doc. 0122

Vermont, 1923

Maine, 1923

New Jersey, 1923

Memoranda

doc. 0122

[Schuchert, Charles
1923

~~7430~~ Vermont
7147 Aug. 9-19, 1923

7431 - Maine
Sep. 9-15, 1923

7495 New Jersey
Oct. 1-6, 1923

]

~~4430~~ 7147

August 9–1903 Sunday.
Springfield to Castleton.

Left New Haven at 7.34 A.M. for Springfield to meet Raymond. At 9.45 we are off for Northern Vermont, my fourth geological trip to see the Cambrian.

Passing through Bernardston, Mass., a few miles south of the Vermont border, Raymond pointed out the old locality for Triassic fossil-bearing erratic stone. The locality is about 1/4 mile south of the Bernardston town on the west side of the road, back on the hill about 1/8 mile from the road. Formerly there was a circular limestone quarry here. The lime has a thickness of 2 or 3 rods & is underlain by slate full of tiny pyrite cubes. The lime is changed to marble and is drawn out, but in places has glistening surfaces as if it were fossiliferous. Crinoid stems are common. Then Raymond told me to pick what appears to be Favosites, but that none show structure under the microscope. He then showed me two specimens that have fallen down. They may be Favosites names of Favosites, but this would be proving that they are.

Down the hill from the li. are exposures of white quartzite and of drawn out quartzite gneiss [?] granite but there is no [illegible]. Beside it is a quartzite.

The slates with the small pyrite cubes appears to me to be the same seen with Stratton in the slate quarry north of the Mass.-Vt. line. Here the little specks must also be more [illegible] (and not ostracods.

Have taken along the specimens of [illegible] seen at the Berrardston place.

Then drove on to Castleton and put up at the Maples at 6.30 P.M.

[illegible] was one of the finest, sunny and cool. We came about 130 miles.

All of the Pine Hill specimens come at once above a form [illegible] of dolomite showing that the iron deposited in shallow water.

Aug. 10 1923. Friday
Castleton to St Albans.

First collected in the then called Lower Cambrian limestone at West Castleton near Lake Bomoseen. I took nothing away because I got little of value. Raymond collected some Erdiscus specimens, Protypus. In one ledge he got considerable pygidia of trilobites that appear like of Mesonacis, and Protypus. He will let me know what he makes of these.

We then road north and before getting to Hyde Manor came upon the slaty Trenton li. that here extends far north beyond Sudbury. Saw no recognizable fossils. The Trenton, Chazy and Beekmantown series continues north by Middlebury to at least 3 1/2 miles north of Vergennes where occurs Middle Chazy. Took nothing from any of these places.

Then stopped at Forest Dale and looked again at the Monkton red quartzite and took away a few specimens, sun-cracked, rain pitted and rippled.

Then looked at the light colored Winooski dol. on top of the red Monkton a little north of

Wagner thinks the dolomite was not laid down in the regular diagenetic way.

Shelburne. Took away several examples because of the distinctly bedded and sandy nature of the dolomite. The Monkton here in the upper part is interbedded with dolomite, and as a rule the latter is uneven red, being then in sharp contrast with the sandy red Monkton.

Then looked at the Monkton in the Phelps stone quarry in South Burlington. As a rule here the Monkton is a fine grained red quartzite but every now and then there is a white or pink thin bed of quartzite. When there is a shale parting it is [illegible] sun cracked, and sometimes rain pitted. All are shallow water conditions.

All of the Monkton and the lower Winooski are of very shallow water deposition.

This is the same marble seen in the quarries at Phillipsburg, Canada.

The Sillimanite dip is bet. 10 and 15 degrees.

This upper Mallett dol. compl. Keith returns as the Milton. This to me is a mistake, and all the space is required to get in the full thickness of the Mallett.

August 11 - 1923 St. Albans.

Saturday

Drove first to [illegible] St. Albans [illegible] and here to my surprise came to river a great deal of twisted marble that must be metamorphosed Beekmantown. Some fine [illegible] of dolomite beds wonderfully fragmented and dragged about by the flowing marble.

Then returned east across the Champlain flats to the fairly high escarpment to the north of the Old Albans Bay road and east of the Hillside Springs road. Here we again saw the ~~Beekmantown~~ Hillside Springs marble, then a [illegible] of 75 feet or more when the Winooski marble is present in full force. We saw the contact between Beekmantown and Winooski in [illegible]. We then walked across three ridges of it when it gradually gave way to the Mallett. Near the base of the Mallett occurs a 30 foot zone (or thicker) of sandy dolomite conglomerate. The blocks are up to 3 feet across, angular and dispersed in all directions, and rather scattered in the Mallett sandy dolomite.

At the road south to Rugg Creek there is Mallett with some congl. and again farther south of this road where the Mallett crosses it. Also here [illegible] coarse sandy dol. A little farther east occurs Colchester shale. This marble [illegible] place 3/4 mi south of "Adams Pasture".

Then we spent the rest of the morning in the Adams pasture in the "Swanton Congl." and the shale.

There are also many pieces of a small pebble lime congl. in the giant conglomerate!

~~1926 Lenses of these and [illegible] both below and above the great conglomerate.~~

The Ovanton congl. dips about 20 degrees to the east and is largely made up of a white limestone more or less like that we have often called the Hellbrunne. It is very just as well be the lense white lc. of the Colekeaton. There many large blocks of it 2 to 6 feet across, and one 10' long. There are also pieces of the Wallett and dol. but apparently none of the Hilfgate then bedded limestone. ~~This appears to me to be Colekeaton shale both below and especially above the lincoln. In other words the folds of the conglomerate and around are parallel over it and with the Colekeaton.~~ All of Howell's Colekeaton crossing was done to the east or above of the conglomerate, or that he found one from above the conglomerate. [rather than in the Hilfgate]

Howell's white quartzite with small ... are evidently from the sand filling between the bedded of the congl. They are therefore of the age of the deposit and are not of ... Howell in the congl. as Keith thinks.

~~At one place above the ... in the Colekeaton I~~ ~~...~~ Satterthw...

~~May ... ... the ... there fan into the ... and ... into ... ...~~

No Walton was seen, nor in the shale

Raymond found two good but small pebbles full of fossils that appear to him to be of Milton species. Therefore the Brewster cgl. is of post Milton age, yet some post Brighton [illegible] since it rests on the [illegible] [illegible] slate.

above the conyl. like the Hodgsgate slate.

Spent the afternoon with Raymond to see the Brewster conglomerate at Sec. II, Rockledge and again just north of Keeler Corners. Raymond was all stumped over the large block of white li. in the conyl. of Sec. II. We talked much about it but came to no solution of it.

This big mass of white li. has quite a number of pieces of dol. scattered through it that appear like pieces of dol. broken up by the flow of the li. The flow structure is very noticeable. When was the flow produced, before deposition in the conyl. or at the late Paleozoic time of deformation.

There is no question that the Brewster Lime part in the Hodgsgate Hook and banded slate. A little farther west is the Milton dol.

Rockledge li. also clearly rests on the Hodgsgate Hook slate.

At Keeler Corners we did not stay long.

All the fossils are of the Upper Cambrian. No Lower Cambrian was seen.

The Lingula ledge abounds, in the coarse grained sandstone, in the basal layers, far more than elsewhere. Higher up it is as common among the [illegible].

It [illegible] the Lingula ledge higher [illegible].

August 12, 1923. Sunday

St. Albans, Vt.

Spent the morning looking for fossils on the Corliss Ledge, five miles N.E. of St. Albans. We got a few cephalopods and quite a lot of Milton fragmentary trilobites. I got one, Ampyx like, that Raymond says is one of Billings' Lower Cambrian species and the second specimen known.

The Corliss ledge [illegible] congl. has an interbedded shale zone at the north end about [illegible] feet thick. There is little sand [in the Corliss conglomerate], and the limestones are much [illegible] and somewhat schistose. There are considerable [illegible] interbedded [pieces] of some sandy dolomite of the Mallett, and [some] Shelburne. The whole [illegible] ~~congl., about 60° to dip~~ [cleavage], dipping east.

In the afternoon we went to the [illegible] ledge [illegible] two miles north of St. Albans. Here there is [illegible] of the [illegible] congl., [illegible] [illegible]. One [illegible] of [Shelburne] [illegible] is fully 30 feet long. Here there is much of the Shelburne marble, some Mallett.

The valley to the east is 1/2 mile wide, and the Mallett makes the eastern ridge. There is no Milton [illegible] [illegible] the Shelburne [illegible] there [illegible] the [illegible] between the [illegible] Shell slate and the Colchester.

The Celestine becomes at the top more massive and dolomitic and finally dolomite. Then more shale and finally the third series of Niagara dolomite.

August 12-1923. Monday.

Highgate Center - St. Albans.

Went southwest of St Albans to the Swanton conglomerate locality west of Georgia Center. Saw nothing new.

Then went to Parkers Ledge and collected some [illegible] at [illegible] west slate. Raymond was much pleased with the locality as some years ago he tried to find the place and failed. Got a few ordinary specimens.

Then drove north to St. Albans Bay road to make sure of the succession up to the Adams Pasture conglomerate. Where the N-S road enters the St. Albans Bay road there is Milton dolomite. Going a little south on the road we came upon the little chip [illegible] farm [illegible] by [illegible] [illegible] then the Mallett dolomite [illegible]. The latter, however, is here very thin, probably less than 20 feet thick. Where I saw it on the St Albans road [illegible] it on the base of the Mallett and is conglomeratic as farther north, seemingly (Aug 11 [illegible]) can be seen to rest on the transition seems to [illegible] [illegible].

Therefore the succession to the Adams Pasture is normal. Over the Milton should come the Highgate or all is covered. It may be that the so-called Middle Cambrian

Stopping again at the Grace Fisher Inn at Lyt-
fole Center. Spoken in [illegible].

is nothing more than Highgate Continued. Certain it is that the shale or sand beds of the Adams Pasture [illegible] in all the [illegible] all of [illegible] come from above the conglomerate. Either the conglomerate is folded into the slate, or the congl. is on the Swanton; or at all of the Swanton places the shales [illegible] are not Georgia in the sense that they are [illegible]. We may have a shale there here of the Milton and Shelly [illegible].

The succession [illegible] St Albans [illegible] Adams Pasture must be repeated (Barry) from the Mayre Conglomerate to the west, though here we did not see the Milton.

[illegible] in Rugg [illegible] we [illegible]. [illegible] that the Colchester has dolomite [illegible] in it. Certainly it was [illegible] before we came [illegible] of dolomite, correlated with the Milton.

Then drove to the Colchester locality about 3/4 mile N.E. of Swanton Junction. Here there is a big quarry in the black shale. [illegible] and get a fine but small Menomacis. We saw [illegible] shales 25 to 30 feet. They go into a soft dolomite in the base, which occurs Olenoides. Then comes in a mass of dolomite 200 to 300 feet thick that must be the Milton. Then a fault repeating the section with more shale followed by more dolomite,

August 14 - 1923. Tuesday.
Highgate Center, Vt.

Cracked rock all morning in the Missisquoi River below Highgate Falls. Got the greatest lot of material from the main locality of last year in the Upper Milton. Raymond hopes to make the list later on amount to 50 species of trilobites.

In the afternoon first went to Highgate li. place in pasture just outside of Highgate Center. Raymond got some material and I got about 10 Lingulella acuminata.

Then to the railway cut in the Highgate li. Got no fossils.

Then to the little road metal quarry at the top of the Colchester. Got a few [illegible] and Acrothele. Raymond got what may be a fragment of Dictyonema and a worm tube. I have one side of the latter.

Then to the conglomerate in the middle Mallett. An intraformational congl. with blocks up to 3 feet across.

Then to Highgate Li. locality 2 miles north of Highgate Center. Raymond got some fern tilolite material.

Then to North Grove School to see the banded slate.

Then collected some fern tilolite on the Grove School road about 1/2 mile N.E. of Highgate Center.

It is raining a little this evening.

All in all we got more better material today than all previous collections. With what we have Raymond should now be able to fix more definitely the faunal relations.

August 15 - 1923. Wednesday.
Highgate Center, Vt.

Collected in the Missisquoi gorge at the upper locality, east of the rock dump and our good place. Got some interesting trachyblocks.

Raymond got a few form things above the Milton conglomerate.

Then went to the lowest bed in the Milton but failed to get anything.

Then went to the Highgate li. pasture quarry in the western outskirts of Highgate Center. Finally found one piece of li. that yielded about 12 pieces of trilobites. Turned them all over to Raymond. These forms link the Highgate li. with the Milton and one head (? Saukia) looks like Upper Cambrian.

today
have
definitely

In the afternoon visited all of the Highgate localities north of Highgate Center. At ① and ② on map got nothing. At ③ the fine li. congl. at the top of the Highgate was seen.

In the sandstones at ⑤ Raymond took away some material but I collected only Obolids and gave them to Raymond. He was inclined to correlate the place

1924. There must have been folding at the close of the Devonian. There is an angular unconformity between it and the Carboniferous overlaps.

with the Beaufortian. Those long sandstones are near the base of the Beaufort, while in the next fold to the west we pass the thin bedded limestone of the Highgate.

At locality (25) near the Canadian border we get considerable material from the basal Beaufort and Beaufortian. At first Raymond was disposed to interpret the contact between the Beaufort and Highgate Li. as one of overthrusting, but clearly this cannot be so. Later we have abandoned this. The contact is an angular one, but the highly folded nature of the Highgate Li. and the Beaufort was well produced at one time. There could not have been mountain making at the close of the Cambrian. The Cambrian was strongly compressed since at the close of this period, then eroded and finally overlapped by the Beaufort in Beaufortian time.

It is about 2 miles [illegible] from St [illegible] road to Phillipsburg, and all is Beekmantown, lying at low dips, about 10 to 20 degrees, to the E or SE. Towards the [illegible] there is some reversed dip and here Logan has described a syncline.

This is the actual Champlain fault of Logan. Keith's Champlain fault is the next one east.

August 16 1903. Thursday.
St Armand - Phillipsburg - Mystic, Quebec
Started north into Canada to follow the Cambrian formations. Went north in Vermont along Rock river. North of the Boundary about 1/2 mile or more where the road crosses Rock River there is a fall in Rock river. Here may be seen in Lot 123 of Ells map the Georgia slates, and beneath them the Hastings [illegible]. The contact is apparently an unconformable one and strikingly [illegible] dips of [illegible] the [illegible]. Raymond calls it an overthrust, but if we it is [illegible] an overthrust than the one seen last evening 1/2 mile south of the Boundary.
Another half mile to the N.W. at Lime Kiln are seen much Mallett and much quartzite. Here [illegible] [illegible] formations could be seen.
We see Mallet all along east of the Vermont Central railway to St. Armand. It makes prominent exposures on the hills. To the west, i.e., St Armand hills, are all Beekmantown. Between lies low land of the Champlain plain, along it runs the railway.
At the north end of the village of Philipsburg the contact of Lyon Beekmantown on the "Utica = Chazy Canajoharie" may be seen. The dips of the former is 10 to 15 to S E., while the dark blue shales beneath are much distorted and twisted, and traversed with quartz veins, and it has

Cut off one of these li. Raymond got a [illegible] of [illegible] with some [illegible]. This may [illegible] [illegible] the Lorigin.

Some yellowish weathering thin beds of dolomite. No fossils are known in the Beekmantown until 1200 feet above this contact. Whether these are the = of Brainerd - Seeleys A and B is unknown.

One half mile north of Phillipsburg there is a large marble quarry in the Lower Beekmantown. About 50 feet of thickness is here shown, and are a whitish mottled limestone. Have taken four samples. Logan gives this zone as 100 feet. There is here 2400 feet or more of Beekmantown.

Going north from St. Armand to Bedford one remains on the western and but little disturbed overthrust sheet of the Beekmantown. The dips are always low, from 10 to 15 degrees. About 2 miles north of St. Armand got some Rafinesquina out of the upper Beekmantown = Cassinian. Just before getting into Bedford the Beekmantown steepens almost to vertical, and when we get to the first houses we are in dark blue shales with an occasional lime. In Bedford at the falls of the (Dawsonville) "Pike" river there is much shale that looks like the typical High-gate slate. Down stream a short distance may be seen a limestone conglomerate. The pieces are flat as a rule, all are small, and may well have come from the Upper Milton. Evidently then the Champlain fault of Keith passes through the western side of Bedford. Everywhere to the north and east the outcrops are of shale. These are in Logan's section Zone D and C_2 = 2970 feet thick

See Ells' Report on a portion of the Prov of Quebec 1895 a 1896; p. 127 f.

See Logan's Geol. of Canada, 1863, pp. 175-280; 844-854.

One mass of the congl. ... ... the ... ... as if of the ... ...

Most of the ... appear to be out of the Normanskill, but at least one ... ...) is of Beekmantown. In my list I have mixed the two lots of fossils; separate these - the ... ... is a sandy dolomite, yellowish weathering.

This congl. is in Ells' map on the boundary between his Farnam and Mystic slate.

(This is Ells loc. of 1890 "Lot 22, Con. XI, Stanbridge", Quebec

We then went 1/2 mile north of Mystic and then one-half mile east to the end of a third road that stops in the midst of a limestone conglomerate. The blocks are of all sizes up to about 6 feet across. In several layers among the fossils are common and Raymond got a large lot of Normanskill forms mainly trilobites. Also many orthids & brachiopods. The li. congl. is in shale, and the paste is of shale. Many of the li. blocks are of a still older conglomerate.

Then drove south to Mystic railway station and here south of the station is a great exposure of a fine grained li. conglomerate. It is surrounded by dull shale, and the age is unknown to me.

On the way back after leaving St. Armand we drove farther east than in the morning and the northeastern part of Lot 112 of Ells map (about one mile north of Boundary), we saw a great mass of li. congl. that looks like the Swanton. If so all to the east of it is Georgian slate, and to the west Highgate. It was in the slate after going over the Mallett that Raymond got an li. pebble with a brachiopod. It may indicate the age of this slate. Evidently it is not Colchester, nor did we see any Milton east of the Mallett.

August 17-1923. Friday
Highgate Center, Vt.

Collected at Locality (10) - to the S.W. of Highgate in the Town Quarry in Colchester formation. Got the regulation things.

Then back to Trooker's Inn and packed all from collections into the auto.

At 12.30 we are off south for home.

Stopped at the Williston locality beside the school house, 2 miles south of the Williston Road, southeast of Burlington. Got the regulation points again in the unmetamorphosed dolomite. To Raymond all of the limestone is Beekmantown and well up in the formation.

Then drove south to Brandon where we stopped at the Brandon Inn over night.

August 18, 1923 Saturday
Brandon, Vt.

Collected in the metamorphosed limestone just southeast of Brandon. Raymond pointed out to me the section of a large Maclurea about two inches across that he feels is the same as a common one at Ticonderoga, N.Y. He also showed me a large cephalopod, probably Orthoceras or Cameroceras. At the small end it was 1 1/2 inches wide and at the large end 2 1/2 inches. In the space of six inches it had about 8 septa each about 1/4 to 3/8 inch apart. Bridge of another boy. Saw no other fossils. These two fossils might have got before show this marble to be Beekmantown.

Then drove to locality (17) to see the banded limestones. These limestones reminded Raymond of the "ribbon limestones" of [illegible] and Seely's Beekmantown.

The shell fauna marble may well be the Phillipsburg marble in the lower part of the Beek mountain.

Ken to drive to Springfield and
stopped at the Brunswick House.

August 19, 1923 Sunday.
Left Ken to New Haven at 4.30 P.M.

Began stopping at the New Arnold Hotel on
Pennsylvania Ave. near the Capitol Building.

7431

Sunday Sep. 9-1923 Boston

Came off at 12.04 P.M. for Boston, and arrived at 4.15. Put up at my old place, the Lenox Hotel.

To morrow morning early I am to meet Prof. Raymond and in his car we intend to get to Waterville, Maine. Now that I have [illegible] and defined the New Brunswick [illegible] line I want to make some of its relations in central Maine.

A most perfect day, and all Boston was enjoying the fine cool breezes and the clear air after the showers of yesterday.

Monday Sep. 10-1923. Boston-Augusta Maine.

Did not make connection with Raymond until 10.15 and then started [illegible] [illegible] Portland, Brunswick and Augusta where we arrived at 7 P.M.

Maine so far is a flat plain region with much glacial sand, boulders and [illegible] [illegible] so far north from Brunswick the country [illegible] but even there it is a dissected plain [illegible] out[illegible]. From Portland to Augusta the [illegible] to be that [illegible] cut by a [illegible] granite. All appears to be old and [illegible]

The old [illegible] locality of Sidney is on the west side of the

[Margin, beside the bracketed lines below: Fossil localities.]

Kennebecca river almost opposite the tin mine near [illegible]
Vassalboro.
Winslow on the north of Waterville.
The R.R. cut near Benton is the one [illegible] [illegible] [illegible] tracks.

To the southeast of the Penobscot occurs the Rockland
formation. It overlies the former and has a great thick
conglomerate with boulders [illegible] of [illegible] [illegible]. Then a quartz-
ite series.

The granite often tore as much metamorphosed as the Pem-
broke series. The granite [illegible] [illegible] [illegible] [illegible] of
Devonian age are not metamorphosed.

Tuesday, Sep. 11-1923. Waterville.

Left Augusta at 7.30 A.M. and rode on north along west side of Kennebec river to Waterville where we arrived at 8.30. Distance 20 miles. Highly metamorphosed strata occur north of Augusta for 5 miles and more, and then comes in a slate-like series of dark beds, probably the Waterville Silurian.

Got into connection with Professor Edward H. Perkins by means of a call, and I explained what I wanted to learn. He then told me of his summer's work with a Mr. Smith, a young man who [illegible], but will teach this next year at Union College at Schenectady.

The Penobscot formation is well developed all about Belfast and occupies a belt along the northwest corner of the Belfast sheet. Also thought to be of Cambrian age. What I saw of it later in the day is a dark fine-grained sandstone considerably metamorphosed. At Belfast it is shot through with igneous material, and about 5 to 8 miles to the northwest occur intrusions of granites and diorites and dikes of amphibolite. They stand nearly on end, but 2 miles N.W. of Belfast dip [illegible] 45 to the southeast.

The first sample of the red am. rock came from 2 miles west of Freedom. It is a biotite gneiss.

The second sample is a mica schist, at Montville.

Between the two above comes a quartz schist. Marks Hog Back Mt.

Hitchcock called them Hurronian.

These formations Hitchcock called Taconic.

These slates and limestones [illegible] are, Paleozoic age, and Raymonds thinks they may be of Sil. age.

To the northwest of the Penobscot comes in a highly metamorphised series in which no bedding can be seen at all. Have two pieces of it. It is a mica schist and quartzite series some ten miles or more across. They begin at about China Lake on Vassalboro Sheet. See map of Maine for delimitation.

To the N.W. of the metam. series comes in a thick series of shaley sandstone or sandy shale, of exceeding fine grain and replete with fine white mica that appears to me to be of sedimentary origin. These pass without break into the Waterville slates and then bedded lis. The lis. seem to crop out in the Waterville area, about one mile to the east of the Kennebec and about four miles to the south of Oakland. They strike to the [illegible] [illegible].

About eleven o'clock started out to see the rocks. About 2 miles south on the east side of the Kennebec visited a place where limestone was once burned, and recently Mr. Holman (State Geologist) explored for tin because of a 3 foot dike there cutting the lis. It is a series of impure even bedded lis. in thin beds up to 2 inches, & up some up to 7 inches, interbedded with sandy shales of fair large amounts average strike N.35°E. Dips nearly vertical. Not a trace of a fossil could be seen, and while the [illegible] [illegible]

metamorphosed they do not look like even badly bad fossils. Hobson said he found a trilobite here, but he has since lost it. We previously had no trilobites.

Farther east the beds are absent and all is slate and then they become more and more sandy and finally come in the thick series of very fine grained shaly harder sandstone. We saw them at several places and finally at Perkins summer camp at Unity Pond. It is all much metamorphosed but still the bedding is very good. Generally the series is of a dark grey color and again it is very dark or nearly black. Mainly [illegible] more [illegible] of slate. One sees no evidence of [illegible], no coarse sand, no cross bedding or conglomerate. The whole [illegible] probably [illegible] series.

It appears to me that the metamorphic series must be very old, certainly Precambrian. It is part of very New Brunswick geanticline. On either side lie different unconnected sea ways. However all that I have seen is a most difficult series of rocks to understand, because of the metamorphism and the closed folded structure.

Stopping at the Windsor Hotel, with Raymond and Perkins.

Wednesday, Sep. 12 - 1923 Belfast.
Left Belfast at 7.30 in a frg, and drove south to Camden and Rockport.

Four miles south of Belfast we see much Penobscot. Apparently much intruded by diorite or all is diorite with piece of the Penobscot strata immersed. See sample.

Then climbed half way up Mt. Battie just back of Camden. To me the Mt appeared to be all quartzite conglomerate with most of the pebbles, and the matrix all of alike quartzite. There are however some almost black quartzite pieces in it and very rarely a small piece of a markedly crystalline quartzite. Saw pebbles up to 12" but most are under 4 inches. Most of them are flat sub-rounded pebbles, but there is also much angular material. See the two pieces from Mt. Battie and a small boulder from the shore at [illegible] Cove. [illegible]

Then we looked at the Rockport li. quarries for lime. They are very deep reel cut quarries in a soft probably worked for [illegible] marble but of no value for marble. Have two samples. One sees no bedding.

Farther south or about one-half mile north of Rockport occurs a li. conglomerate [illegible] called an intraformational congl. It is a true conglomerate, (we gave about 3.5 [illegible]) since it is made up of other pieces than the formation

itself, and it has some quartzite outliers. See the specimens. Below it occurs a thin quartzite conglomerate (see specimen), and a siliceous li.

Then we went on to Hog Cove and Deadman's Point south of Ragbert to see the Cornets li., a very peculiar hilly metamorphosed laminated li. See the samples. These are the oldest known rocks in the Rockland Folio, and all that we have seen are said to be one conformable and sequent series of the "Cambrian and Cambro-Ordovician". However no one has found the first trace of a fossil and no one will in my opinion, therefore there is no evidence here to check the age other than the Amos li. of North Haven Island of Silurian age that unconformably overlies all these "Cambrian".

To me the whole series is of Pre-Cambrian age.

In the later Paleozoic came the intrusive igneous intrusions.

We then drove back to Camden where we had lunch and then back to Waterville via Hope, [illegible] etc. (about here is the junction between [illegible] and the metamorphic series). The contact [illegible] little matter [illegible]. Then Fair ... Searsmont, Montville (not the one of geology), Liberty and Albion.

Put up for the night at the Edmund Hotel.

Rockland Quadrangle. By Bastin.

No fossils of any kind in quadrangle.

All strata are regionally altered and thrown too... metamorphism.

"Devonian granites and their associated diorites, diabase formations."

There are also "gneisses".

"The sedimentary rocks of the quad. constitute a single conformable succession made up of four formations

2/3 of quad. occupied by "Devonian" series. Most important are the granite and the Rockport li.

Oldest sed. = Islesboro Formation.

Lower member a slate series. At Rockport harbor. No base seen.

Upper Coombs impure li. Rockport harbor. About 30 to 70 feet thick.

I saw it in Dog Cove. The impurity is shale as a rule, but there is some arenaceous material (may be secondary during fold or infiltration)

Thinks there were active volcanoes at the time of the shale formation.

"Provisionally classed as Cambrian".

Battie quartzite. Battie and Bald exposures. Thickness 400 or so

of any contact with Islesboro top conformable.

Determined bedding from the lay of the conglomerate pebbles. Dome structure, or anticlinal.

Bastin describes the congl. ... up to several feet across. Rest quartzite.

To me most of the material is a congl. Pebbles and cement the same.

I saw some almost black quartzite and saw a large crystalline quartzite. Says some of the pebbles are 6 inches across, but I saw at least one 12 inches long. Most are under 2 in. diam. Most are flat subrounded pebbles, but the small ones and sometimes a large one are angular ...

On Battie indicates that the thickness must be considerably greater than Bastin ... I should say 1000 feet or more.

Penobscot formation. Thickness ... or more.

"Shaly sediments regionally metamorphosed, and in places further altered by igneous intrusions of granite or diorite.

are "phyllites, pelite schists, argillaceous quartzites, and small amounts of true slate." Also has congl. zones with ... up to 2 feet across.

Also has calcareous zones.

There is complete transition from the Battie into the Penobscot, and the Rockport li. conformably overlies. All is one unbroken succession.

Rockland formation

1 Wesleyan quartzite member, 200 to 300'

2 Siliceous li. member, 100 to 200'

3 Rockport li. member, the main mass, at least 400 to 500'

Has "intraformational congl." with ... I should say a true congl.

Correlates it with Stockbridge and Shenandoah li.

(Cambrian) [margin, bracketing Islesboro through Penobscot]

Cambro-Ordovician [margin, bracketing Rockland formation]

The Elmwood Hotel

EUROPEAN PLAN

WATERVILLE, MAINE

(7)

Granite cuts all the "Cambrian formations" & the [illegible] folio cut the Silurian. Therefore the granite is "at least as young as the Silurian". I think he has two granites mixed here. Those cutting the Silurian are [illegible] Dev. or even Carb., the main mass of granite [illegible] Proterozoic. Again he says "the granites of the Rockland area are assigned with considerable certainty to late Sil. or Dev. time."

Penobscot Folio (149).

Oldest rock

Ellsworth Schist. = Cambrian or Pre-Cambrian

unconformity

Cambrian:
- Islesboro Formation
- Battie quartzite 400-500'
- Penobscot Formation
- Calderwood Formation. = either Penobscot or Islesboro.

Amos Knob Formation. Silurian with fossils

The Elmwood Hotel

EUROPEAN PLAN

WATERVILLE, MAINE

in the small specimen.

Then to the railway cut on the Maine Central R.R. near Benton, northeast of Waterville. Here occur the Waterville slates (or Li. Lore) to collect trails. Quite a number were seen and gotten. I also got what appears to be a definite Buthotrephis. Saw nothing else in these fine grained muds. As a rule the schistosity and bedding is the same.

Stopping with Perkins and Raymond at the Edmund Hotel.

Thursday July 23-1903 Waterville, Maine.

At 9.00 A.M. we went up [illegible] to see the geology of the country [illegible] at [illegible].

Saw no good exposures along the west side of the Kennebec river until we came to Shawmut(?). Here at the falls of the Kennebec is a good exposure of thin bedded grey-blue laminated and cross bedded very fine grained quartzite with some slate, the series is sharply folded several times. Strike N. 40 E. Strata nearly vertical, and much metamorphosed. Raymond says the same kind of strata occur in the Portland area which Copps(?) has called Carboniferous(?). Can these strata be the equivalent of the quartzites beneath the Waterville

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quartzites, that look as if they had ... particles, Lee of
this or since. Have two pieces ... [illegible]
Granite intrusion occurs in Harmony township.

POST CARD

Address

doc.0122

Harmony, Maine
Looking from bridge of steamer to dam.

Ltrs with Sept. 13, 1923

series. Hardly think it so, but the point should be considered.

We next stopped one mile south of Athens and looked at dark blue slates and thin bedded quartzites, very much like those at 2 Korth farm. Strike N. 38 E.

At Athens in the stream is an exposure of the same thin bedded series, but here the quartzites are in beds up to 2 feet thick.

The next stop was three miles west of Harmony. Here are massive dark-blue quartzites with some slate. All much metamorphosed. Strike N. 12 E.

Then at Harmony. Here in the railway cut just to the south of the station (Maine Central) is well shown a series of laminated dark blue sandy rocks and slate, [illegible] cut through with small and large quartz veins. See specimen

In the river falls at Harmony beneath the bridge and up stream is a series of blue thin bedded limestones like those we saw at the Winslow [illegible], [illegible] out of Waterville. At least so far as we have seen, the beds becoming less and less toward the dam. See photo of it on postal card. About 300 feet of strata are here seen. There is some crumpling.

Three miles north of Harmony seen thin bedded quartzites, that look as if they had ash particles. See of them or since. Have two pieces [illegible]

Granite intrusion occurs in Harmony township.

Then passed through Parkman.

One mile south of Guilford occurs sandy slate in ortho beds of quartzite

At Abbot in the river is the first exposure of rock seen. It is very light blue, very fine grained and much contorted quartzite. Lies in rude in thick beds. The continuation of stream but how far I do not know. Below the bridge is a great deal more but how it lies I could not in general terms. The thickness is at least one hundred feet thick. So far we have seen nothing like the series.

Under the North Abbot bridge occurs dark green sandy slates much altered. Strike N. 45 E.

At Monson occurs large slate quarries in a very dark blue slate that has some dark blue coarse sandstones. The layers of the sandstone have layers of slate parrents that are not highly inclined due to the action of movement. These slates are very even and not crinkled and folded as is so common in slate districts, but there seems to be an immense amount of strain. We all looked for fossils for quite a while but without results. The slates are considerably [illegible] by quartz veins.

C

Stopping at the Lamson Hotel (private house) at Monson.

The slates here are also very hard blue, have few longitudinal veins, and in certain layers a great deal of iron pyrite.

Friday Sep. 14 – 1923 (Monson – Waterville

Hunted for 1½ hours in the main slate quarry at Monson but did not get the first trace of a definite fossil. Picked up a number of specimens to show the lithology.

Then went to the Portland and Monson quarry south about one mile of Monson. These quarries are in a different horizon and the cleavage is more along the bedding planes. There is also banding here and more sandstone zones. On the bedding planes one sees considerable mud flow marks, and more rarely unmistakable plant [illegible] of [illegible]. Are these Psilophyton or sea weeds. Raymond got a large slab of gastropod tracks – [illegible] grooves about [illegible] and [illegible] with small scallop turnings. There is no evidence here in the least suggesting graptolites and [illegible] position of the Monson quarries [illegible] is that their age is Silurian. The base of the Silurian [illegible] place in the quartzites seen at Abbot.

The strata in these various quarries stand nearly vertical, and the quarries go right down into the earth. As the [illegible] wall [illegible] and eventually falls into the quarry (= bench), they now tunnel and mine out the slate. One shaft [illegible] down to 300 feet.

Mr. H. Dodge is reported to have found here an Olenellus. Raymond got this from Dodd's notes and will look it up again.

At 11 A.M. we started back for Waterville. We came by a different route than the one of yesterday, and passed through Guilford (had lunch here), Dover-Foxcroft on the Piscataquis where [illegible] reported slate quarries, but no one was known of their whereabouts, Dexter, Corinna, Newport, Pittsfield, Burnham, Clinton, Benton (our first collecting ground of two days ago) and then Waterville.

Then packed my box of rocks which Raymond will ship from Cambridge.

Finally at 5:15 visited the slate exposures along the [illegible] beneath the campus of Colby College. It was so [illegible] [illegible] that we had only a half hour of collecting, [illegible] [illegible] that time got a number of rocks. [illegible] are by no means as rare as [illegible] [illegible] Perkins thinks [illegible] to set a student [illegible] [illegible] [illegible].

Raymond took along all the [illegible] Colby College [illegible] to [illegible] them up. I volunteered to [illegible] them for Raymond. The Boston Society [illegible] [illegible] the result.

Saturday Sep. 15 - 1923 Waterville - Boston.

Having finished the work contemplated Raymond and I started from Waterville at 6.30 A.M. Perkins saw us off and the morning is bright and cold, there having been a hard frost last night. At 7.30 we were at Augusta and here we took the most traveled road from Portland to Bangor, and went through Winthrop-Greene to Lewiston. Here we wanted to see the Li. quarries (= City Quarry for road metal). It is a series of more or less thick bedded marble interbedded with what was a shale now a schist in the upper part. The dip is all over 40 degrees. Below these rocks is the main mass of marble and the main quarry. The whole is shot through by pegmatite dikes and a big granite, and finally by a few vertical (undisturbed) trap dikes said to be of Triassic time. Probably all of these li. are of Proterozoic age including the granite intrusions. See the rock samples.

We then started for Portland and then along the Maine shore to Portsmouth. Just beyond (?) Ogunquit Maine, about 3 miles we turned towards the shore and arrived on the rocks in front of the Bald Head and Cliff House hotels. Here are great exposures of vertical strata all highly metamorphosed but

Coffin correlates with the Cantrinfarms of Bram. It is a series of thin bedded sandstones (some flint) that are laminated, interbedded with some shales (some schist). It is cut by many basic dikes, usually thin ones, but one appeared like 20 feet thick. Not far away (one mile) are great bodies of granite so that the metamorphism is probably mainly due to the igneous injections. Annelid has been seen a fossil here.

Raymond tells me that these Cant. rocks lie in line of strike with the Worcester Cant. of Mass. See Coffin report on the geol. of this and the Portland area.

Going through York and on westward see more of these Cant. rocks.

See the beach pebbles and rock samples collected.

Get to Harvard Square at 5.30 and South Station at 6. P.M. At 6.30 start in the Shawmut by train and get home at 11 P.M.

Trip with State Geologists through New Jersey

Sep. 30-1923 Left New Haven at 11. A.M. and N.Y. by the Erie at 3.30 pm for Port Jervis where I arrived at 5.30. Stopped at Mitchell Hotel. On the train I met Lawson, Matthews (Md.) and McCallie of Georgia. The members of the trip are

H. B. Kümmel, Trenton N. Jersey. Leader

A. C. Lawson, Berkeley Cal.

David White, U. S. G. S.

C. Schuchert, New Haven, Conn.

E. B. Matthews, Baltimore, Md., [illegible]

O. N. Hartwell, U. S. G. S., [illegible]

R. M. Field, Princeton, N.J.

D. G. Thompson U. S. G. S. Ground waters.

S. W. McCallie, Atlanta, Ga.

Phillip Smith, U. S. G. S.

T. C. Watson, Charlottesville, Va.

Stose, [illegible], Pa.

M. M. Leighton, Urbana, Ill.

E. W. Berry, Baltimore Md. [illegible]

7495

Oct 1, 1923. Monday.

Otisville, N.Y.

Then Reagan Quarry, south of Port Jervis. See section on separate sheets. It is the one of Weller.

Cliff olive-ozenite near Bennisville.

The agglomerate near the ozenite. Have taken samples of both. Described in one of the Folios of the U.S.G.S.

The view from Culvers Lake, a summer resort region is very fine. One looks from the Kittatinny ridge across limestone across east to the highlands of Precambrian rocks.

Stopped at Cochran Hotel at Milton a good hotel in a pretty village.

Oct 2, 1923. Tuesday.

Near Monroe R.R. Station saw the base of the jacksonburg. Here rich in algae. Have taken a slab.

In a railway cut 1/2 mile from station of Hamburg, one sees the Hardyston quartzite on the ozenite. Probably [illegible] followed by the dolomite of the Kittatinny. I wonder if there is here a [illegible] as at Franklin

Monday ①

Beemerville, Elaeolite Syenite. Precambrian. 1 & 8 sf.
1/4 miles N.W. of Beemerville. Kittatinny Mt.
Large dike about 2 miles long, and about 1/4 mile wide.
Cuts slates
Orthoclase-feldspar, nepheline (= elaeolite), pyroxene and pyrite.
Has no quartz.

Chondag ② Kittatinny Valley – Green Pond Mt.

Lower Cambrian

Hardyston quartzite = Chiques of Penn. 10 to 200'.

Common Olenellus thompsoni in fine [illegible] (weathered).

Also in Green Pond Mt. Walcott got Olenellus.

Middle Cambrian absent. At the contact, Weller describes it as [illegible]

Upper Cambrian – Ozarkian – Lower Ordovician.

Kittatinny magnesian lime or dolomite, 2700 to 3000' – [illegible], etc

At Newton in O'Donnell and MacGlanniman's quarry Lingulella stoneana, Orthis newtonensis, Ptychoparia newtonensis, Saukia newtonensis (common), etc

Half mile north of Blairstown (abandoned quarry) Cryptozoon saratogensis, [illegible]

Both in upper part of Kittatinny

At Columbia (Delaware [illegible] of N.Y. Susquehanna & Western R.R.) has a Ozarkian fauna rather than Beekmantown.

Also in Green Pond Mt area.

Erosion and.

Middle Ordovician = Mohawkian lime (= Jacksonburg) 130 to 150 feet. [illegible] in Green Pond Mt. 300' on Delaware.

May be absent, with the Hudson River slate resting on the Kittatinny.

All Lower Mohawkian – Lowville – Black River – [illegible] Trenton.

Richly fossiliferous. Best place on land of E. J. [illegible], back of mill at Jacksonburg, near Blairstown.

Fossils listed bed by bed on pages 18–36. Has 64 species.

Middle Ordovician continued.

Hudson River slates (Martinsburg) — several thousands of feet thick.

Conformable on Trenton with transition. No break.

Base clearly in Trentonian. How high the series goes is not known, but possibly into the base of Maysville.

In a flagstone quarry in the township of Sussex. Calcareous sandstone

Has Plectorthis plicatella among 4 species.

On hillside above Trenton li. in a small slate quarry. About 50 to 75 feet above Trenton li.

Diplograptus (2 sp.) Lasiograptus mucronatus, Corynoides calycularis. = Normanskill

Normanskill = middle or lower Trenton.

Near Jutland. First R.R. cut east of Jutland on Lehigh Valley, 340 yards east of station. Triassic 92 yards beyond. Climacograptus, Dicranograptus, Cryptograptus gracilis, Retiograptus geinitzianus.

= Normanskill

Great break.

Silurian

Shawangunk, 1500 to 1600 feet. Green Pond congl. supposed to be eastern shore phase.

The dip is near Poxino Island is 2305 feet thick. In Delaware Valley 2385 feet.

Over Green Pond comes the Longwood sandstone, or red shales, over 200 feet.

These are probably Salinan.

Cayugan

Best section in William Hornbeck quarry and in the ridges beyond. In the area 150'; 700' in ...

At base Poxino Island shale 1 foot + In Penn. over 200'. No fossils.

Bossardville li. 12'. Thickens south to 100+ No fossils

Decker Ferry for. 50' Best seen in Hornbeck Bluff (2 mi. S. of Tristates N.Y.). See fossils on pp. 63-66 (48?)

Rondout fm. 40 Has only Leperditia (3 species) and Hyatella lamellosa.

Monday (3)

Near pan quarry hill

Devonian

Manlius li. 35 (Shimer 40)

Coeymans li 40+ (Shimer 42)

New Scotland 160' (Shimer 170)

Becraft 20' (0.16) Stormville ss.

Kingston 80' no fossils. (Shimer 200)

Oriskany 170' (Shimer 150)

Esopus grit 400 (Shimer 350)

Onondaga li (Shimer 235)

Farther east Newfoundland grit 215'. Same fossils.

Monroe shales 700–1000 = Hamilton

Bellvale flags 1800 = Hamilton

Skunnemunk conglomerate

7495

Area mit Dotter 1-1973

doc. 122

doc. 0122

In a railway cut near Furnace there is a fine exposure of the Kittatinny passing down into the Hardyston. The lower portion is a series of interbedded quartzites with dolomites and some black shales. It is clearly a transition series so that some of the Kittatinny must be Lower Cambrian. How much is unknown.

Visited Zinc Products Corporation near the white Precambrian limestone (= Franklin) & ground up for farm fertilizer. The lime much shot through by pegmatite. See the samples.

Then to Franklin Furnace where we first went through the mill and took a number of mineral samples. Then to the open cut to see the ore bodies at [illegible] depth.

Then visited at the [illegible] iron mine (magnetite) in Precambrian. This is about 4 miles from Dover, where we stopped one night, at the [illegible] Hotel.

October 3, 1923 Dover, New Jersey.

Started first for the Replogle Magnetic Iron Mine at Wharton, near Dover. The ore veins are in Pre-Cambrian syenite, and average about 35% iron. The ore is crushed very fine and then passed under magnets and over washing tables. Have a sample of the iron ore, and one of the country rock, a syenite.

Near Singac looked at some Triassic lava flows that Lawson admitted showed not the slightest metamorphism of the Triassic mud rocks. It was held that the lava had flown over wet Triassic mud flats.

Near Pleasantdale looked at the great trap quarry showing a wonderful series of columnar structure. Forgot to have a picture for my text-book.

Stopped one night at Perth Amboy.

Friday

Triassic and trap ridges (=basalt)

Trap = diabase or diorite. At Orange average 100 feet thick
Lodding 1886 speaks of it as "lava flow"
In quarry on Mt. Pleasant avenue columnar structure is fine. O'Rourke's quarry.
Plate 9 shows radiate structure of columns. Due to irregular cooling
Undercliff quarry 1½ miles away not so fine

doc. 0122

October 4 - 1923 Thursday.

Looked over two of the large bleeding sites described on the schedule, and some others along the Raritan river and in South Country.

The rest of the day we looked over Trenton and visited Rutgers and Princeton, and the Lenox China factory in Trenton. In the evening looked over the State Museum and Kummel's offices and [illegible].

Near Princeton [illegible] more intensive and south of Princeton it has metamorphosed the whole series at least 100 feet down. [illegible] [illegible] [illegible] [illegible] [illegible] had to come to [illegible].

Stopping in the elegant Stacey-Trenton Hotel.

Looked like rain [illegible] this morning. But instead it was bright and cold.

October 5 - 1923. Friday.

Cool and clear morning.

Drove off to see the Cretaceous on our way to Atlantic City. Practically saw all of the various formations, but the impression left is a series of glauconitic marls interbedded with sandstones. Also saw the Vincentown lime-sand but here the fossils are not at all as abundant as at Vincentown itself, which is only four miles away. Formerly the Cret. is uninteresting.

All of the higher land is covered with the Pleistocene yellow gravel - I believe the Pensauken gravels.

We then drove into Atlantic City where we stopped at Walden Hall.

October 6 - 1923 Saturday.

Left Atlantic City at 8.30 and drove up along the Atlantic Coast all the way to Asbury Park. Much of the land is barren and but little inhabited due to the loose sandy soil. Here and there a town, mostly fishing villages. All lies but little above sea level until we get near Point Pleasant when the land becomes a rolling country.

Got to Asbury Park at 12.30 and left

Correlates well with Atlantic and Gulf Border.
Few species in common with Rocky Mts.

Thursday and Friday

Cretaceous. 450 – 650 feet thick. Weller had about 600 (95 new).

Jerseyian or Lower Danian:

- Manasquan marl 10 species
  30 – 50 feet
- Vincentown formation (includes "yellow sand") 125 = Lower Danian or Maestrichtian
  40 – 50 feet
- Hornerstown marl 11 species
  30 feet

Ripleyian or Senonian — Montanan:

- Tinton beds 33 species (7 restricted) Cucullaea fauna
  Glauconite. Up to 20'
- Red Bank sand 43 (4). Lucina fauna
  Up to 100'
- Mount Laurel – Navesink formations 112 (54) Navesink Cucullaea fauna
  Navesink has glauconite 45 feet.
- Wenonah sand and clays. 81 (19) Lucina fauna
  50 – 55 feet
- Marshalltown clay-marl 43 (10). Cucullaea fauna
  Glauconite. Thickness 30 to 40 feet.

Coloradoan:

- Englishtown sand. no fossils
  20 to 100 feet thick

(over)

Ripleyan or Senonian

Cretaceous

Woodbury clay 9(732). Lucina fauna
Thickness 55'

Merchantville clay-marl 102(33) Cucullaea fauna
Glauconite. Thickness 35-60

Magothy formation (includ. Cliffwood clay 43(14). [illegible] fauna.
Hotul [illegible]

Raritan clay. Estuarine. Flora of 150 or more species.
clay, sand, gravel. Has 5 marine species.

Bres mit
Oct [illegible] 5-1/23

doc 0122

for New York City at 3.20. Got to Murray Hill Hotel at 5.45 P.M.

October 7 - 1923. Sunday, New York,
Looked my bag at the Grand Central R.R.
and left it to Columbia Univ. to attend the Council meeting of the L.O.C. The meeting dragged
on slowly and President White talked too much.
At 4.15 left the meeting and N.Y. at 5
P.M. for Lancaster, Penn, where I arrived
at 9.15 P.M.

ASSOCIATION OF STATE GEOLOGISTS

ITINERARY

Monday, October 1.

Leave Port Jervis, 8 A. M. for Otisville, N. Y. Railroad cut and quarry in the Shawangunk Conglomerate (Oneida sandstone of early writers). Clarke found a Eurypterid fauna in thin black shales intercalated in the conglomerate beds and referred the formation to the Salina. Later Schuchert found the typical Medina fossil Arthrophycus in quarry. At east end of cut the unconformable contact of the Shawangunk (Silurian) grit on the Martinsburg (Ordovician) shale is exposed. Have a piece of the Shawangunk conglomerate.

Leave Otisville 9 A. M. - Return to Port Jervis, thence to Nearpass section, Tristate, at 9:45 A. M.

Nearpass Section-Base Upward

1. Poxino Island shale. 1 ft. +

Buff colored or yellow calcareous shale.- 200 ft. thick in Pennsylvania at type locality (I. C. White). Salina age.

2. Bossardville limestone. Regular orthoceras zone. 12 ft. 4 in.

Fine grained, thin bedded, gray or blue limestone, the so-called ribbon limestone of Cook. Small ostracods and a few other fossils in upper 4 feet.-Salina age- Correlated with the Tonoloway of Pennsylvania (U.S.G.S. Prof. Paper 108 K).

3. Decker limestone. 42 ft.

3a. Highly fossiliferous, earthy, somewhat sandy limestone. 1 ft. 7 in.

3b. Hard, bluish-gray limestone with some thin shale beds. 15 ft. 2 in.

3c. Yellow, shaly, platy limestone, with occasional thin beds of bluish crystalline limestneenear top. 7-8 ft.
(Beds 3a-3c are correlated by Hartnagel with the Wilbur limestone of New York).

3d. Reddish limestone- a crystalline gray limestone with many fragmentary fossils and red oolite grains suggestive of the lean Clinton ore at Hemlock Creek, Bloomsburg, Pa. (Van Ingen)- the Ptilodictia zone of Weller. Large bryazoans abundant. 2 ft. 6 in.

3e. Fissile yellow shale. 9 in.

3f. Blue crystalline limestone-many fossils, shaly partings, crinkly and discontinuous. 7 ft. 4 in.

3g. Thick bedded, calcareous shale, bluish where fresh buff to yellow on weathered faces. 7 ft. 3 in.

Beds 3d-3g are probably equivalent to the Salina waterlime or Lower Cement bed of the Rosendale district.

4. Cobbleskill limestone. 10 ft.

4a. Irregularly bedded, bluish limestone, containing large numbers of fossils particularly corals-generally debris covered. 6 ft.

4b. Blue, fossiliferous crystalline limestone in beds 6 to 10 inches thick, many ostracodes-genus Beyrichia. 4 ft.

Beds 4a and 4b equal the "Middle bed", between the Lower and Middle Cement at Rosendale, New York.

5. Rondout limestone. 39 ft.

5a. Earthy shale with bands of limestone- Leperditia abundant. 3 ft.9 in.

5b. Fine grained, dark slate-colored limestone-Many ostracods 6 ft.4 in.

5c. Shale 1 ft.6 in.

5d. Hard, fine grained, bluish-gray, brittle limestone- Many ostracods and stromatopora 2 ft.3 in.

5e. Calcareous shale. 6 ft.3 in.

5f. Pale blue or gray limestone, weathering yellow. 5 ft.9 in.

5g. Fissile, calcareous shale 15 ft.0 in.

6. Manlius limestone 34 ft.8 in.

6a, b, c, d, e, f.- Hard, bluish-black limestones, the basal bed being made up largely of large, Stromatopora heads. The ostracode fauna of the Rondout continues, but marine forms appear a little above the base.

7. Coeymans limestone.

7a. Coarse grained, crystalline gray limestone, many Favosite Corals in masses. 10 ft.3 in.

7b. Not exposed. 30 ft.

8. Stormville sandstone. The top of the Coeymans is not exposed in this section. Five miles southwest a thin, sandy layer was noted at this horizon. This expands southwest and becomes the Stormville sandstone of White's Pennsylvania section.

9. New Scotland beds - Not exposed in bluff, but in fields back of bluff and northeast, and immediately above the northern quarry, are

9a. A hard cherty, very fossiliferous limestone 20 ft.

9b. Soft, limy shales, forming a shallow depression west of bluff section. Estimated thickness 140 ft.

10. Becraft limestone. Forms a low ridge and more or less continuous outcrop along crest of hill back of quarry bluff.

Hard, dark or grey cherty limestone, many fossils 20 ft.

11. Port Ewen beds. Not exposed but underlie a marked depression west of the Becraft ridge, beyond which is a wooded ridge- Estimated thickness 80 ft.

12. Oriskany formation. Along crest of wooded ridge.

12a. Hard, more or less siliceous black or gray limestone, fossiliferous,- many trilobites. The Dalmanites dentatus limestone Have a Rhipidomella penneyana in Utah. 30 ft.

12b. Dark siliceous limestones- Nowhere exposed in continuous section- characterized by Orbiculoidea jervensis. Estimated at 20 ft.

12c. Earthy or siliceous limestones, usually not exposed- Upper part becoming sandstone further southwest. Spirifer murchisoni, characteristic. 120 ft.

13. Esopus grit Exposed along west slope of ridge formed by 12a. Estimated thickness 400 ft.

14. Onondaga limestone - Exposed as low knolls rising above the glacial terraces along the Delaware River, and along road near Dingman's Ferry

Leave Nearpass 11:15 A. M.- Return to Tristates, thence down Delaware River road to Brick House.- Note bare ledge of Esopus grit on left, 1 mile southwest of New York State line. Typical of the gray [illegible]

Ledges of Onondaga limestone 3-4 miles S. W. of State line.

Brick House to Hainesville. 3½ miles. Cross the strata obliquely downward from Onondaga to Portage Island shale, but only occasional exposures along road.

Hainesville to Layton- 3 miles-- Along Little Flat Brook- poor exposures.

Layton to Dingman's Ferry and back to Layton- 2½ miles, Cross section in ascending order to good exposures of Onondaga near Dingman's.

Layton thro Culver's Gap to Branchville.- 7½ miles- Cross Kittatinny Mountain through an abandoned river gap (piracy) 917 ft. elevation, crest of ridge 1500 feet. High Falls shale, and sandstone and Shawangunk grit. East of gap, across closely folded Martinsburg (Hudson River) shale and slate to Branchville.

Dinner at Branchville. 12:45 - 2 P. M.

2 P. M. Return to Culvers Gap. Turn right in gap around Culver's Lake. From road north side of the lake note views of the Schooley Mountain peneplain (gneiss rock) across the Kittatinny Valley (Martinsburg shale and sandstone and Kittatinny limestone). Follow road at base of Kittatinny Mountain to ledges of Nephelite-Syenite (Elaeolite-Syenite) north of Beemerville. Occurs as a sill 2½ miles long, ¼ mile wide between Martinsburg shale and Shawangunk sandstone.

3:45 P. M. Leave Syenite dike- Continue N. E. on same road,- 1 3/4 miles to volcanic plug in slate. -Igneous rock containing angular fragments of slate, limestone, and granite gneiss- the "roof" through which it broke.

4:30 Start for Newton (20 miles) via Plumbsock, Woodbourne and the Papakating Valley, rocks Martinsburg shale. Hotel-Cochran House. Supper, lodging, breakfast - $3.00.

TUESDAY

8 A. M. Leave Newton for Franklin Furnace via Milford Station, Houses', Monroe, North Church, Hamburg, Hardystonville. First mile across an anticline of Kittatinny limestone. Miles 1 - 2 1/2 syncline of Martinsburg slate. Miles 2 1/2 - 4, across westward dipping Kittatinny limestone and gravel plain with small lakes, marking site of buried ice-blocks, 4 1/2 miles- Lime Products Corporation- Quarry and mill in Franklin limestone (pre-Cambrian)- Inspect quarry and mill.

9:30 A. M. Leave quarry- North of second railroad crossing, note wide gravel plain, with kettle holes and moraine.

At Monroe turn left, cross railroad to first road fork.

Examine ledges of Jacksonburg limestone in fields to right, between the Martinsburg shale and the Kittatinny limestone. Top of Kittatinny is Beekmantown age. Jacksonburg limestone is Black River-Lowville. Base of Jacksonburg locally contains conglomerate of Kittatinny pebbles.

Return to Monroe, turn left. After crossing railroad note lobate front of a high glacial delta at North Church,- best marked east of road. Edge of ice sheet lay against north side of delta. Note huge kames to northeast.

Turn south at Hamburg to Franklin. Note very large kames on right, 1 mile south of Hamburg and south of these the east front of the North Church delta. Arrive Franklin 10:30.

10:30 A. M. - 12 M. Trip through the Separation plant of the New Jersey Zinc Company. A visit underground cannot be arranged for.

12 M - 1:30 P. M. Lunch.

1:30 - 3 P. M. Inspection of surface geology including outcrop of ore body, open cut, contacts of basal Cambrian (Hardystonville quartzite) on gneiss.

3 P. M. Leave Franklin for Dover via Ogdensburg, Sparta, and Woodport.

At Ogdensburg note great V-shaped embankment of stratified glacial drift which for a time dammed the Wallkill Valley. On the right across the valley are (1) a white limestone crushing plant and (2) the Ogdensburg works of the New Jersey Zinc Company. Wallkill Valley is underlain by a syncline of Kittatinny limestone, the western half cut off by a fault which has brought the gneiss and slivers of pre-Cambrian limestone to the surface on the west. At Sparta, road ascends to level of the Schooley Mountain peneplain, here much dissected.

At Woodport there is seen the north end of Lake Hopatcong- Area 4 square miles- partly artificial,- level having been raised 8 feet in 1831.

At Hurdtown- magnetic iron-ore mine, 6000 feet long on a shoot of ore pitching 26° north, which was 60 to 90 ft. high and 35 feet thick.

Two and one-half miles south of Hurdtown,- cross the Longwood Valley on Devonian shale, faulted down against gneiss on west.

Three miles,- Green Pond Mt.-Silurian S. S. and cg. resting on gneiss or Cambrian limestone.

Five to six miles- Pass abandoned iron mines-caved ground.

4:30 P. M. Mount Hope Mines- Inspect Model of ore-bodies.

5 P. M. Leave Mount Hope for Dover via Rockaway- crossing Wisconsin Terminal moraine.

Dover- Mansion House.

Wednesday.

8 A. M. Leave Dover for Replogle Mine, Wharton,- Inspect separation plant.

9:30 A. M. Leave mine- Pass Dover, Rockaway, Porsippany, Jersey City Reservoir, Boonton, Montville- 14 miles.

10:15 - 10:45 A. M. Inspect planes of Morris Canal-Boonton. Note glacial delta- east of Montville, elevation 400',- marking shore line of glacial Lake Passaic. Trias conglomerate near railroad.

Montville to Mountain View, 5 1/2 miles- Across bed of north arm of Lake Passaic. On right a curved ridge of extrusive basalt, of Trias age,- the latest of several flows. At Mountain View deep gravel filled gap in the basalt ridge.

Turn right to Singac- 2 1/4 miles.

Turn right at Singac, keep left at second fork, up steep hill,- 1 1/2 miles to road cut, showing beds of Trias shale between flows of basalt. Note conformable contacts, absence of metamorphism of shale, vesicular character of upper surface of basalt.- Exposure on back slope of second of the great basalt sheets.

Return to Singac to Little Falls. Inspect East Jersey Company's Filtration plant- Lunch at Little Falls.

1:30 P. M. Leave Little Falls- via Great Notch- to Montclair Heights- offset of Trap ridge by faulting. To old quarry at Upper Montclair- Basal contact of first basalt flow on shale; pillow lava, absence of metamorphism, conformity of contact.

To Montclair and Verona- cross ridge to valley on Trias shale and sandstone between first and second basalt sheets.

Eagle Rock Manufacturing Company- flowing wells in vesicular trap. 12 inch core thro first basalt sheet.

Pleasantdale.- Brownstone quarries in sandstone between basalt sheets. South to Mount Pleasant Avenue and east to old quarry showing columnar trap columns,- described by Iddings.

To Millburn via Gregory and Wyoming Avenues- Gap in First Mountain- Corresponding gap in Second Mountain filled by Moraine. These gaps mark pre-glacial course of the upper passaic and Rockaway Rivers.

To Springfield- Church of Revolutionary fame. - To Union, Roselle, Wheatsheaf and Woodbridge. Perth Amboy for night.

Note on Trias of New Jersey

Triassic formation in New Jersey consists of a great thickness of red shale, arkosic sandstone, (some beds conglomeratic) dark colored argillite, and three thick sheets of interbedded extrusive basalt. Each of the latter was formed by several flows closely following each other. Near the base of the series is an intrusive sill of diabase which forms the Palisades along the Hudson. The sediments were mainly fluviatile, accumulated in an intermountain valley, under arid conditions. From the top downward they have been grouped into the (a) Brunswick shales (b) Lockatong argillite (c) Stockton sandstone. Along the northwest border are local deposits of very coarse conglomerates- the alluvial fans of snow-fed rivers debouching from canyons in the mountains. In the northeastern part of the State only the Brunswick beds are recognized. The Stockton and Lockatong beds are best seen near the Delaware, where profound faulting repeats the series twice. The igneous rocks form conspicuous ridges, the crests of which form a part of the dissected Schooley Mountain peneplain. The sedimentary rocks underlie rolling lowlands, remnants of two base-levels, developed in Tertiary time, the lower of which (Somerville peneplain) was widely covered with stream deposits in early Pleistocene. These have been since almost entirely removed and the present dissection accomplished.

THURSDAY

Note on Cretaceous of New Jersey

In New Jersey the Cretaceous consists of the

Manasquan marl	25 feet
Rancocas group	
Vincentown sand	25-70 feet
Hornerstown marl	30 feet
Monmouth group	
Redbank sand and Tinton sand member	0-100 "
Navesink marl	25-40 feet
Mount Laurel sand	5-60 "
Matawan group	
Wenonah sand	20-35 feet
Marshalltown formation	30-35 feet
Englishtown sand	20-100 "
Woodbury clay	50 feet
Merchantville clay	60 feet

Magothy formation	25-175 feet
Unconformity	
Raritan formation	150-250 feet
Great Unconformity between Cretaceous and Trias	

There is no complete section exposed. Sequence can be made out only by careful piecing together of scattered outcrops.

The Raritan formation is best exposed in the clay district around Raritan River. Here there is the following section, top downward:

Sand bed	75 feet
Amboy stoneware clay	25 feet
Sand bed	20 feet
South Amboy fire clay	20 feet
Sand bed including "so called" "feldspar" and "kaolin"	45 feet
Woodbridge brick and stoneware clay Woodbridge fire clays	80 feet
Sand bed	25 feet
Fire and terra cotta clays	0-30 feet

Higher members in the series will be seen on Friday.

Note on Tertiary Deposits

The Tertiary deposits of New Jersey are chiefly sands, with some clay beds. The lower member- the Kirkwood sand- is known to be of Miocene age. The upper member- the Cohansey sand- is thought to be Pliocene, but without definite proof. Both members contain lenses of clay. The highest hills of South Jersey are capped with the Beacon Hill gravel, regarded as younger than the Cohansey but probably Tertiary, and the correlative of the Lafayette.

Note on the Pleistocene

The non-glacial Pleistocene deposits are the Bridgeton, Pensauken and Cape May, the first being the oldest. They are generally orange colored or yellowish brown sand and gravel, ranging in thickness up to 30 feet, probably fluviatile in origin; separated from each other in age or by periods of erosion. The differentiation between them is partly lithologic but mainly topographic. In general they agree with the Sunderland, Wicomico and Talbot formations of further south.

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8 A. M. Leave hotel for trip through the clay district about Perth Amboy, Woodbridge, and South Amboy. Near Perth Amboy and Woodbridge sections frequently show (1) Glacial till (Wisconsin) (2) Pensauken gravel (3) Cretaceous. Near Woodbridge, the Woodbridge fire clay is dug extensively.

Near Perth Amboy , the Woodbridge brick and stoneware clay is dug. Near South Amboy, the best clay is the South Amboy fire clay.

11 A. M. Arrive New Brunswick. Visit State School of Ceramics and view Trias reptile foot print in museum of Rutgers College. Lunch at New Brunswick.

1:00 P. M. Leave New Brunswick via Lincoln Highway for Princeton and Trenton. Route crosses beveled Trias shale; 1 mile after railroad crossing (3 miles from New Brunswick) patches of Pensauken gravel on the shale;- similar gravel caps all hills above 120 feet elevation over a wide area northward. The general absence of this gravel below 120 feet indicates (a) development of a wide plain on shale in pre-Pensauken time, (b) period of fluviatile aggradation; (c) removal of gravel and development of broad flats and gentle slopes just under 120 feet with narrow trenching along main streams,- since middle Pleistocene.

10 miles from New Brunswick cross intrusive mass of diabase, southwestern extension of Palisade diabase of Hudson.

1:35 P. M. Kingston- Deposit of much disintegrated Pensauken gravel on beveled Trias shale.

2.00 P. M. Rocky Hill-Metamorphism of Trias shale adjacent to the diabase.

2:30 P. M. Arrive Princeton.- Drive around University grounds- visit Guyot Hall.

3:30 P. M. Leave Princeton for Trenton via Penn's Neck. Good exposures of Stockton sandstone (Lowest member of Trias) near Carnegie Lake.

4.15 P. M. Lenox Pottery show rooms, Trenton, N. J.

Hotel Stacy Trent.

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New Jersey Steinway