Vermillion Lake County, Minnesota: [specimens] 8710-8736. No. 46 July and August, 1885

Irving, Roland Duer, 1847-1888
[s.l.]: [s.n.], July and August, 1885

U. S. GEOLOGICAL SURVEY

FIELD SECTION BOOK

No. 46.

July and August, 1885

Vermillion Lake Country, Minnesota

R. D. Irving.

8710 - 8736

Survey of the Pre-Cambrian Rocks of the N. W. States.

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 figure attached, showing the amount and inclination of the dip. Denote slaty or other very plainly bedded rocks by lines running in the direction of the strike, with figures and a dip arrow attached as before. In all cases where there is the least doubt about the true bedding directions, 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 line as 100 paces, and twenty of these spaces as 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.

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.

3. The ruling of the left hand page is also arranged so that a smaller scale can be used. Each one of the black lines may represent a section line and the red lines quarter sections and "forties." The scale of the maps may thus be reduced, if desirable, to two inches to the mile (the ordinary town plat scale.)

4. Collect a specimen from each separate ledge of rock, or wherever there is a change of rock on any one ledge. In case of trips made on foot or in canoes, for long distances, neighboring ledges, unquestionably of one kind of rock, need not be sampled, the position and extent of the ledge being marked on the map, with a note that it is of a rock identical with specimen so-and-so. Under the same conditions small sized samples, trimmed to a uniform size of 2x2½x¾ inches will be allowed, but in all other cases *large sized specimens*, trimmed to a size of 3x4x1 inches, must be selected, in accordance with ¾ 3, chapter IV, p. 44, Regulations of the U. S. Geological Survey. In all cases collect chips for slicing. All specimens are to have numbers painted on them, in white on a black background, in the field.

5. 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., etc.

6. Forward this note book, as soon as filled, as registered mail matter, to R. D. IRVING, U. S. Geologist, Madison, Wis.

46

R. D. Irving

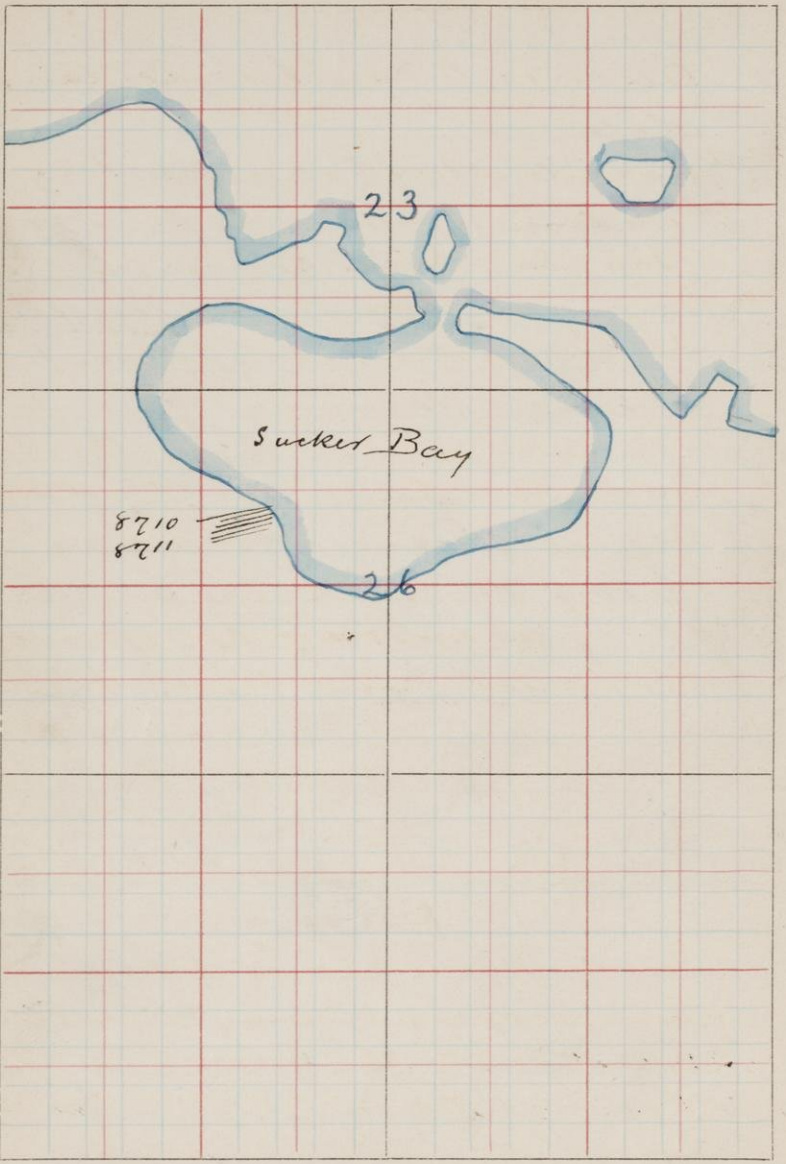
Vermilion Lake Country

1885

Jules-Ames.

8710-8736-

T. 62 R. 16



Sucker Bay Vermellion Lake
August 13 1885

Sucker Bay Vermellion L

8710 slate

8711 quartzite interstratified with 8710 from large exposure on Sucker Bay, in Indian Reservation. Glaciated surface sloping East. Exactly like Animikie interstratifications as seen on Mountain - Rove - other lakes on boundary - Most beautifully banded. Bedding vertical. Trend N. 85° E mag. The bands grade into one another across the middle of the exposure is a fault zone thus: the

joints and cracks are filled with quartz. The fault cracks and its effects are apparent for several feet on each side. Indeed there are several parallel faults, making a zone 20 feet wide on each side the fault is a clearage parallel with fault zone. A most wonderful similarity all through with

Lucker Bay Pennellis Lake

the Animikie

The exposure is longer than at first supposed. Running back on the hill - wherever mining has been done - probably 200 + feet in thickness of the layers is exposed. At the shaft the exposure is 30 ft + in thickness and is gracefully the Animikie turned on end.

The slaty cleavage or incipient cleavage is not parallel to strike but oblique to it.

Iron Belts of Vermillion Lake

Tower Minn. Aug 14/85

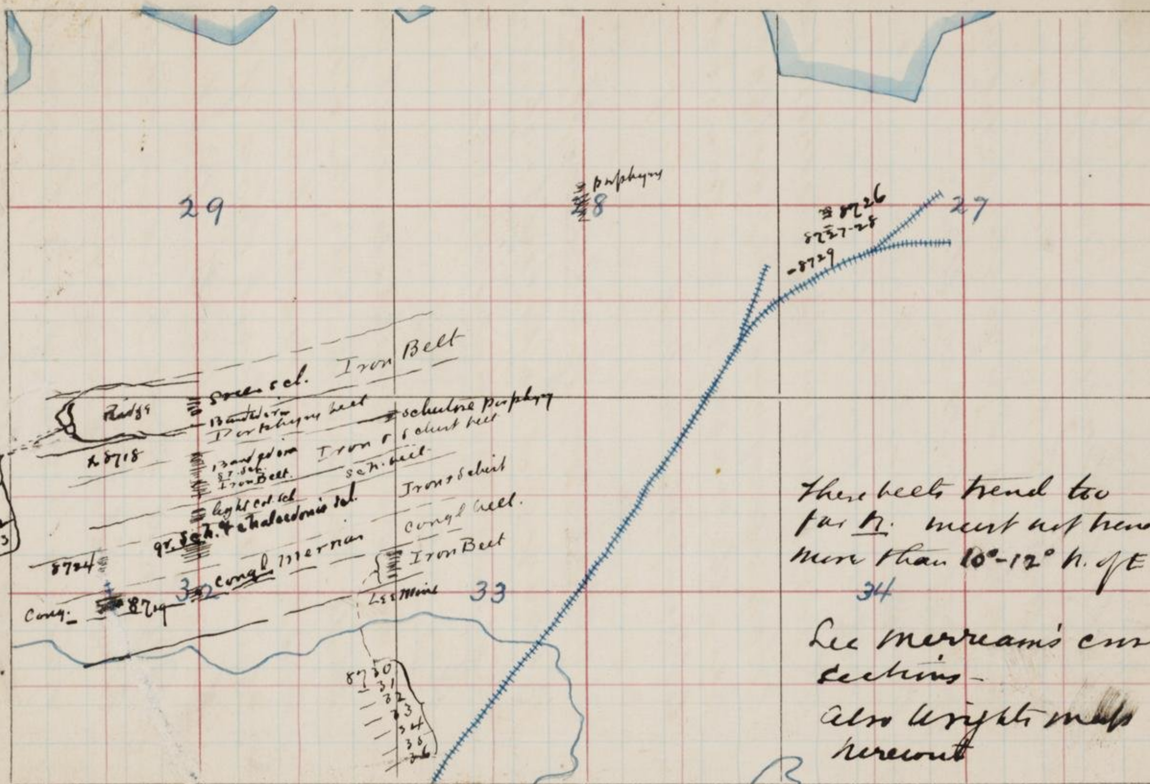
3

In the afternoon walked west and north from the hotel at Tower, and crossed the following, with intervals between them:—

8219 (1) Massive conglomeratic quartzite Pebbles not plenty. Matrix looking almost crystalline; quartz-saturated, recomposed. Exposed on and near the wagon road from Tower to Steamboat Landing.

(2) Alternations of siliceous shaly ferruginous beds with schistose light-colored shales and shaly conglomerates.

Compare these shales with those white shaly sch. near or Long and Falls and Moose Lakes. We counted at least three of the ferruginous belts, with an additional zone holding singular lense shaped and narrow detached areas of the ferruginous material, within the shaly schists.


29
8 porphyry
8726
8727-28
8729
27
Iron Belt
Ridge
8718
Banded iron
Porphyry belt
schistose porphyry
Iron & schist belt
Banded iron
Sch. belt
Iron Belt
Iron & schist
light col. sch
gr. sch. & chalcedonic sch.
Congl belt
Congl Merriam
Iron Belt
8714
15
16
17
8720
21
22
23
8724
8719
Congl
32
33
34
Lee Mine
8730
31
32
33
34
35
36
These belts trend too far N. must not trend more than 10°-12° N. of E
Lee Merriam's cross sections -
Also Wright's maps hereabout

T. 62

R. 15

(3) Besides the above, south of the northernmost of the ferruginous belts, we saw a large exposure of what seemed to be a massive quartz porphyry or granitic porphyry, with large porphyritic quartzes. 4

8718.

The ferruginous beds of the above succession are of the very highest interest. They present several different appearances in their parts, besides most singular contorted shattered, and brecciated forms, which baffle description. The northernmost of these belts is the broadest by far of any that we crossed. We did not make any measurements (see memoirs detailed section) but this belt must run up to the hundreds of feet in width. It is also much the most regular; a great succession of regularly banded layers, bending with the course of the belt. This belt forms a broad ridge, whose western

Ethenicity projects into the lowlands on which lie the iron company's farm, and the Vermilion lake boat landing.

On this knob may be seen as neat interesting kinds of gradations and interlaminations from dark colored slate or slaty quartzite(?) into banded jaspery iron ore, strongly suggesting the possibility of the formation of the banded jaspers or ores by replacement of slaty beds!

The first stage in this happy process must be a penneation of the slate or slaty quartzite along the lines of bedding by silicious solutions - the resulting siliceous material being white, greasy, chalcedonic(?)

8714 shows the rock impregnated with some white silica. Was the rock originally quartzite? Rather a slaty rock ^somewhat? This is from the western end of a low named ridge. It passes within twenty feet into across the bedding into

banded jasper.

A fourther stage, showing somewhat more thorough silicification results in a banded material of alternating white, siliceous, and dark colored, fregish to black bands.

8715 Shows this phase.

At times the white silica will form entire bands, several inches in width

8716 shows this white silica from a single band. The thickness of band.

It is often the predominating material for a number of feet. That this white material is not connected with the original sedimentation is rendered certain by the frequent occurrence in branching veinlets and veins traversing the laminations of the rock,

8717 or cementing together the fragments of a brecciated mass. These breccias occur apparently at sharp folds. The silicifications have taken place then both before and after brecciation! Certainly

some of it belongs to a period after the brecciation - but that any of it comes before is not here so evident - the Silica bands partake of the folding - but may not this merely mean that the Silica replaced already folded slate &c. One thing noted elsewhere - namely the abundant occurrence of the silicified slate with white silica in the conglomerate to the north - is surely a strong indication that some silicification took place before folding. Even before induration?

Compare this white silica with the peculiar rock at the base of the Penokee section.

Instead of the white from the jasper-y form silica prevails over large areas, and then seems often to have replaced, along with specular iron with which it is always associated, great thickness of beds, completely retaining

however, the most minute bedding or laminations lines of the original slate -

8720
8721
8722 } show this jaspery material has the fine lamination lines still remaining in the jasper.

This jasper, but is associated iron, also occurs in traversing seams, cutting both the white banded and red banded materials. Places may be seen where the jaspery iron ore makes regular intrusions into the white banded, ~~slate~~, suggesting the greater recency of the jaspery material, but in another place may be seen regularly banded jaspery and specular iron layers partaking of the contortions of the formation, which are traversed both by the white siliceous seams and by jaspery iron veins

The following are other specimens illustrating these beds collected this day: —

8723 Same as 8715

8724 From one of the most southern of the iron belts crossed today. The specimen shows a graphitic slate silicified. Matrix shows an amygdule of quartz. The Lingulas nodules are plenty just at this place.

8725 Fragment of along Andalusite X.l. Taken on Basswood Lake - See note book No 46, pp 82-83

August 15 /85

The following specimens were collected today from the neighborhood of Tower, about the mines &c. They further elucidate the matter of the origin of these interesting ferruginous rocks.

8726 Banded (silica-impregnated) slate, from the north side of the hill on which occur the Tower and other mines.

Iron Belt Vermel Lake

8727
8728 } White schist interstratified with the banded iron, west slope Tower Mine Hill.

8729 Silicified black slate. Tower Mine Hill.

8730
8731
8732
8733 } Breccia from the jasper belt just north of Lee Mine, characteristic of quite a portion of this belt, which elsewhere is regularly banded.

8734 Schist interstratified with the jaspery rock north of the Lee Mine

8735 White silica from the Lee Mine jasper belt.

8736 A fragment selected to show the dark colored silica which makes up much of these jasper belts. It has not been mentioned heretofore in this book but is of prominent importance. Some of it loses the dark flinty appearance on breaking, and shows within the sugary white silica abun

described - In other cases however, as in this and other specimens it is dark reddish ales. Is this because some of the original material remains - i.e. slaty material or because we readily have here to do with a different form of silica - a chalcedonic form?

The following hypothesis is framed to account for these various occurrences - framed on the ground, and of course subject to the modifications, or indeed rejection, required by more careful consideration.

I A series of slates, probably carbonaceous, with interstratified slaty quartzites, has been impregnated by silica, indeed often replaced bodily (nature of the process?) before folding. When there was much iron-rich

silica, the red or jaspery from ores produced, where little or no iron, the white. For the original phase of these layers take some of the black (ferruginous?) slates of the Kaministiquia river, with interstratified more quartzose seams, and again in the Penokee region. For partially replaced and rearranged layers see gunflint beds at various places, and certain of the dolomitic beds of the Penokee region and the Kaministiquia (Query what is the relation of the Dolomite to this change.) In general the Penokee and Animikie ferruginous rocks show the alterations so far as they went on before or without folding.

II These beds in the Vermillion Lake country have been subjected to ~~the~~ intense compression and extremely sharp folding

Iron Belts-Vermilion Lake

which has affected them to
ceries- They were at the
time of folding relatively
small & resistant, and there-
fore made long slender & sharp
bends, often running into brec-
cias

III during or (and) after this folding
and shattering there was the further
silicification and ferruginization
above noted- Large bodies now
formed - i.e. magnetic & specular
although some oxides may be
later the Rouge ores - formed
before folding by chemical
rearrangement, and altered
more or less in the folding-
Now were formed the transverse
veins of jasper and specular
iron together.

The folded iron beds of the
Marquette region, of the Menomi-
nee region and of the Vermilion
Lake region illustrate this

The extreme jasperization
accompanies the folding

Note that while the carbonaceous beds are so closely linked with the folded strata to compel belief in a community of origin there yet are differences and marked ones to be explained.

Queries

Original condition of the iron beds?

Original condition of the iron in these rocks?

Original Connection of the carbon with the process?