 14th. 1901.