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Van Hise, Charles Richard, 1857-1918

[s.l.]: [s.n.], 1895

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U. S. GEOLOGICAL SURVEY
FIELD SECTION BOOK

Notebook 185.

C. R. Van Hise -

1895
1895.

Southern Appalachians. (Tennessee)

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 $2 \times 2\frac{1}{2} \times \frac{1}{2}$ inches will be allowed, but in all other cases *large-sized specimens*, trimmed to a size of $3 \times 4 \times 1$ 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.

#185

25753

185

1

Continued from Notebook 184.

The latter are not at right angles, and suggest that the substance was a viscous body approaching a solid condition. All the structure can perhaps be explained by pressure at right angles to the bedding.

95786

In other cases the rock is less regularly fractured, and in some cases is becciated.

In general, however, the fractured areas, exhibiting such structures as shown by 95785-6, are local and appear in areas of exceptional stress. For the most part the deformation has occurred without numerous macroscopical fractures.

2

Sept. 10.

Rode from Johnson City to Dry creek then up Dry creek to Limestone Cove. Then across cove to SE up mountain until rock was found along creek. In going up Dry creek from the plain the Knox was found dipping into the mountain. This continued for a certain distance, and after a short interval - not more than 50' ft the coarse acidic quartzite followed. So far as could be determined the two are conformable. At this place there certainly is not sufficient room so that the black slate could be present between the massive Knox and the quartzite seen in going to the Cove to the N.

After the quartzite appears it is within a short distance interbedded with graywackes, and above the graywackes are red fossiliferous slates. For a time the dips are toward the mountain and then away from it. In the rocks dipping away the same succession is seen as before. This shows a subterminal syncline, which also shows folds of a still higher order. These minor folds are especially marked in the red slate.

After the syncline is passed, the

25787 Knox again appears, having all the characteristics in this island seen in the main area.

25788 S.E. of the Knox of the Cove the first rock appearing is a hard novaculitic one.

25789 We now drove back and went to Lemhiville. The Knox was again noted, showing minor folds, and in places the peculiar fracturing described in notes of N. The Knox of the lower fern is upland or overlain by the quartzite, and this in a little way passes up into graywacke, but beyond this and at higher horizons appears massive quartzite in all respects like that above the lower graywacke belt on Dry creek.

In going up the N. Richucky from Lemhiville to point where Erwin road branches off, for most of the way the quartzite is in massive beds which strike nearly parallel to the river and dip away from it. Although showing minor rolls, upon the whole the dips show, in connection with those seen at the side of the mountain, that the quartzite is in a broad, flat, northward N.E. ward plunging synclinal. At various

place the minor folds become quite sharp, and at one place the quartzite is broken and apparently faulted, as thinly bedded layers stand opposite thicker bedded ones. Adjacent to this place the quartzite is much veined and broken.

In the center of the section, resting with visible contact upon the slightly changed quartzite, is a schist which has wholly decomposed, so that it can be broken down with the pick. Between this schist + the quartzite there has been evidently a differential movement, as a result of which there are minor violent granulations of the schist. Just at the bottom of the hill to the S.E. of the point where the schist first appears, the rock becomes an impure limestone which is supposed to underlie the schist, and to be the highest rock between Emburyville and Erwin.

95790

Rain coming up the contacts between the bitum and the Knox of Erwin valley were not studied.

So far as studies have yet gone, all

5

appearances are in favor of conformity of Knox and Attio, but are impeded with the complex character of the Attio. It seems to comprise fine grained conglomerate, quartzite, graywacke, graywacke slate, and red slate. The question arises whether the base of Cherokee and Buffalo mountains are not divisible on a base similar to the base of the mountains on the SW, on the other side of the Noli-chucky river.

Sept. 11, 1895.

From Lewis rode ~~from~~ up Rock creek to SW end of granite, about 2 miles NW of Indian Grove Gap.

The Knox was noted in stream at junction of roads, dipping away from the mountain. The quartzite of the Cambrian was seen at various points, and was white and crystalline. As the granite is neared the rock becomes an arkose carrying well rounded grains of feldspar. Still nearer the granite it

75791

becomes a fine grained conglomerate, the quartz and feldspar of which are like those of the adjacent granite. The conglomerate exposed along the road was disintegrated, but large boulders of a fresh conglomerate were seen, which without doubt were from the conglomerate formation adjacent to the granite. Besides granitic debris, the conglomerate contains many pebbles of what appear to be black chert, and also pebbles of white quartz. As I remember the Citico conglomerate of the lower part of Johnson City, this resembles it very closely. There can be little doubt that the granite is the older rock and that the conglomerate rests unconformably upon and has derived material from it.

In the afternoon road to Unaka Springs located at point where railroad crosses the Nolichucky river. Then walked up R.R. to Devil's Creek.

For the greater part of the way the rock is a quartzite, often conglomeratic. Of the 3 formations mapped by Keith the first is mostly non conglomeratic quartzite containing

25792

sides of slate and graywacke. The middle narrow formation is slate and graywacke (25791), with quartzite, the graywacke being the predominant rock. The quartzite between the graywacke is often conglomeratic similar to those of Rock Creek. In places the pebbles of quartz are 2 or 3 inches across. (For detailed spec. of this section, see notes of previous year.)

Sept. 12, 1895.

Rode S. along South Indian Creek, then up Higgins Creek, then on spur to top or near top of Rich mountain, then down fork of Clarke's Creek to Clarke's Creek, then to Bamford Cove, Emberville, and Lewin.

In passing along the S. Indian Creek I saw the Cambrian quartzite along the road and the limestone in the creek, with the Willhite slate just to the N. Farther on I saw the Willhite slate next to the quartzite, and hence the Cambrian and Silurian are cut off, but could not tell why.

7

No contacts were seen, and different explanations might be offered of the areal distribution.

Going up Higgins creek, saw the Whitelute slate just N of the granite, but no contact was found. This slate is much contorted, micaceous and cleaved, so strike and dip could not be determined. In climbing the spur of the mountain above Higgins creek we saw the Citico conglomerate dipping into the mountain and above this followed the Pigeon slate.

95793 The Wilson sandstone was missed, but above this found the Shelton slate.

This is a little altered formation.

95794 Going down mountain on branch of Clarke's creek, I found the Wilson sandstone, Pigeon slate (95794), Citico sandstone, and Whitelute slate, all dipping into the mountain. So could not doubt the succession given by Keith or that Rich Mt. is a syncline.

In Clarke's creek + E. of Burnetts Cove I saw various alternations of Whitelute + Citico, but did not study closely enough to determine the structure.

75795

At Bumpus Cove we found the ore to be an exceedingly regular replacement of the Knox dolomite. Stringers of masses of ore were in all possible relations to the limestone. Moreover, at the 2 mines visited the Knox is fractured in a most complex fashion, being a dolomite-breccia. All the ore bodies mined are in the wider parts of the limestone area, and most of them are said to be in recesses in the cores. This strongly suggests that the contact horizon of the Leticia and Knox at places at which underground drainage could start backward out of anticline in brecciated places of the limestone, has resulted in the formation of ore deposits. The occurrences are thus analogous in a way to those of the Lake Superior region. No contacts of the Knox and Leticia were seen.

The contrast between the Cambrian fragmentals and Cleve fragmentals as seen in the section of the previous days is most marked. The Cambrian is essentially a quartzite or conglomeratic quartzite formation, which contains

subordinate belts of slate and graywacke. Upon the other hand the Crook series is a great series of slate and graywacke, for the most part not much metamorphosed, but indurated and somewhat shaled, and containing subordinate belts of quartzite.

Sept. 13, 1895.

Road SW up. S. Indian Creek, Devil's Fork, and the Shelton Laurel. The trip for the first part of the day, as far as Higgins Creek, was the same as on the 12th.

Beyond Higgins Creek the granite and White were again seen close together, but not in contact. The White is here again much cherted. We went up Rocky Fork of S. Indian Creek to Cambrian Quartzite, and beyond this to where the bitumens appear.

85796 Granite is in the creek, and after a very short interval is found

85797 conglomerate, the debris of which is evidently derived from the granite. Above this

95798 in the stream is the Flint ridge, composed of orthoquartzite (95798) and feldspathic quartzite.

95799 Beyond this comes another belt of conglomerate,
95800

and beyond this ridge is the Rock called Citrus by Keith. If I were mapping, from my unboy examination, I should not have placed any Cambrian here. Should have regarded all as Citrus

If contacts had been followed, perhaps would have seen a reason for calling Flint ridge Cambrian. The only one that occurs to me is that based on the general statement of the previous day that for the most part the Rock is a slate and graywacke formation in this district rather than one of quartzite. The dip of the quartzite and conglomerate of Flint ridge is nearly vertical and is parallel with the direction of contact with the granite.

Except for this side trip for the most of the day we were in the granite. However, the Wilkite and Citrus with usual characters were seen along the Shelton Laurel, before the forks of the road were reached.

Sept. 14

12

Road from forks of road and Shelton Laurel N through deep gap to near Hayesville. Our course took us S and N of Little Ridge mountain, then S to Paint Rock, and along the French Broad to Hot Springs.

Just after passing the first small divide, found exposure of Whitelie limestone. This rock is gray and little metamorphosed not so much as the Knox. A little farther on I found less pure phases. For the remainder of the day noted the rocks as mapped by Keith, but no new point of interest was seen.

Hot Springs, Monday, Sept. 16.

Rode up road S along Spring Creek from Hot Springs to Bluff P. O., then N to near the French Broad, then S to Hot Springs.

In going up Spring Creek saw all the formations on Keith's map, that is, Hesse, Lenoir, Murray shale, and Cochran's conglomerate. The Hesse sandstone is as

described in Knoxville sheet. The Citico is of the usual type but I should certainly have regarded it as but a facies of the Hesse, and the whole as a downward conformable succession. This impression is so strong that I think that my map of Keith's geology must be erroneous.

95803 The Hesse is a strong white quartzite, in place conglomeratic. (Citico?) The Murray is a cleaved slate.

The Cochran is a coarse feldspathic quartzite, or a fine grained conglomerate lying thin beds of slate. The original rock must have been a coarse grained arkose. The thickness of this formation is such as to suggest that the granite from which it was derived may have been disintegrated. For some distance before the granite S. of Bluff is reached, the Cochran appears to dip to the N, which suggests that the granite core is an anticline overturned toward the N.

Upon the return trip the facts dips were found to be all to the N, i.e., away from the granite. No

observations were made which would indicate ~~an~~^{inter}ruption of the Murray shale, nor was any rock noted which could not belong to the Cambrian. In short the succession appeared to be a continuous conformable one for all of the members noted in the trip to the Bluff, and following these members is the limestone. Above the limestone comes slate - the Hiltite

Along the road about $1\frac{1}{2}$ miles before Hot Springs was reached, the limestone beds were seen to be folded upon themselves in an isoclinal manner, but this doubtless a local phenomenon.

In the afternoon rode down the N side of the French Broad, and went up the 3 small streams which enter the river near Hot Springs. In the lower reaches of the two western streams the limestone is found, and a little higher up, dipping in the same general direction was the Citico, with a slightly different strike. The dip of the Citico higher up on the mountain

was less steep, and suggests a syncline. In the NW side of Silver Brook the lower of the 3 streams, the limestone is found at the base of the hill. Just above this to the NE is quartzite (Hesse). Beyond this in a ravine appears the a considerable width of limestone breccia and beyond this the Citico. These relations certainly suggest that there is faulting here. In the SE bank of the stream the Hesse quartzite comes to the river. Above this is a point of broken rock taken to be the limestone, and just above this the Citico crosses the stream and occupies both banks. The areal distribution of the Citico could be explained by the deposition of the eroded Cambrian and Silurian, or by faulting over them. However, faulting in this place seems probable, although the faulting may have taken place in a series having originally unconformable relations.

75804 is Citico slate from Silver Brook, about 1 mi. up. The specimen was taken because it shows more than the average

-amount of shearing. The quartz grains are elongated.

In the ride down the French Broad river no reason was seen for separating the Cato belt from the Hesse. For some distance the rock is a vitreous quartzite which at one place is conglomeratic and closely resembles the Cato. The Hesse slate was not noted separately from the Cochran conglomerate, but did not go quite so far down the river as the Big Laurel Creek. Should, however, have placed the rocks of the last mile in the Cochran as entirely similar to the Cochran along the streams examined in the morning. The rock is a coarse graywacke bearing belts of pebbles, and becoming in places a graywacke conglomerate. As on my map, this would be Munay.

From my walks yesterday and study today, I feel yet though the geology in the vicinity of Hot Springs should be reviewed, if the maps given me correctly represent

Keith's mapping.

In the Hot Springs area it is certainly not the case that the supposed Alce is more metamorphosed than the supposed Cambrian.

Tuesday, Sept. 17.

Rode down the French Broad to 2 miles below Del Rio, and from there walked through the gorge into Bridgeport. The limestone along the R.R. track just after leaving Hot Springs was examined and found to have a somewhat uniform northerly dip.

After passing Wolf creek noted the hard quartzite (and Hesse). Dip not taken. Beyond this appear slate (Mil-lite) with northerly dip, and beyond this the bitum conglomerate with similar dips. Upon the farther side of the basin the dips were seen to be in the opposite direction, and here the coarsest belt of conglomerate which I have seen in the area was found, many pebbles 3 in. long being seen.

I could not have discriminated the Wilhite slate from the Cambrian slate, nor the Citico from the Cambrian quartzite and graywackes. The rocks of the French Broad gorge between Del Rio and Bridgeport vary from pure white quartzite, through graywacke, to fine grained conglomerates extremely similar to those seen below Hot Springs the previous day, and to which they are supposed to be equivalent. The supposed Citico of Del Rio, the Hesse quartzites, and the Silurian limestone were not found close enough to one another so that anything can be said as to their relations.

Sept. 19.

Rode from Maryville to Montwall Springs, and thence to the N end of Leadus Cove. Saw the succession essentially as mapped by Keith, but structure was not apparent because no contacts were seen. Attitudes of rocks, as far as observed, were as mapped by

him. In riding along the N side of Leadis Cove to E. end, found the limestone with unmistakably northern dips, and the slate had been skewed with a similar dip at the NN point of the cove, and therefore probably overlaps the Knox, at least in their present position.

Sept. 20

Rode from E. end of Leadis Cove to top of Thunder Head, and then S. Again found rocks dipping as mapped by Keith, and also this full succession of Coge rocks, except the Clingman conglomerate. At point where road from Thunder Head passes into Truckaleeche cove the Wilhite slate was seen dipping SE, and immediately following this, not more than 10 steps, were seen heavy beds of dolomite dipping under the slate. In crossing the Cove great masses of limestone were seen in a horizontal position, and the SE end of the Cove

at a small creek the limestone was found on the N side and the Wilhite slate on the S side, both dipping SE at the same angle. The dolomite and slate were seen even nearer together on the road leading to the little river from the Cove, and here the same relations were observed. It is hard not to believe that the limestone is ~~not~~ a lower formation than the Cove, and that it is in an anticline, the slate surrounding and overlying on both sides.

75805-6 leads conglomerate on way to Thunder Head.

75807-8 V phases of Thunder Head conglomerate

75809 Hazel slate on S. spur of Thunder Head!

75810-11 V phases of limestone of Tuckaleeche Cove, at point where limestone was first found on road from Thunder Cove. The last shows shearing planes in V directions

25812

21
Whitish slate on S side of Tuckalee-
chee cove, - from close to limestone.

Sept. 21.

Rode from Tuckaleechee Cove to Mary-
ville along Little river. The exposures
as far as the plain are good, and
correspond exactly with the succession
as given by Keith.

25813

Light conglomerate. Pottsville series.
Lykens Valley, Pa. From David Whit

25814

Folded gneiss near Great Falls of
side of Potomac River. About 12 miles
above Washington.



