[Original Huronian III] : [specimens] 45887-45894, 45962-45970. No. 374 1902

Van Hise, Charles Richard, 1857-1918; Leith, C. K. (Charles Kenneth), 1875-1956
[s.l.]: [s.n.], 1902

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.

Notebook No. 374.

45887-45894
45962-45970

See Notebook 373

Bruce Mines.

Sept. 16th.

Leith.

With Hillyer started at Bowker's Point about 2 miles west of Bruce mines and landed where the limestone appears on the point. We followed the limestone down the shore and around the next main point, a distance of nearly a mile. Throughout this distance the limestone shows considerable folding and contortion and is frequently cut by dikes and bosses of greenstone. The dip of the limestone or rather the pitch of the minor folds is throughout in southerly directions, usually about southeast. The angles vary from perhaps 25 to 35° and close to the diorite an angle of nearly 90°.

Around the point in the bay (see map where we expected to find slate conglomerate, we found an island (or point) consisting of a very peculiar rock. It has a dark yellowish greenish weathering surface, shows a good banding, and a coarse brecciation. This material is undoubtedly the same as that seen to the west of the limestone belt north of the town, for it contains the same small red eyes in places, which I am not certain whether quartz or feldspar. In addition this rock contains fragments of clear material which is almost true quartzite. The rock contains considerable quantities of vein quartz in irregular angular areas. It contains also certain round-

ish and ellipsoidal cavities lined wi th quartz crystals which look like amygdules, although I cannot explain their presence here. The rock under the lens looks like typical slate and graywacke, but its aspect on the weathered surface is clearly that of an eruptive breccia. Is it possible that we have here a bedded ash?

45962-4 45962, 45963, and 45964 represent three phases of the rock on this point.

Some of the most beautiful glacial work I have ever seen appears on this ledge. ¶ The fresh surfaces show gradations from gray to green which make the whole look like mixtures of true sedimentary and igneous material.

On the next little point to the northwest the same may be seen with little coarser texture and with good strike and dip. The strike is north 25° west and dip averages 30° to the southwest. Excellent ripple marks and shown in places.

Then went north for a short distance and back through the woods to the lake, hoping to get the contact of the limestone and upper slate conglomerate, but did not get them any nearer than we first saw them i. e., about 100 steps. Also tried to find

something in behind the limestone but found nothing but diorite.

In the afternoon took the boat and went down into the bay west of Bowker's point and visited the island southwest of the point where we stopped in the morning. This is slate conglomerate with low westward dip, although much contorted in detail.

On the point to the north of the island the slate conglomerate shows folding, but in general dips in a westward direction at an angle of 10°. One portion of the point shows northwest dip. Certain of the layers become coarse and conglomeratic here and some of them carry fine-grained chert and calcareous material. They weather with a brown color showing cherty ridges like the limestone.

45964 45964 shows the interbanded slate and calcareous chert with limestone weathering.

On the mainland still farther to the north, i. e., on the exposure we saw across the bay, which in the morning we thought was quartzite, we found dark gray quartzite showing beautiful ripple marks, etc., and showing also typical brecciation like the slate exposure. Interbanded with it are slate phases and there can be no doubt as to the fact that this is a part of the upper slate series. The ledge was followed for about 200 steps

45965 west and found to become massive and not brecciated and to have a general dip to the northwest at a low angle estimated at 12°. There was no good place to measure it. This quartzite shows the same dark eyes of quartz and general appearance of the quartzite seen south of the C. P. depot. I think, therefore, that the succession is correct. The only addition to yesterday's work is that the eruptive breccia found west of the limestone, yesterday called eruptive breccia, will now be called a part of the upper slate series because of today's work.

Then went back to Bowker's point and worked back along the shore from there back to town. Northing but diorite was found.

We then crossed to the point just east of the town. This point consists mainly of diorite, but on the southwestern side next to the water is a low exposure of red quartzite, typical 3G. It is so massive that I could not find a good place to measure the dip, but the surface of the ledge itself I believe shows the dip. The ledge is broken into layers, the surfaces of which are gently rolled, but for the most part dip to the west and southwest at a low angle, 8 or 10°. The quartzite shows some variety of phases.

45966 45966 shows three phases of the quartzite.

The dark one is the metamorphic phase close to the intrusive diorite which comes into contact with the quartzite on the north side. The prevailing color of the ledge is a yellowish red. Some of the ledge is white and vitreous with a few spots of red feldspar, while other parts have more of the red feldspar, and still others are somewhat conglomeratic.

This quartzite is far from the limestone, about 1 1/2 mile west, but so far as the dip goes it ought to be under the limestone. Also it is different lithologically from the quartzite observed above the limestone.

Then we went to the little point between Garden Bay and ..... Bay where there is a low series of fine exposures of quartzite, varying from the other one in showing more conglomeratic phases in places and in showing more brecciation and in showing more injection of greenstone on the north side. The pebbles of conglomerate are of chert of different colors and jaspers and the rock is similar in all respects to 3G and the jasper conglomerate Van Hise saw west of Little Rapids. The rock is folded

gently, and it is difficult to get good strikes and dips. However, using the top surface the dip is usually flat, about 12° or so, in a northwesterly direction. Some were found to the north and to the southwest.

Bruce Mines.

Sept. 16th.

Leith-seaman. Notes by Leith.

with Hillyer, Seaman, and Mr. Chase S. Osborn took a boat and went down to Palladieu island, about 5 miles east of Bruce mines. Saw the normal quartzite on the island at a number of points. It is quartzite with abundant feldspar and quartz eyes which weathers to a reddish color. It contains also chert, vein quartz, and a few jasper pebbles. The attitude of the quartzite on the island could not be determined, although it seemed to dip to the south on the island just to the north. Perhaps 50 steps from the main island are low flat exposures of slate conglomerate, containing the usual pebbles of granite and greenstone. This slate conglomerate was actually observed to become coarser in bands and finally to become interbanded with the quartzite with all the characters of 3G. In one ledge slate conglomerate was seen with quartzite and all dipping to the northwest at a low angle of about 20°. In another ledge the same quartzite shows true vein quartz pebbles, so that there can be no question that the two are actually interbended and form a continuous westward dipping series.

Then landed on the point just west of Palladieu island and followed the road out from the shanty to the main road. At the point and at a number

of places out to the main road after a distance of perhaps a mile red quartzite may be observed with gentle northwesterly dip at angles varying from 10 to 60°. The latter, however, are probably due to intrusion. There are many minor rolls and in some places heavy reverse dips for a few feet.

We worked along the main road for about 1/2 mile and then went northwest to the railroad track. From there we went to the road a little west of the place where the railroad track crosses the division line between 1 and 2, then went north.

In the open field about 1 1/2 miles north we struck the beautiful brecciated slate and graywacke which we had found west to belong immediately above the limestone and going northward about 1/2 mile we found typical slate conglomerate dipping to the north at a high angle, 45°.

Then worked along the railroad until we found the limestone in a low cut where it stands vertical and strikes east and west and is cut by diorite which may be seen in contact with it.

We followed this limestone west on the course marked on the map. At about 1/3 mile in a farmer's yard we

found limestone dipping northward and 100 paces north of it typical brecciated graywacke and slate belonging to the upper slate conglomerate. There could be no question as to the succession here.

Reached a point about 1/2 mile west of the railroad track where we found quartzite evidently part of the great conglomerate lying directly under the limestone.

At this point the limestone takes a sudden bend to the south and we had to offset about 200 paces while we went west 100 paces to pick it up again. Then working south from this we soon struck slate conglomerate in its typical form. The two are separated by an interval of 50 paces. The limestone was dipping to the north as was also the slate conglomerate, judging from the breaking into layers. This slate conglomerate was carefully examined and found to contain at least two kinds of granite, greenstone, vein quartz, black chert, or jasper, slate, and finally, but most important, quartzite. The quartzite boulders are not plentiful, but at least 12 were found, some of them three or four inches in diameter. Some of them were white, resembling vein quartz, while others had grayish appearances.

45967 45967 represents the normal slate conglomerate.

45968 45968 represents a specimen pebble of quartzite with several chips from other specimens.

Some of the best quartzite fragments could not be specimened because they were flat in the ledge.

On the lower flank of the escarpment, about 25 steps to the east, may be seen normal 3G, i. e., massive pha phase. Going north about 100 steps this may be seen dipping gently toward the slate conglomerate. At this point it is apparently associated with red granitic material.

Then went west about 100 paces and in the open clearing (See location on map) found actual contact of 3G with slate conglomerate. The bedding of neither one could be determined certainly, but apparently the layers of red and white quartzite dip gently under and conformably with the layers of the conglomerate. Not enough of the contact was exposed, however, to warrant a positive statement of unconformity. We hunted here for quartzite pebbles and found only a few rare ones. They are certainly very rare near the contact and they seem to occur in certain layers.

45969 45969, red quartzite six inches below the contact.

45970 45970, slate conglomerate just above the contact.

Throughout the day abundant diorite was seen. Indeed at almost every point it interfered somewhat with the study of the relations and no attempt was made to map it. Going south to the road the dip of the red quartzite could be clearly seen and it dipped gently to the north. Also vein quartz pebbles, indicating it is original, could clearly be seen.

Bruce Mines.

Sept. 16th.

Leith.

With Hillyer went west about 4 1/2 miles along the Lockport mine west of Bruce mines to a point within about 1/4 mile of the bay of the lake. At a distance of about 2 miles from the town we crossed limestone with typical character dipping at a low angle in a westerly direction. It is so contorted that the strike and dip were not measured, but in general would say it to be about 20°. Then went on west and about a mile farther on and possibly a little more east saw the ledges of typical slate conglomerate which were followed west until we were in sight of the lake. They are in abundant exposure from here on.

Mr. Ingalls states that the area of slate conglomerate mapped over in this direction is more than half quartzite.

Then went back and picked up Mr. Ingalls and examined the limestone near the contact of the quartzite just north of the town. We had traced one belt of limestone with the quartzite and slate conglomerate to the south and this knob in the fork of the road is fully 500 steps south of this belt. The limestone dips to the north at a low angle. Going north the limestone was again seen crossing the road and going over into the field to the east.

About 100 steps south of the limestone are large ledges of typical slate conglomerate, while immediately to the south of this and dipping at a low angle under it is white quartzite like that to the south. I am not sure whether this white quartzite belongs with the quartzite itslef or is a true phase of the slate conglomerate.

On the west side of the road also Ingalls shows us limestone about 200 steps south of where we had traced it.

We then went northward to the railroad track and walked west along the track about a mile to find an outcrop of supposed limestone there reported, but found nothing but slate conglomerate and diorite in typical exposures in the railroad cuts. Afterwards in talking with the man who directed us he said we had visited the right cuts and that he was simply mistaken in the rock.

The distribution of the blets looks like a case of redistribution by gentle folding bringing up slate conglomerate and probably also the quartzite between the two belts. As there is quartzite and slate conglomerate in the same relative positions north of the northernmost limestone belt, the question naturally arises is this not a further duplication and

ought we not to find limestone to the north of the slate conglomerate. It has evidently not been found and I am inclined to believe, therefore, that the quartzite and slate conglomerate to the north of the limestone are true upper sediments. Further, it is somewhat different litholigically from the lower, being more of a slate and quite lacking the round dark quartz eyes and coarse character of the lower slate conglomerate.

The facts of the three days show a monoclinal succession from the shore about five miles east of town across the strike in a gentle northwest direction, interrupted only by diorite, as follows:

(1) Slate conglomerate, very quartzitic and interstratified with layers of reddish quartzite, some of it containing pebbles of vein quartz and dark chert and jasper. Cut by diorite.

(2) Reddish feldspathic quartzite with bands of pebbles of chert and jasper, most of them not red, but some of them red. Cut by diorite.

(3) Slate conglomerate consisting mainly of dark quartz eyes in a dark colored matrix containing pebbles of two kinds of granite, some greenstone, vein quartz, dark chert, true jasper, two kinds of quartzite. Maximum thickness 100 feet. In its

upper portion it becomes dark quartzite without fragments.

(4) Limestone, banded and cherty, showing ridgy weathering and much contortion. Some fragmental material is associated with it in the form of fine-grained novaculitic layers.

(5) After an interval of 100 paces, which was nowhere filled, a peculiar dark green breccia showing on the weathered surfaces ridges of vein quartz and of brecciated character. Parts of this look eruptive but the most is unquestionably sedimentary. It contains true slate, graywacke, and quartzite and soon grades up into coarse slate and graywacke and then into a feldspathic quartzite, weathering light gray.

(6) Typical slate conglomerate showing fragments of granite, greenstone, and chert.

(5 and 6) constitute what has been mapped as upper slate conglomerate.

Therefore, this portion of the district forms the limb of one fold. The limestone west of Bowker's point shows that the fold is anticlinal with axis running from this point southeast into the lake. This makes it probable that the conglomerate at Thessalon is lower. It also shows tha

the limestone north of Thessalon is lower. In fact it shows the essential correctness of Logan and Murray's mapping. The work does not show any erosion interval above the limestone, although there is a space of 100 steps in which conglomerate might appear with limestone fragments. This naturally suggests that the supposed upper slate conglomerate is really a part of the lower series and that the break above the limestone in this district comes above the slate conglomerate, i. e., the upper slate conglomerate has not been removed by erosion.

The brecciation of the green slate just above the limestone it is suggested might be explained by the fact that in the folding the readjustment w was largely taken up by the limestone and that involved considerable movement in the slate adjacent. The limestone moved easily by recrystallizatio while the more brittle slate had to accommodate itself by fracturing.

Garden River.

September 15, 1902.

Van Hise.

Drove from Canadian Sault to point where road first comes down to the pre-Cambrian rocks on way to Garden river, between 4 and 5 miles north of west of Garden station. At point where we first touch bluff there is an old wood road which goes north along the west face of the bluff. Here the ledge of slate conglomerate faces to the west. It shows beautifully its bedding - is rather a fine conglomerate. The rock is directly on end as shown by the beds of fine and coarse material. The strike is about N. 60° W. In following the foot of the cliff to the north and as the bluff turns about to the northeast, the conglomerate becomes coarser and coarser until it is a coarse boulder conglomerate, the dominant fragments being granite, and showing no bedding. Following the ledge to the east one comes on a northwest facing cliff of the limestone. This limestone is here in a rather broad band. It strikes about N. 45° W., and dips 65° to the northeast. The conglomerate and slate are in immediate contact with the limestone, and at this point are under it, the limestone evidently being overturned. We followed the limestone to the southeast, and after a short distance slate and slate-conglomerate is found both northeast and southwest of the

limestone. At no place did I find the conglomerate, quartzite, or slate, these phases of the same formation, lapping over the entire limestone formation. The facts which I saw at this limestone belt which I followed for at least a third of a mile, might mean that we have here both the lower slate conglomerate and the upper slate conglomerate, and the fact that the belt of conglomerate to the northeast of the limestone contains limestone fragments, combined with the facts given by Leith and those described below, incline me to the belief that all the conglomerate here found belongs above the limestone and that its position to the north is due to overlap, erosion, and folding. The granite bluff to the northeast is about 100 steps or more from the slate conglomerate, and the limestone thus far seen; but returning to the old road and following it a short distance, it now swings to the northwest, we first find slate conglomerate then the quartzite. The westward swing of the road is normal to the strike, and thus we pass to higher and higher horizons. Now climbing up the bluff and going in a northeast direction toward the granite I pass from the quartzite to the fine slate conglomerate and by transition into the

form in which the conglomerate is a mass of granite boulders in a slate matrix; then to the form I have called granite stucco, i. e. granite debris of all sizes, many of the pieces more or less angular, these cemented by fine granite debris; so that on fresh fracture the material closely resembles granite, but upon the weathered surface shows its true charadter.

This granite stucco is found close to the genuine granite at various places, and indeed it at a number of places is plastered over the granite. A very short distance to the north east of the stucco veneered granite acrossa little ravine is found the granite complex, i. e. ancient schistose greenish rock cut by granite. That the complex is older than all the slate conglomerates exposed in this vicinity there can be no doubt, but whether any of the conglomerate belongs below the limestone is uncertain. We therefore have no positive evidence that any of the granite here is older than the limestone. If both conglomerates are present apparently the limestone has been eroded between them to the northwest of where observed; but if this is so I was not able to show it by an unconformity between the two conglomerates. The northwest trend of the ridge at the place examined corresponds with the

strike of the rocks and is therefore a strike ridge. It looks as if the strikes south of west north of Garden, the east-west strikes some distance to the west, and the northwest strikes all corresponding to the topography are taking the sediments around the granite.

(At Sudbury the granite formerly called the Laurentian, but now mapped as Huronian by Barlow, has a true foliation, in places, and where mingled with the diorite schist is a banded gneiss).

The succession of the Upper series above the limestone is conglomerate - coarse - fine conglomerate, then quartzite, then same as at Echo lake.

Algoma Central Ry.

Sept. 16, 1902.

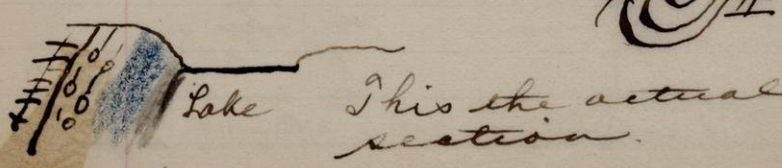
Van Hise.

Examined the succession of rocks at Loon lake near Wild's station, Algoma Central Ry. To the northeast of the lake is red granite. To the southwest of the lake also a little way back from the shore is a similar red granite. To the southeast of the lake the granite of the upper sides approach closer to each other - indeedare mapped by the Clergue survey (private map) as coming together. Between the two granites is a Huronian basin which opens out to the northwest.

The relations of the granite to the Huronian rocks were first studied on the southwest side of the lake, but at first were not clear. But on the northeast side of the lake at a slightly projecting point the red granite was found to be overlain at the water's edge and for a little way above by a beautiful slate-conglomerate which contains as the dominant fragments the immediately subjacent granite in well water worn boulders and pebbles. Some of the boulders are a foot in diameter and from this they decrease in size until they are lost in the slate matrix. Beside the red granite there are other gray granites, various green pebbles, One, three inches in diameter, is composed of red jasper. The conglomerate is separated from the granite with knife like sharpness. Indeed the granite

worn by the waves at the time of the deposition of the conglomerate is pasted over with the sedimentary rocks, and when separated shows the surface smoothed in Huronian time. In the matter of sharpness and clearness of contact with the relations so plain that a child can read, I do not know that I ever saaw this one excelled. A miner with me comprehended its meaning upon a single explanation. Indeed the position of the dike at this place, cleaving off the conglomerate, really suggests how the ancient sea made the deposit against the granite shore.

Upon the southwest side of the lake the succession of sediments is well shown. At the lake and for some distance inland from the northwest point
45887 of the lake slates are found. These slates are fresh, little altered, and very like the Animikie slates. These slates grade into graywacke and then into quartzite. The dips are steep to the southwest, from 65 to 80°. South of the quartzite at one place is again the conglomerate XX which rest against the granite and greenstone showing the sediment belt to be an overturned syncline thus



The quartzite was not seen on the northeast side of the lake, but we were told that a place southeast of the northeast point of the lake showed the quartzite - and this just fills in the gap. The quartzite where not affected by dynamic action is a gray-wacke-like phase. But where the ore occurs this is broken up and veined
45888 with quartz. Indeed it is a dynamic breccia or autoclastic rock which has been cemented with and impregnated by quartz and hematite. At one place the roundish quartzite areas in the cement of quartz and hematite present a remarkably conglomeratic appearance, but the fact th that the pebbles and boulders are all the same and that it grades unmistakeably into a breccia leave no doubt of the real character of the rock.

The contact of the sediments and the granite to the southwest of the lake is not nearly so clear as to the southeast because (1) exposures are in the woods instead of on the clear lake shore (2) because more contorted sediments are more altered, and (3) because a black or gray dioritic schist confuses the relations. This cuts or is cut by granite - this is not quite clear. This similar in the dark woods and moss-covered exposures to the altered slates; but the clear conglomerate just above the boarding camp of the . . . . . exploration shows the relations between the sediments and the granite to be the same as on the northeast shore.

Small quartzite exposures said to be at small lake south of Loon lake, are beyond this granite. This we did not see.

Algoma Central Ry.
Sept. 17, 1902.

Van Hise.

Walked along railway track from Wilde to granite quarry (?) 23 1/2 miles to Heyden, 13 miles from Sault

For first mile, that is nearly to the 22 mile post, the rock is the ancient green, somewhat schistose, peculiar reddish granite and whitish weathering Archean greenstone cut intricately by red granite dikes and veins. In places the greenstone is somewhat schistose - in general it is broken into blocks, and in places it is massive. Have no doubt of the Archean character of the greenstone.

Shortly after the 22 mile post we see many fragments of slate conglomerate, but no outcrop. Have, however, no doubt the same belongs here. One big block is full of quartzite pebbles similar to the quartzite seen at Loon lake.

Before the 21 mile post is reached red jasper conglomerate or red quartzite containing the thin bands of conglomerate with numerous red jasper and chert fragments occur. This as shown by conglomerate, bends striking N. 80° W, dipping 70° S.

Just past the 21 mile post white quartzite filled with rather slaty layers are seen.

Here the strike is E-W and the dip south. It appears that we has passed above the red jasper conglomerate to the white quartzite above, but this quartzite is reddish at various places; indeed the reddish varieties are as common as the clear white ones.

About 1/4 mile beyond the 20 mile post an epidotic-chloritic-schist is found - similar in many r respects to that at Wilde except that no injecting granite is found in first(?) ledge. The rock has well developed schistosity which strikes N. 45° E. and dips 50° to the southeast.

The greenstone contains small granite-like veins, but these are plainly veins and not dikes, which I examined closely. Off at the side where red streaks which at the time I took to be granite, but after seeing the peculiar quartz-feldspar veins I am somewhat in doubt, although one certainly, as I remember it, was several inches wide and cut straight through like a granite dike, continuing to past Bellevue indeed to the 18 mile post. For most of this distance many of the beds are strongly amygdaloidal. The amygdules in places run up to two or three inches or more in diameter, although those smaller are much more common. The strong amygdaloidal

beds contrasting with the dense(?) beds, led me to suppose on the trip up from the train that the ledges about Bellevue were the slate conglomerate. Indeed I did not doubt this whereas they turn out to be a bedded amygdaloidal volcanic series.

After the 18 mile post is passed the first cut shows greenstone con-
45889 glomerate, a rock with greenstone fragments in a greenstone matrix. Many of the fragments are well rounded however, and suggest a water-worn character. The conglomerate continued to the eastern part of the cut. About the middle of the cut the conglomerate rests against amygdaloid-like that higher up, the contact being vertical. It looks as if the conglomerate may belong with this volcanic series. Certainly the volcanic yields all or nearly all the fragments for the conglomerate. But whether this was almost at the time of formation or ages after does not
45890 appear. The volcanics continue again in typical form for perhaps a quarter
45891 of a mile or more. 45890, amygdaloidal phase of volcanics. 45891 Vein in volcanics. But at a creek on the northeast side the greenstone con-
45892 glomerate appaars against the veined amygdaloid. (45892 specimens and matrix). This looks exactly like the

conglomerate before seen with the volcanics. Just across the narrow ravine perhaps 20 feet the same conglomerate is found, and in a few feet this coarse conglomerate is found to contain well rounded pebbles and boulders of granite, red, massive banded, etc., at least four or five kinds contain ferruginous material in considerable fragments and red jasper. 48593 specimen of matrix, 48594 specimen of quartzite pebble in conglomerate. The schistosity is vertical and the whole thing at once suggests the Original Ogishke conglomerate, and is certainly like the conglomerate of the Michipicoten district. I can have no doubt from the variety of the material in this conglomerate that it is a late formation. It is also possible that the volcanic series belongs with the conglomerate, but it may be much older. One would say this if the volcanic series were plutonic, but following the volcanic outbursts a conglomerate may immediately follow. In any case the two are closely infolded and the volcanics may belong with the granite schist series of Wilde. Indeed when I first came upon them I supposed that these belonged there, but as these rocks at the middle are northeast of the sedimentary belt there is no evidence that the volcanics are not a newer

series. The volcanics, the greenstone conglomerate, including the granite pebbled kind, are veined with quartz and feldspar, are fractured, etc., but to the trestle 17.29 no genuine granite dikes have been found in them.

As we go to the southwest away from the contact of the conglomerate with the amygdaloid, the conglomerate becomes finer and this suggests that the volcanics are a basement upon which the conglomerate was deposited. The strike is so obscure that it was not determined.

Going a little way further the conglomerate becomes so fine as to show quartzitic places, and then it becomes coarse again, and shortly after the 17 mile post was passed there appeared coarse schistose to massive diorite rock which was shot through with small amounts of unmistakable granite. The granite is very subordinate in quantity until the 15 mile post is reached where the green diorite rock is permeated with granite dikes. This coarse greenstone rock cut by granite is almost if not quite identical with that which occurs for a mile south of Wilde and I do not doubt that the series is unconformably below the conglomerates as at Loon Lake and Sarden River.

The volcanic material associated with the conglomerate I am inclined to associate with the sediments as at Thessalon, but this point probably can only be determined by making a geological map of the district.

While directly at the 15 mile there is much granite and the same is true at several other points, for the most of the way between the 15 and 14 mile posts the granitization has not gone far; and at such places the green rock is finer-grained, chloritic epidotic, and calcitic, and showing traces of amygdaloidal texture like the volcanic band associated with the conglomerates. Indeed the likeness is so close that I am now inclined to regard the break between the volcanics and the conglomerates a great one -- not on the existence at the contact, but because of the general relation. The conglomerate was nowhere seen to be interstratified with the volcanics. The relations in fact are exactly those which I have described as due to infolding between a basal conglomerate on granite and its recomposed material. The difference as stated is that the granite does not form at the surface, hence must be eroded; while the volcanics do and the conglomerates might not mean much. Upon the other hand there is no reason why the conglomerates might

not mean the same thing as when against granite. Certainly in the Vermilion country we would map the conglomerate as the newer series and the volcanics as the older series, because of the proved relations, and probably detailed mapping in the Algoma district will lead to the same conclusions.

From the 14 post to Heydon.

At the 13 post the granite injection is more abundant and at Heydon the green schist is infolded parallel to the foliation in a very pretty fashion giving an injection gneiss structure. The injection bands of granite vary from those of paper thickness to dikes of granite a foot across or more.

It is very clearly seen from the 17 mile post to the 13 mile post the metamorphism, as represented by schistosity and the production of hronblende schist instead of chloritic schist, is proportional to the abundance of the granite. The epidote, however, persists in the most granitic phases.

While I have no doubt of the Archean age of the greenstone schist from 17 to 13 mile posts did not anywhere see distinctly the ellipsoidal structure so characteristic of the Archean.

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Today's observations bring the area of Archean greenstones and the vertical cleaved slate conglomerate of the Ogishke type much farther south than before known by me on the east side of Lake Superior.

From Heydon to Granite as seen from the train rocks almost certainly the same except that granite in the greenstone is much more abundant and may be dominant.