Trip in Lake Superior region with Profs. Pumpelly, Barrvis, Reusch, Schmidt and Tschernyschew: [specimens] 25058-25070. No. 110 1891

Van Hise, Charles Richard, 1857-1918
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U. S. GEOLOGICAL SURVEY

FIELD SECTION BOOK

Book 110.

1891.

Trip in Lake Superior region with Profs. Pumpelly, Barrois, Reusch, Schmidt & Tschernyschew.

C. R. Vanhise.

25058-25070.

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 page is also arranged so that, if desirable, a smaller scale can be used, two inches, one inch, or even 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, for instance 4025, 250 *N.*, 300 *W.*, *Strike*, *N.* 6° *E.*, *Dip*, 50° *E.* Then follow with as full a description of the ledge as possible. 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, but chips of them must be taken. 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. In all cases collect chips for slicing. 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. It is desirable that specimens 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.

#118

bluff of slate-conglomerate and recomposed granite is a narrow V-shaped ravine which places perhaps 100 feet between the two. If time had permitted there is little doubt that the exact contact could have been found between the recomposed granite and the original rock.

The contact between the Lower and Upper Huronian was next visited.

25058 Limestone from Garden River quarry.

25059 Recomposed limestone from block fallen down from face of cliff about 40 rods east of contact observed and described in previous visit.

25060 Limestone bearing curious impressions which have a fossil like appearance, from top of bluff.

25061 Basal limestone at north side of bluff; very silicious.

25062-63 Lower slate conglomerate carrying numerous fragments of ash like material which Pumpelly suggests came from the lower chloritic slate. A chloritic slate is reported to occur north of Echo Lake.

Bearing in favor of a considerable break between the Upper and Lower Huronian in the original area are:

(1.) Difference of dip: Lower Huronian vertical, Upper Huronian not steeply inclined.

(2.) Upper Huronian gently folded; Lower Huronian so closely folded as to give vertical cleavage in different directions so that the conglomerate breaks up into polygonal blocks with parting planes in several directions.

(3.) The Lower Huronian is semi-crystalline, while the Upper Huronian is little metamorphosed.

(4.) Blocks of limestone in the upper slate-conglomerate have a condition exactly like that in the original ledge; and also jasper fragments are contained in this upper conglomerate, and these must have been derived from the formation in the Lower Huronian which had reached the condition of jasper before Upper Huronian time.

The likeness of the upper slate conglomerate to the lower is largely explained by the fact that it is likely that the lower slate conglomerate has contributed very largely of its material to form the upper.

September 28, 1891.
Houghton and Calumet, Mich.

25064 Copper pebble from Calumet and Hecla; showing replacement of matrix by copper and also remaining unreplaced feldspar.

The visited the Hungarian Houghton and Hungarian Ravines, and also saw the sandstone at another ravine at a point some distance from the contact between the sandstone and Keweenawan. At this place and at the Hungarian the sandstone does certainly appear to dip to the northwest at an angle of from 5° to 10°. In walking rapidly up the Hungarian I saw no reverse dips between Torch Lake and the contact.

At the Hungarian contact

while the basal metaphyre does undoubtedly overlie the sandstone, there is the clearest evidence that this is due to an overthrust fault. Our German friends all called the contact a Reibungs breccia.

At the Douglass Houghton, where the same relations are seen, while they are not so clearly caused by faulting, the same explaination probably applies.

September 29, 1891.
Michigamme, Michigan.

25065 Recomposed ferruginous material on peninsula of Michigamme Lake some distance south of mine; showing that the thickness of quartzite, which has received ore from material below, is very considerable.

September 30th, 1891.

South of the Palms Mine, Gogebic district, the basement granite is well exposed, and here is seen the contact between the Penokee series and this rock. The conglomerate of the Penokee is dipping along the granite, and also penetrates it in cracks which existed at the time the quartz-slate began forming. Some of these seams or veins, real conglomerates, extend for some distance into the granite and one fine-grained one several feet away from the face is not over an inch wide. All agreed that the explanation given applies. As before observed at this locality, the conglomerate contains pebbles of jasper, quartz, etc; as well as granitic detritus.

25-066 Contact specimen of granite and conglomerate.

We next visited the chert breccia which occur along the south line of Sec. 10 T. 47 N., R. 45 W. Here a good exposure of the chert breccia and containing jasper pebbles was found ~~was found~~ above a quartzite, 25-067. This quartzite is to be regarded as a part of the Upper Huronian and was an equivalent of the upper quartzite of the Marquette region, that is, the quartzite resting above the ore formation.

25-067.

A short distance to the southwest is 25068, schist, which is taken to belong to the Laurentian.

25-068

The Keweenawan rocks east of Sunday Lake were visited and the amygdaloidal and other flows were found to have a high dip to the north, corresponding very closely to that of the iron-bearing formation.

Oct. 1st. 1891.

The Potato River basal conglomerate again was seen, and here, as in the conglomerates at the base of the Penokee series to the east, jasper fragments were found showing that a sedimentary formation like this must have existed before the beginning of the Penokee series.

We next visited the Keweenawan rocks south of Bessemer. Here a sandstone or quartzite, 25069 in a layer about 20 feet thick was found to be interbedded with the basement trap and an overlying flow. This locality is on the south face of the first bluff, about 3/4 of a mile northeast of Bessemer, that is the bluff forming the southeast angle of the gap. The lower flow is exposed for some 20 or 30 feet of thickness and above the sandstone comes a very thick flow, or a succession of flows, having the usual

amygdaloidal structure. The inclination of the bedding of the quartzite and the contact plane of this rock with the amygdaloid is high, 60° or 70° to the North, and thus corresponding very nearly if not exactly with the dip of the iron-bearing series at this locality.

General.

In the foregoing run over several series of the Lake Superior region some points have appeared in reference to the succession and relation of the Marquette and Penokee district which were not observed when the study of one district was long time removed from the study of the other.

(1.) Heretofore I had not fully appreciated that the upper quartzite of the Marquette district is represented at the base of the Penokee series proper. However, associated with the chert breccia of the Penokee series ~~proper~~ at its base, along the east half of the north line of Sec. 15, and the northwest part of Sec. 14, T. 47 N., R. 45 W., is a siliceous quartzite which passes upward into the chert breccia as described. (see Bos. 25-067-68)

(2.) While the Lower Marquette series is only known to be represented in the Penokee series by the limestone formation, the basal conglomerates of the Penokee series proper give evidence as to the existance of other formations. The most significant fact in this connection is the presence of red jasper fragments in the conglomerate at Potato River, in the conglomerate at the Palms mine, and in the conglomerate in the south part of Sec. 10 already referred to. Also in these conglomerates are found pebbles and bowlders of quartzite. The presence of this material bespeaks the existance of formation of these characters before the lowest member of the Penokee series proper was deposited. Such formations and the limestones are the characteristic members of the

Lower Marquette and show that these existed before the formation of the Quartz slate of the Penokee series; for such formations were present to furnish material to this quartz slate.

(3.) Leaving out of the Penokee series proper the limestone member — it being properly correlated with the Lower Marquette — the correlation of members between the Penokee series and the Upper Marquette becomes complete. The Upper Marquette series is a great slate formation, passing upward into mica-schist in which, comparatively near the base, is the upper iron ore horizon, which like the Penokee iron ore horizon was originally unquestionably a lean cherty carbonate of iron. The character of the ores and of the chert con-

taining them in the two districts are identical, that is, the characteristic rock associated with the ore is chert containing bands and shots of ore. The chief difference between the two formations is that the ore of the Marquette district is somewhat more hydrated and that the formation seems to be less persistent than in the Penokee district; but in the latter district the time of the deposition of the ore formation must have been somewhat longer, or at least more definitely differentiated from the slates. Connected with this persistence of the ore-bearing formation of the Penokee series is doubtless the fact of the presence of an upper horizon of persistent quartzite at the top of the quartz slate member. This shows that a clearing up of the seas occurred

before the beginning of the formation of the iron-bearing member, and therefore conditions more favorable for the deposition of carbonates.

A still farther analogy between the Penokee series and the Upper Marquette is the presence in both of surface volcanics the so-called greenstones of T. 47 N., R. 44 W., Mich. in the Penokee series being almost identical with great areas of this material in the Upper Marquette series proper, as well as in the large area of Upper Marquette rocks Southwest of Lake Michigamme.

We have then in the two districts the following parallel successions:

Penokee	Marquette
Upper slate, locally mica schist	Upper slate, rather extensively mica schist
Iron-bearing formation.	Iron-bearing formation.
Quartz slate: upper horizon of ~~Central Mass a slate~~ persistent quartzite; lower part often conglomeratic bearing fragments of lower series and locally a quartzite.	Lower slate: lower part quartzite or quartzite-conglomerate bearing fragments of lower series, either Lower Marquette or Archean
Unconformity.	Unconformity.
Eroded away.	Iron-bearing formation.
Limestone	Limestone and
~~Lower quartzite~~	Lower quartzite
Unconformity	Unconformity.
Archean	Archean.

The likeness of the ore-formations of the Upper and Lower series in certain cases ought to excite no great surprise, if it is true as believed that both are derived from the same kind of an original formation. This likeness is still easier to understand if it is remembered that the final stage of alteration of the Lower Huronian occurred at the same time and as a result of the same processes which caused the changes in the Upper Huronian iron-bearing formation.

Subsequent to Huronian time there have been several periods of the deposition of iron carbonates. Moreover the ore formations of the two series are not identical. There are certain phases of rock in each series which are not found in the other series; certain other phases however, occur in both.

25070 Bowlder noticed by Prof. Pumpelly September 11th, 1891. one half mile south of Ellsworth mine east of road. Evidently from Michigamme schist. Pumpelly thought the peculiar areas were possibly fossils. Some sent to C. D. Walcott, who reported: "Simulating Hyolithes, but probably a crystalline mineral chiastolite-like"