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doc. 119

Boston - Cambridge -

Boston - Cambridge -
Greenfield N.H., - and
Vermont with Keith

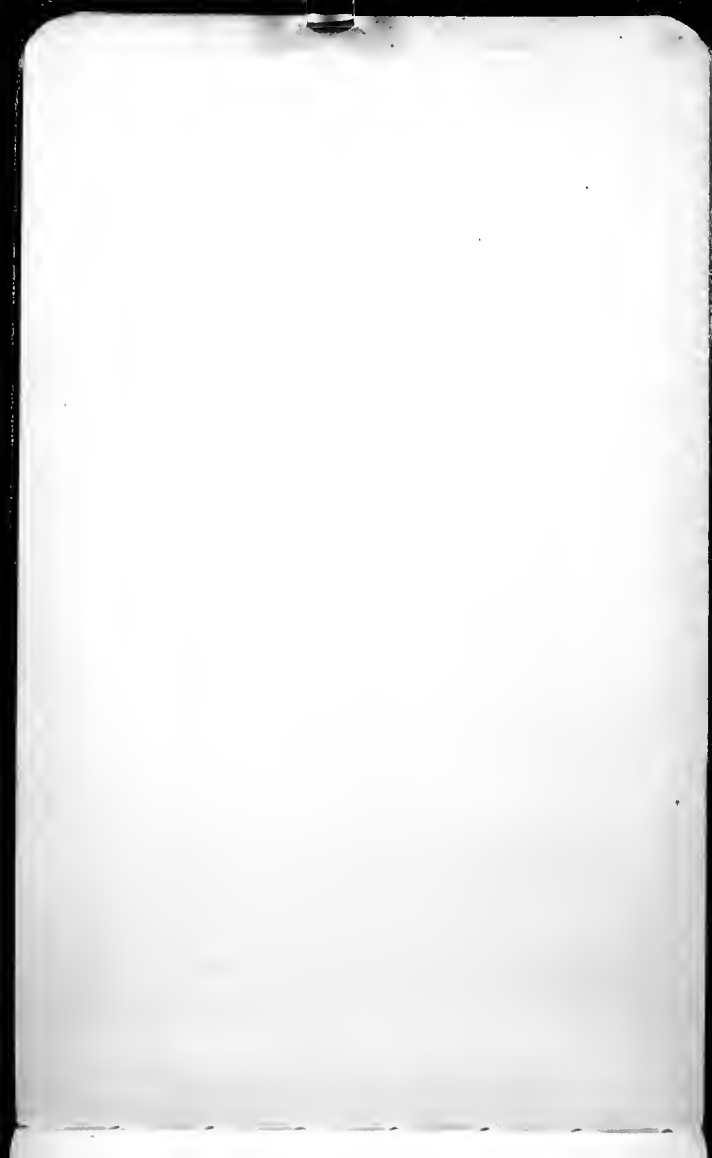
1921

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Charles Shuchert
Yale University
New Haven
Conn.

1921

doc. 119



July 22-1921 Friday

New Haven, Conn.

Left at 10.32 and got to Boston at
2.15. About 3.30 I was visiting with
Raymond. In the evening had dinner
with him at the Harvard Club.

July 23-1921
Boston, Mass

Worked all day at Mus. of Comp. Zool.,
Harvard, picking out duplicate brachiopods
out of the Bohemian collection. Bohemia.
This is a very ^{large} collection and today I got one
out of the orthoids and strophomenoids.

The Silurian species are not many
and all come out of shales, sandstones and
iron-stone like concretions probably out of shales.
Saw Dalmanella, Plectorthis-like but appear
to have a cranidium, Heterella, something like
Orthis clypea, Triplexia slightly lamellose, Plect
ambites, Rafinesquina and Schizoserania.
The whole reminds rather of high Trenton.

Of Silurian saw nothing of the earliest
or Alexandrian faunas. Of middle Silurian
the common genera are Dalmanella, Rhipid-
orella, Brachyspirin, Strophonella, Acheobert
ella, Plectambites,

I saw nothing to suggest an upper Silurian.
Of Marlies (Ff) there is of course little
but what there is appears to lead directly into the
Knieferussian.

Of Knieferussian there is a large lot of
Ahipidomella, Schuchertella, Strophodonta,
Strophomella, Plectambonites?, Orthothota deformis
that come out of Schuchertella pecten like
forms, Chonetes, Amphibia, Leptostrophia,
This fauna is very suggestive of some New Zealand.

Of the G zone there is little and it is
not suggestive of Lower Devonian, rather Middle
Devonian, but upon the whole there is little to
speak.

Of H saw no tracks at all.

July 24 - 1921. Sunday.
(Boston, Mass.)

At ten took the South Shore steamer
for Plymouth. It takes about $3\frac{1}{2}$ hours
to go. At Plymouth we have about $2\frac{1}{4}$
hours. Outside of the immediate historic
places there is not much to see. The place
is living on its history, and even though they
should have celebrated last year the 360
anniversary they are now building a new water
park and squares.

July 25 - 1921 Monday

Spent the day at Harvard picking out
Botanigen brachiopods of the Schuchert collection.

The Roniprussian is the greater part of
the collection and has the finest material. A
wonderful array of Sictarella, ^{Cloridae,} Rhynchonellids,
Merista, Meristella, Eospirifer, Atrypa,
Rhynchospira, and Beachia like form (T. melonia)

While there are forms reminding at once of
New Scotland yet upon the whole the fauna
is a different one and a subprovince of the
Atlantic Helderbergian. Anastrophia is not here

The brachiopods were marked Ff, though
I think some are from these Shell limestone.

Of G there is very little, and of H nothing.

Of the Silurian many forms are suggestive
of the Roniprussian and for this reason
can well be identified species of the two
formations. Most of these if not all will
prove to be different species.

In the Silurian one sees no Pentamerus
illinois. Rhynchotrema cuneata is here but as

a rule the ^{shephardellid} species are again very different
from those of the English - Scottish Silurian
and quite different from those of the American
Silurian. I saw nothing that is certainly
younger than Beulth or Higgin's Louisville,
Cochlidium knipfii is rarely here, and some
may even say that only Ludlow is present.

If it is clear the introduction to the
Devonian and Permian. Accordingly there
is a break here and all of the Lipon Ludlow
is absent including the Lipon Silurian the
Tonoloway.

All of the Oriskany is absent and so is
May - see Oriskany.

Of Lower Cambrian there is none.

The Paradoxides fauna is well developed.

Of Upper Cambrian, Ordovician, Canadian
and Chazyan there is none. All of the
Ordovician appears to be Marshallian. There
is no Cincinnati and apparently no

earliest Liliura = Alexandria

I am getting a fair array of Bohemian
hachisprocks, and if I could take the time
to work up the unlabeled lots I would get
a great deal more.

The Bohemian collection and all of Banard's
specimens should be restudied in the ^{light of the} modern
generic terms. Probably many of Banard's
specimens are not revisited. All in all it would
make an interesting study, and many a new
genus would turn up among the abychonellus
and spinibeauss. Then too contrasts should
be made to show the provincial character
of the Bohemian faunas. With Banard's
fine illustrations and the Bohemian collec-
tion then should be no difficulty in
doing this.

July 26 1921. Tuesday
Boston Mass.

Finished today picking out a duplicate set of Bohemian brachiopods out of the Schary Collection. I have picked out about 200 species, and Barnard has described about 600 forms. In the end I doubt if B. has as many as 500 forms. When the Schary collection is fully labeled there may be 300 and not ^{than} 300 forms. The great majority of species are in E2 and especially in F2. Then in D, next C, F1 and least in H.

What I have will with a few exceptions illustrate all the genera. I saw no Streptis or Paterula.

July 27 1921. Wednesday.

Ragmond found more specimens, so I finished selecting today. Has have picked out the following:-

	^{Baranale may} have			
Ordovician	50	19 lots	=	98 specimens
Silurian	250	121 "	=	1100 "
Ff 1	15	8 "	=	34 "
Ff 2	200	105 "	=	725 "
G	20	8 "	=	41 "
	<hr/>	<hr/>		<hr/>
	585	261 "	=	1998 "

When I have all restudied in the light of Baranale's volumes I should have from $\frac{2}{3}$ to $\frac{3}{4}$ of his forms. As there is a good deal of sameness in the formations it must mean that Baranale has divided the species too fine. In the end there may not be more than 400 species and varieties. In any event I have a fine collection and it will serve most purposes.

July 28-1951 Thursday.

Boston, Mass.

Packed up my box of books, and Raymond will ship it by Express.

Tried out my ideas about the Bohemian succession with Raymond. He has studied the trilobites and I now have seen the books. There is no Lower Cambrian.

The Middle Cambrian is the equivalent one of the Atlantic province though the species are different south of the Pontic barrier than to the north of it.

There is no Upper Cambrian.

There is no Ordovician.

From D, I saw no books, but Raymond has trilobites and these he says are clearly of the Bohemian. This seemingly means that some of the Canadian or Beekmantown is present.

There is no Chazyian.

Nearly all of D is of Mesozoic age
beginning with the Black River and apparently
ending with the highest Trenton.

There is no Eden or Massville.

The equivalent Richmond is present
but a fauna wholly unlike those of America.
It is the time and fauna of the Brachiopodum
- Trinucleus Schiefer of Sweden, and
is a near of the Brachidonta of Scotland.

Of earlier Silurian, the American
Alexandria series then appears to be none.

As far as I can see all of E is of
the time of the American middle Silurian
- Clinton - Guelph. As Cynochidnum knighti
is present in Bohemia it accepts that a
little of the Sabinia is present, but in general
it appears to me that all is middle Silurian.

There is no Cayuga.

The lower Devonian starts in with the
Black limestone of F₁ and thence into the
red limestone of F₂. These are the equivalents
from Brantford, Cayuga, New Scotland
and probably the Beecroft.

There is no Crickhamian.

Zone G is Middle Devonian and possibly on Grandy.

What H. represents I do not know.

To morrow early Raymond and I start for Liverpool, N. Hampshire to see Keith. The distance is 68 miles and we go by his auto. Raymond returns in the late afternoon and I remain over.

Wednesday and Raymond start next week on at least a six weeks trip to Cra., Tenn., and Abatama. This means that T. will not get to Nashville before Sep. 10 and it probably will be later. He is then to visit Miller at Lexington, Fennerman and Bucher at Cincinnati, and Forster at Dayton. Then Bryant at Buffalo, and finally J. M. Clarke and

Rue demands at Albany. After this
he returns to Harvard to label his
material and then comes to Yale to talk
of the methods of Palaeogeography. I doubt
if I will see him before the middle of
October. The only fine one a good chance
to read of my Text-Book.

July 29-1921 Friday
(Greenfield, N. Hampshire.)

Started away with Raymond in his
car from the Lenox Hotel at 7.30. His
fine driving and the scenery becomes more
amazing as we go. We go through
Lowell, Ashua to Greenfield. Keith's
house is about 2 miles west upon the mountain
side. From his grounds we have a fine view
to the north to Mt. Mansfield.

Raymond asked Keith much about
the final location; about Knoxville, Tenn.
He left about 4 o'clock in a showy after-
noon.

July 30-1921 Saturday

Greenfield, N. H.

A showy cool day with very little
of the sun - sight. Nevertheless having
a good and restful time with the Keiths.
Mr Keith's cousin Miss Parsley of
Stonington, Conn., came up for a visit
on Sunday.

Reading Lansing's book on the League
of Nations. A fine book and a grand re-
proposition of the folly of the politician Wilson.
If he was a lawyer we could not have
an international League and court doing
away with most of the future wars.

July 31 1921. Sunday.

A heavy Sunday, Reading most of the morning while the Keiths are at church. Much embolism during afternoon and evening.

In the late afternoon took a little walk with Keith to see the sea of mountains to the north of Annapolis. It is the result of the Appalachian orogeny and the erosion since. Annapolis rests on an elevated plain between 1200-1300 feet, a plain with others below that front to the sea to the south. To the north rise the hills and mountains of New Hampshire.

I personal Keith rather believes that the rocks of N.H. are due to the Appalachian orogeny, but also believes that there is some late Permian uplift.

The region about Greenfield is in the main a much metamorphosed gneiss - a schist - intruded by much granitic granite. It may be that all of it is on the side of the Palaeozoic strata in the main part of the State.

near around by slates - like the Acadia slates
of Waterville Maine. All of this brittleness
leads leading into to see if any paleogeography
needs guide rectification.

The Logan north thrust may be as much
as 20 miles in modern Vermont. The basal ^{Carboniferous}
formation is either a grey quartzite or the red
sandstone former thought to be the = of the Acadia.
Higher follows (approaches with limestone conglomerates
and limestones. The thickness is probably not nearly
so thick as Walcott states, but as far as Keith
has not determined it.

East of the Logan fault there is normal
faulting late Tertiary time, one further east
another one of the Appalachian type.

The Paleozoics rest upon highly altered meta-
morphosed sedimentaries, slates, sandstones and lites,
of Algonkian age and still older Laurentian.

Keith evidently does not believe there is an
Ogishian system. He thinks all is Beekmantown.

In the north the Beckmantown is usually a *Strobilites*,
but in Tenn. and Ala. it is *diptera*, and it is
this difference that has led Ulrich to conclude
that it is *Keuper* or older series. Stree, Barber,
and Butts are the three great upholders of Ulrich's
Opinions. It appears that Ulrich has not of
late set at the top some members of the *Opinion*
but has as well done so at the bottom. The
largest sequence and the most prolific are a
small ^{of the *Opinion*} or small *Opinion* in Ala. and now described
by Butts in the Ala. Folios. Under the circum-
stances it might be best to place all of the *Opinion*
with the Beckmantown as one system in the
Ordovician.

The only two *Opinion* have the *Opinion*
trend and according ^{to} must lie in the
Opinion province. See about the *Opinion*.

August 1-1921 Monday.

Greenfield, N. H.

In the morning first checked a lot of female moths that were laying great nests of eggs. Then autoed to Greenfield, and from there to Peterboro to get some supplies for Kings auto. Had five miles of Amador and Paed Amador.

To-morrow we are to go from Greenfield to Peterboro - Marlboro - Keene. Then north west to Westmoreland - Walpole, across the Conn. R. to Bellows Falls - Rockingham, Chester, Saneto, Proctorville, Ludlow, Summit, East Wallingford, Cuttingville, East Claremont, North Claremont, Rutland. The distance will be nearly 90 miles.

August 2 - 1921. Tuesday.

Erna Keith is not ready to go west to Rutland, so postponed another day. More a less overcast skies.

Apparently all is in order to start to morrow

August 3 - 1921. Wednesday.

One of the finest of sunny mornings and at 11.15 A.M. we are off for Rutland, Vt. Left Greenfield (2 miles) at 11.40 and got to Peterboro (7 1/2 miles) at noon. A few miles further and our new front wheel had a puncture. This we had repaired at Dutton 3 times and it was 3 P.M. when we started again. All then went well. Got to Acene, N.H. at 3.40 P.M., Galpole at 5 P.M. and Ludlow at 7 P.M. where we are stopping over night.

Between Peterboro and Dutton had the first clear view of Madrock. The road has winds around a large lake where there are many pine

Lones. Pampelly has a home here.

Between Adelpole and Bellows Falls one sees many river terraces and especially on the west side of the Corn River.

Ludlow is on the eastern side, the Green Mts, and here towards Bellows Falls the very Paleozoic shales are altered to garnetiferous schists. The intended gneiss that caused this alteration are already adjacent. No fossils are known here but in some of the Black slates such might be found. These slates are very regionally metamorphosed. The Green Mts proper are made up of of hornblende schists of Algonkian age.

A short distance beyond Bellows Falls we left the Corn Valley and went up the Black River. Here also one sees river terraces. Ludlow is in the Black River valley.

Travelled yesterday about 50 miles.

August 4-1921. Thursday.

Get up at 6 and about 8 we are off for Rustland. We go a short distance up the Black River and then leave it. At Summit we are in the core of the Green Mts and all the rocks are Archean ^{or it is Paleozoic} - gneiss, horn-
blend schist, then quartzite and limestones.

Leaving Summit we see some quartzites and phyllites. As we get through the Green Mts I learn that the Archean is shown to the west over the Cambro-Ordovician series. Then the wide valley of dolomites and Cambrian quartzite, to the west of which are the northern equivalent of the Taconic Mts. Their eastern facies is of Lower Cambrian greenish gray quartzite, said to be several hundred feet thick. They too are pushed to the west and under the Ordovician. In the valley lies a normal fault of Triassic time.

We get to Rustland at 9 A.M. and as the car does not run well we put in for repairs and will not start out until after lunch.

At 1.30 we are off for West Rustland to see a little of the great marble quarries. The limestone valley lies ^{that rises to the south and soon is lost;} in a syncline, ^{practically} all the quarries are in


one line on one side of the small valley. The quarries extend for about 2 miles ^{north}, according to Keith's interpretation the total thickness of the limestones are not much more than 300 feet. To me the thickness seemed greater.

The limestones are from pure white to more or less banded, and even greenish. These gradually give way to dark blue impure limestones, and finally then to again pure white limestones. Every now and then there are thin zones of dolomite, from a few inches to about two feet.

The limestone shows much flow structure, and this is best seen about the dolomite layers. The dolomite does not flow so readily as the limestone but breaks up in pieces and it is around these that the limestone flows. All in all the li. are much jumbled around and about, and all is recrystallized. It is therefore only the layer fossils and seemingly only the gastropods that still show traces of themselves.

On the top ^{of the hills above the big quarries} near the school

found one seen on occasional gastropods. The
flattest of these appear to be Raphidoma about
one inch or a little more in diameter. Associated
with these appear to be Maclurea but none seen
where more than two inches across. Rarely some
crystalline lumps that I tried to make out to be
Strophostoma but could not do so. Saw no
cephalopods at all. May have seen some byo-
zoan and tiny echinoderm columns.

We then went to the small abandoned
quarry a little to the west and here above
the quarry ^{on the side of the hills} is a good nearly 5 feet thick filled
with a great quantity of small Raphidoma
measuring from $\frac{1}{2}$ to $\frac{3}{4}$ inch across. In section
these looked to me like this  Here
also crinoid-like columns are present, but
saw no plates. Keith says he has Maclurea
Hecks. across near the school above the big quarry.

In one place I thought I could make out on
several layers a great quantity of Buth Strophis
little interstratified.

Then returned to Coastleton.

Put up at "The Maple" at Castleton, at
\$3⁰⁰ per day.

As there are no granite injections near
the Rutland area, about 30 miles (see for distance)
the intense metamorphism is due to regional
deformation. If Walcott's estimates of the thickness
of the Cambrian is correct the load of the Paleozoics
may have been 3 miles thick, but probably was less.
Keith holds that the evidence points to deformation
during the Appalachian orogeny, and that the
masses a mile or more thick was shoved over the
Rutland area helping to cause further meta-
morphism. Since then the cover has been worn away
revealing the intense metamorphism. Therefore it is
clear that the alteration increases from west to
east.

In the Berkshires and Taconics the Lower
Cambrian quartzites are thickest, 600 feet or more.
They thin out ^{westward} and in Conn. are only a few feet
thick. Their greater mass and erosion intensifies

the next thing to the east. The L.C. shore therefore
lay to the west ^{highlands to the west?} (Kitts view) and the question arises did this
sea extend directly across the intervening area
all the way to Boston and beyond to what it
was the ocean? If this is so, that is, if there
was overlap of Passaic, then the Appalachian
geosyncline did not arise until the close of Lower
Cambrian time.

In Vermont it may be that the Red ^{quartzite,} _{formation}
called Medina sandstone, is the direct equivalent
of the White quartzite to the south. In New
York, and to the east these directly ^{originate} the Archeozoic

In the Rensselaer valley above the Archeozoic
comes 600 feet more of white ^{L.C.} quartzite that
gradually goes into a dolomite series of consider-
able thickness. What relation these bear to the
purple-green shale series ^{and of Lower Cambrian age upon the next page} _{is not known.}

In northern Vermont the red sand rock is
supposed to be younger than the white quartzite.
The red sand rock goes over into a dolomite series
at the same time that the Lower Cambrian
Benning slates.

August 5-1921. Friday.

Spent the entire day along the western side of Lake Bonoseen which is west of Castleton several miles. This is in the slate belt and many quarries were seen taking out purple and green slates. The slate belt zone is probably not wider than 50 feet though in places probably as much as 100 feet has been quarried out. [Some days later we saw in the bend of a gorge that these slates are of the same age.] Just above the purple and green quarried slates is a zone about 15 feet thick of slate interbedded with thin limestone that range from one to two inch thick. These are always much puffed apart and pushed into the shales; they are always jointed in many directions and the joints filled with crystalline calcite. These limestones have Lower Cambrian fossils, and I got what maybe Endoceras ^{specimens} and I got a form Orthis acron. If these are what they appear to be the age of the rocks is undoubtedly Lower Cambrian.

The lower Cambrian fossils are mostly small trilobites.

These fossils were gotten at the north end of Lake
Bromsen or West Castleton.

Beneath the quartz zone there are thin
zones of dolomite. One of these is two feet thick
and is said to have a wide distribution.

At the north end of Lake Glenn we saw
a zone 6 feet thick of snow white quartzite. Also
much jointed and filled with quartz veins.

At one place at the south end of Lake Glenn
we saw a vertical cliff, a jointed ^{face} of a very clean a
synclinal ^{structure}. All near sharply cleaved at a low
angle to the east. From this it is held by Dale

that the Lake Bromsen area all lies in
[with one it appeared to be a series of beds all thrust to the east and lying
a syncline. The main quartz zone along west
side, Bromsen is of one kind while those
of Lake Glenn are of the other.]

Probably all the thin limestones and dolomites
have more or less of sand, usually fine but
sometimes coarse well rounded grains.

What we saw today of the Lower Cambrian
would not make a thickness of 1000 feet, but
we eroded along the strike, and not across it.

Schistosity is so thoroughly developed that
it was destroyed in the rocks and at joints there
was. Even the limestone and dolomites and
even the quartzites are somewhat schistose. Then
too all is pulled apart and the joints filled
with calcite or quartz. It is for these reasons
mainly that we get so few fossils. A solid day
of crawling would probably yield a half dozen
specimens, and these should determine the
time. The fossils are of good for time values.

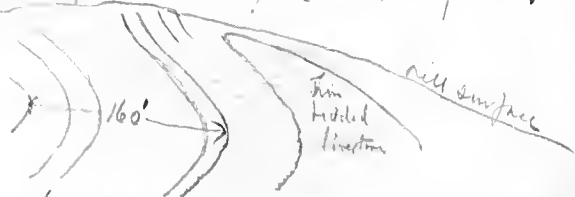
Mr. Drimmeron of Harvard was with
us all day. He has an area 6 x 4 miles
given him for a dissertation. He is after
the structure and not the fossils.

[Comparing this region with the Georgia one
there are seen great differences in the sediments. Here
concretion prevail while about Georgia dolomites of several
kinds and varieties are at hand along with a great
development of conglomerates. In both areas, however,
Lower Cambrian fossils occur.]

August 6 1921. Saturday.

Keith, Brinnerton and I first went west to one-half mile east of Fair Haven. Here we found well exposed the 15 feet zone of thin bedded limestone. I bore a well continuously for two hours and got but a single very small Lingulella or Stolid. Otherwise saw no fossils.

We then went along the western side of Lake Bomoseen to other slate quarries and finally at Cedar Point in a slate quarry ^{high upon the hills} saw an overturned and closed fold about as follows.



Then left Lake Bomoseen and crossed over to Lake Glenn and near the south shore found black slate interbedded with fat little crumpled thin in the place of the 'original' soft green on August 5. Saw Clonellus. These had long now and then fragments of Clonellus and finally got an identifiable piece of the plottella. There is now no doubt

that all the slates that we have seen today and yesterday are of Lower Cambrian age.

We have now seen about 2000 feet of Lower Cambrian slates, and Keith says the whole series is about 3000 feet thick. A light green but an intense one, and a grey-green color make up the bulk of the slates. Throughout are interspersed rare white quartzites, usually thin - from a half inch to two feet thick - but at times considerably thicker. Limestones are much rarer and come in zones. One zone of thin bedded limestone is about 15 feet thick, and a black shale zone has thin bedded limestones less crumpled. One thick thin black shale is I do not know. Of purple and red slates, there are at least two, one is about 20-25 feet thick, and of the other one I do not know the thickness.

The scarcity of the fossils is extraordinary and is hard to explain. They may be ^{more} ~~more~~ common than appears, due to the crumpled

nature of the limestone.

What is the cause of the red and purple
shales? When red shales are in contact with
water grow by an intensely green. In a
condition of deposition, and in one place. I
saw green slate terminated by a thin quartzite
($\frac{1}{4}$ inch thick) and above it red slate.

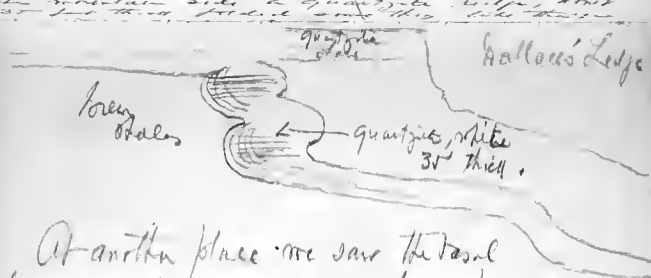
Of course mud bottoms are not the home of an
abundance of life. Can these red shales have any
thing to do with shallow water and shore conditions?
Some of the thicker quartzite grows a dense
a slab well marked with ^{or small} branching, circular in section,
fucoids, these were originally holes in the quartzite
mud, and are now filled with the fine sand as
casts now / situated to the bottom of the quartzite
layer.

The quartzites are invariably of very fine
sand, and seemingly always of clean, white
quartz sands. The phenomena are ^{likely} for deep
water and far away from the shore, or for
low rivers bringing only clean washed fine
sand.

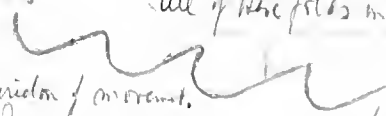
August 7-1921. Sunday.

Started north to the east of Lake Bomoseen to see the area more as has studied by Swinerton. We again were in the State belt of the Lower Cambrian. It is the succession we saw first along the south shore of Lake Glenn. Finally near Twin Lake we came upon a good development of the limestone, and in it I saw considerable fragments of stony trilobites of the Lower Cambrian. There are few pieces but initially the debris cannot be determined. Fragments of Alonella

Pteroporia spicula are common. Associated with these limestones are black slates, some of which are marked and they that might be mistaken for grapholite. None are, however. We saw the same black slates along the south shore of Lake Glenn. Near Twin Lake we saw first on the mountain side a quartzite ledge, about 35 feet thick folded some thing like this:-



At another place we saw the basal layer of a thinner quartzite showing how the sands were shored into the shale. It was about like this



In one of the large purple shale quarries, Mr. Jones, we saw a face of more than 100 feet of purple shale, and got 25 feet in the ordinary thickness ^{of the shippings}. We soon saw the cause - folding, closed anticline leading north and showing of the dip slope = to the west.

Strike
← North
E.



The purple shales are probably folded here before these times.

The shales are so much folded that it is only in the quarries that we can see ^{locally and certainly} the shales, before ^{structurally}.

Leaving Torrington and Iron River
we started north and in passing Bullard ^{town}
we found that the same Cambrian suc-
cession. Keith says the two areas have the same
sequence.

At Torrington ^{and} ^{near} ^{the} ^{base} ^{of} ^{the} ^{mountain} ^{side} ^{we} ^{found} ^{some} ^{of} ^{the} ^{same} ^{strata} ^{as} ^{at} ^{the} ^{base} ^{of} ^{the} ^{mountain} ^{side} ^{at} ^{Torrington}. These ^{strata} ^{are} ^{unusually} ^{thin} ^{and} ^{break} ^{up} ^{like} ^{shaly} ^{slates}.

The ^{strata} ^{at} ^{Torrington} ^{seem} ^{to} ^{be} ^a ^{fine} ^{example} ^{of} ^{what} ^{is} ^{called} ^{the} ^{Lower} ^{Cambrian}. I have two samples of
these ^{strata} ^{at} ^{Torrington}. Keith collected
at another place ^{some} ^{back} ^{up} ^{the} ^{mountain} ^{side} ^{at} ^{the} ^{base} ^{of} ^{the} ^{mountain} ^{side} ^{at} ^{Torrington}. From here
north we remain in the Ordovician, and
it is probably an <sup>un-
folded</sup> ^{mass} ^{which} ^{was} ^{thrust} ^{into} ^{the} ^{Lower} ^{Cambrian} ^{the} ^{series} ^{seen} ^{to} ^{the} ^{south}
during the last three days. Rutland is another
part of these younger strata but has their position
ⁱⁿ ^{due} ^{to} ^{normal} ^{faulting}.

At Torrington can be seen a complete
section out of of the Torrington, but below

of the clayey marl like that of Russell
but beneath the latter, ^{occurs} the heavy bedded
dolomite and sandstone of the Piedmont.
In places there ^{are said to} rest on the Piedmont con-
bedded sandstone.

All of this area was once covered by the
overthrust masses of the Lower Cambrian.

North of Ludbury the country soon becomes
a fine farm country, because in all the
low places the land was covered by the
Champlain sea, and the Champlain clays
smooth out the ground and make good

^{but sticky} farm lands. The great farm and summer
site of Hyde Park ^{was passed this afternoon} started in 1851,
is one of the most extensive of these places

but to Middlebury at 6 P. M. and
soon after it began to rain.

There are patches of red marble
of Cambrian limestone north of Ludbury.

The Taconic Range are as far north as
Ludbury.

August 8-1931. Thursday.
It rained considerably last night. This morn-
ing it is clear and cooler.

To the east of Middlebury there is a Beechman-
town and associated are merchantable marbles.
Same occurs to the west of Middlebury. Farther
west occurs the Ludbury Trenton, and some miles
still farther west are the high ridges of the Vermont
red sand rock. It ^{and other Cambrian strata} come out from beneath the above
mentioned formations. All these masses are thrust
to the east.

The western faces of the Green Mts are here lined
with the white L.C. ^{quartzite}. In going west they
pass beneath the L.P. dolomite, and higher come in the W.C.
dolomite ^{and marbles}.

The following is the sequence of the Lower C.
from Middlebury south to Mass. At base the
Proterozoic slates, limestone, gneisses and rocks.

White clear worked quartzite 3-100' in Conn.

Up here to 600-800 feet.

Grey dolomite, 1000 at Rutland.

Alston, li.

Lower Cambrian

- Green schist dol. and quartzite. 400'-500'
- Grey dol. ^{dominant} and white calcareous sandstone. 300'
- Grey pure dol. 150' Eith Ord. or Cambian.
- Marble white 300'
- Limestone ^{interbedded with sandstone.} mottled and banded. Little to 400 feet.

Structural belt

Black & white interbedded with li of Ord. series.
The West Rutland marble series.

The place of the Red Vermont quartzite is not known. It may represent a red or yellow dolomite, 0-100 feet thick.

In going north from Middlebury to Burlington one sees in the most high ridges that are made up of the Red Vermont quartzite. In the Chelburne region they make the shore of Lake Champlain. In Burlington at the falls of the Wisconsin River the red quartzite fan gradually into the red Hatched Wisconsin marble or dolomite. Over these lies a great thickness of grey dolomite, all of which are thought to be of Lower Cambrian age. All of these Lower Cambrian masses are interbedded upon the but little altered Ordovician series along the shore of Lake Champlain. To the east some distance there is a great fault

of the normal type listing the a. C. series down.
To the eastward of this fault comes in the
Ordovician series, ^{descriptive type} but all are much altered
and drawn out, and practically no fossils can
be had.

What is the position of the Vermont Red
quartzite and the succeeding dolomites? Is it
a western phase of the eastern white quartzite?
If not are they the eastern phase of the Potsdam
and the succeeding Little Falls dolomites? No!

What is the relation of the roofing slate
series of the Lower Cambrian to the white quartzites
and the dolomites of the known basal L. C.?

Keith does not yet have the field relations
determined and as yet has nowhere seen contact
to demonstrate the age relations.

The basal ^{white} quartzites are clear washed fine
sands, and are now vitreous and intensely hard and
splitting like glass. Similar are the quartzites
deposited in the upper Cambrian.

The Vermont red quartzites are red in color

light in the upper Cambrian.
The summit red is not as red as water
and very much in character like the Triassic of
Conn., but are not conglomeratic. Then too the beds
are more equally bedded and are but little con-
bedded. The parting layers are thin red shale
zones that are usually sun-cracked. Some
rippling of an indistinct nature is seen. I also
thought I saw some fossils. This was at Jones Hill
near Charlotte.

Can this red quartzite be the eastern shore
phase of the Potsdam? See if any other fossils
occur other than Ptychobalanus adamsi. At
least 300 feet is known, but as mica
has been seen near what the formation rests upon,
the total thickness is not known.

To make me go to go to Inanton, Parkers
Quarry, and Highgate Falls. May be I will
get more help here.

The red dolomites seen this afternoon are
all crystalline, fine grained to coarse, some
are very white, and others are colored dark red
dark bluish. In one place we saw much
traced black chert disposed in the dolomite
quite irregularly. ^{as if a conglomerate.} It must be of diagenetic
origin.
Stopping at Steels Hotel at Milton, Nt.

August 9-1921. Tuesday.

A fine bright morning, and at 8.30 we are off in the north. Did all from north in the first 7 miles north and northwest of Milton.

Saw a great deal of the Lincoln Cambrian dolomites, sandy dolomites and intraformational conglomerates. The dolomites are always thick bedded and usually dark ^{-Here} in color. The sandy dolomites are light gray and even thicker bedded than the pure dolomites. The peculiar feature of these is their sand which is scattering, variable in size and always more or less rounded.

The dolomite conglomerates are very variable in the quantity of the pebbles. Frequently they are angular irregular pieces of two to three kinds of limestone and dolomite, and at other times the pieces are thin, flat and like those of the Bealman town intraformational conglomerates.

These flat pieces more often lie flat, but may be at all angles and sometimes vertical to bedding. They then take on the character

are at all on any of the sections marked to
indicate that the latter is the character
of adhesive conglomerates. The pieces are of
all sizes from very small ones to those 3/4
and even 6 inches across. Sometimes these
conglomerates are badly squeezed and drawn
out. They are the ochreous when the pebbles
are much thinned and partly elongated. See
my sample.

These flat pebble conglomerates have the
pebbles, usually of limestone, and one wonders
where the limestone all came from since such
formations are not to be seen. Are they probably
the semi-eroded limestone of a year or two
of accumulation and just diagenetically altered
to dolomite before entombment in the dolomite?
[Later thoughts: are you sure of li. at Highgate Falls?]

The great conglomerates seen not far from
Benjia Center are most interesting because
of the quantity of pebbles, their large size, and
the little dolomitic parts that find their
way there. Some of the pebbles are 8 feet long
and the other dimensions may be 6 and 4 feet.
They consist of three kinds of dolomite, of the
oldest formations. However one sees no Vermont
sand rock, no basal white quartzite, and no

shale pebbles. No granite or rocks. All is
either dolomite or of the quartzites interbedded
with the dolomite. Evidently no other rocks
were exposed. The pebbles tend to be angular
but the large blocks are somewhat rounded.
At first we thought ice was the agent of
transportation, but finally we concluded as
these conglomerates are ^{probably} local that torrential
rivers was the form of transportation.

In a local limestone conglomerate - the
first one seen today - I found a road for
more than two hours to get fossils. Keith got
the first fragment and after all my work I
got 2 or 3 specimens of Protospira or Solenopleura
a large tail like Alenoides ^{but has no rays, in d. of spine,} and possibly
the tail of Bathynotus. I also saw
seen Fossilifer trojanus. Over this conglomerate
follows the great thickness of L. C. slate.
It is in the lower 100 feet of the slate
that these fossiliferous conglomerates occur.

August 10-1921. Wednes day.
Started north for Highgate Falls, ^{to (Menominee) office.} The
distance is 8 miles. For nearly 6 of it we saw
the blue limestone conglomerate, the "Giant Con-
glomerate". At six miles north we came upon a
little ^{whisk} ^(Eocypripes) hill ^{to} the west of the road, exposing marble.
It was underlain by banded slates and overlain
by the blue limestone conglomerate. This marble
exposed a length of ^[= 175-200'] 120 feet by 30 to ^[= 110'] 40 feet
and the thickness must have been 10 feet or so.

The question at once arose is it a boulder
or is it a piece of the old ground over which
the blue limestone conglomerate is laid. ^{or is it a red limestone?} It seems to
^{be top} ^{of} ^{the} ^{glacier} ^{type} ^{of} ^{glacier}.
Finally Keith was disposed to regard it as
a piece of the old floor of the second cycle of
sediment (= Wp. Cambrian to Trenton) let down
to the east during Tertiary faulting. [Later we
^{also found of this idea} today we again saw many fine exposures
of the Giant or Blue Limestone conglomerate. As a
rule the pieces are of a thin blue limestone, and

The prices are laid down at all angles, often they stand edgewise. Some of these pieces bear Lower Cambrian fossils, (3 miles north of St. Albans) and in one block I got Paritypax and Lingulella. The next abundant pieces are of a white bridge like limestone, the same as the great block seen 6 miles north of St. Albans. Finally there are pieces of the sandy dolomite and of a flint colored dolomite, one much further than is the Lower Cambrian series. Again we saw no oolite, no granite. Some of the boulders, the marble like li. are fine 2 to 6 feet long. We also saw some blue black shale pieces included in the conglomerate. The great majority of pieces are angular. Beneath the blue li. congl. one often saw a banded dark slate, that in places becomes interbedded with a gray sand in thin beds. In these various occurrences, ice appears to be the best explanation. One of two miles occurrence to be of cliff origin, and the same appears to be true of several rivers.

At 6 1/2 to 7 miles north of St. Albans we saw much black slate that in a way reminds of the Alps, but it has probably nothing to do with

[am. 1912]

to do much it. [has been turned out to High-
gate Falls. There is a fine exposure
of almost all the strata seen during the past
few days. The blue li. congl. is well shown here
in section towards the west end, ^{of the river cliffs,} and at least
two hundred feet are probably feet thick. Higher
comes in a thick series of black shales, with an
occasional thin dolomite band. At the bridge
is another conglomerate, but much higher than
the blue li. conglomerate farther down stream.

Toward evening saw for the first time
an exposure of the Kirooki marble about
400 feet is exposed beside the trolley line between
Dunton and St. Albans. Above it comes in
a very long bedded dolomite that weathers
brownish.

The Keith's interpretation, inserted as
a loose sheet here.

Probably the entire thickness seen at High-
gate Falls exceeds 1000 feet.
The best explanation of these conglomerates

... of the same thickness seen at High-
gate Falls, exceeds 1000 feet.
The best explanation of these conglomerates
is that they are of glacial origin. This is the
more certain of the "Saint Conglomerate" than of the
salmon island ^{older} dolomite conglomerate. On the other
hand there are some intraformational conglomerates.
All in all the evidence is not yet fully in
hand to explain the origin of the two main
conglomerate zones.

The banded nature of the sandy shales
beneath the Saint Conglomerate are also evi-
dence of glacial origin. Occasionally one
sees a large boulder in these shales. Pieces
of this shale and up to 3 feet long were seen
in the Saint conglomerate. This conglomerate
has a variable thickness, and in one place
[where the large mass of waste occurs] at least
a thickness of 40 feet is seen.

American House

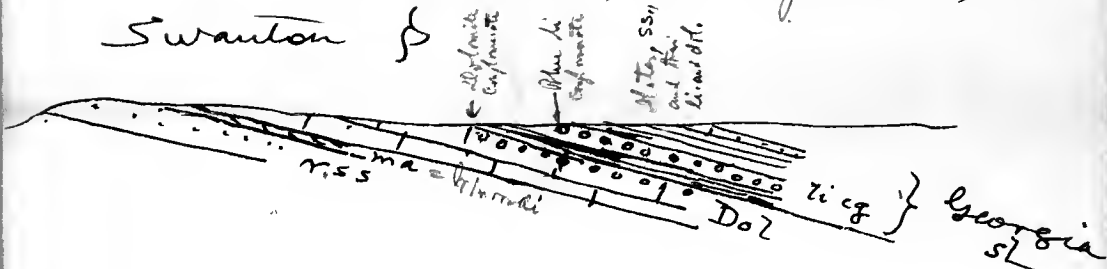
IRVING J. WRY,

PROPRIETOR

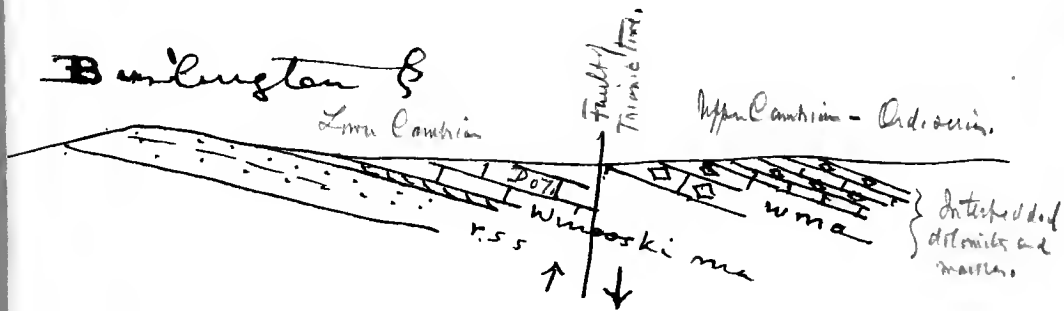
THE AMERICAN HOUSE AND ANNEX HAVE BEEN REFURNISHED, BATHS, ELECTRIC LIGHTS AND SAMPLE ROOMS.

St. Albans, Vt. August 10 1921

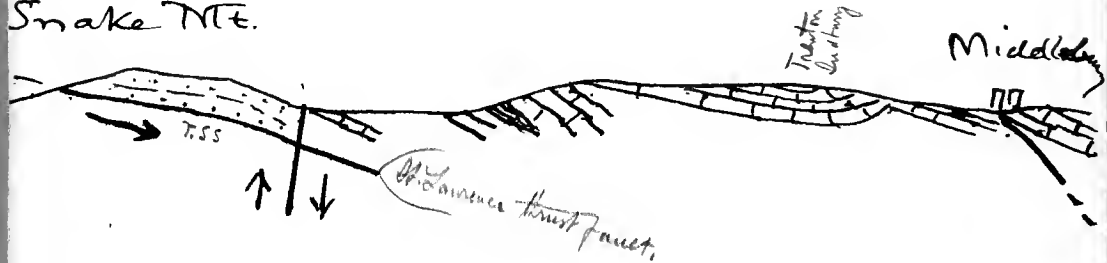
Swanton &

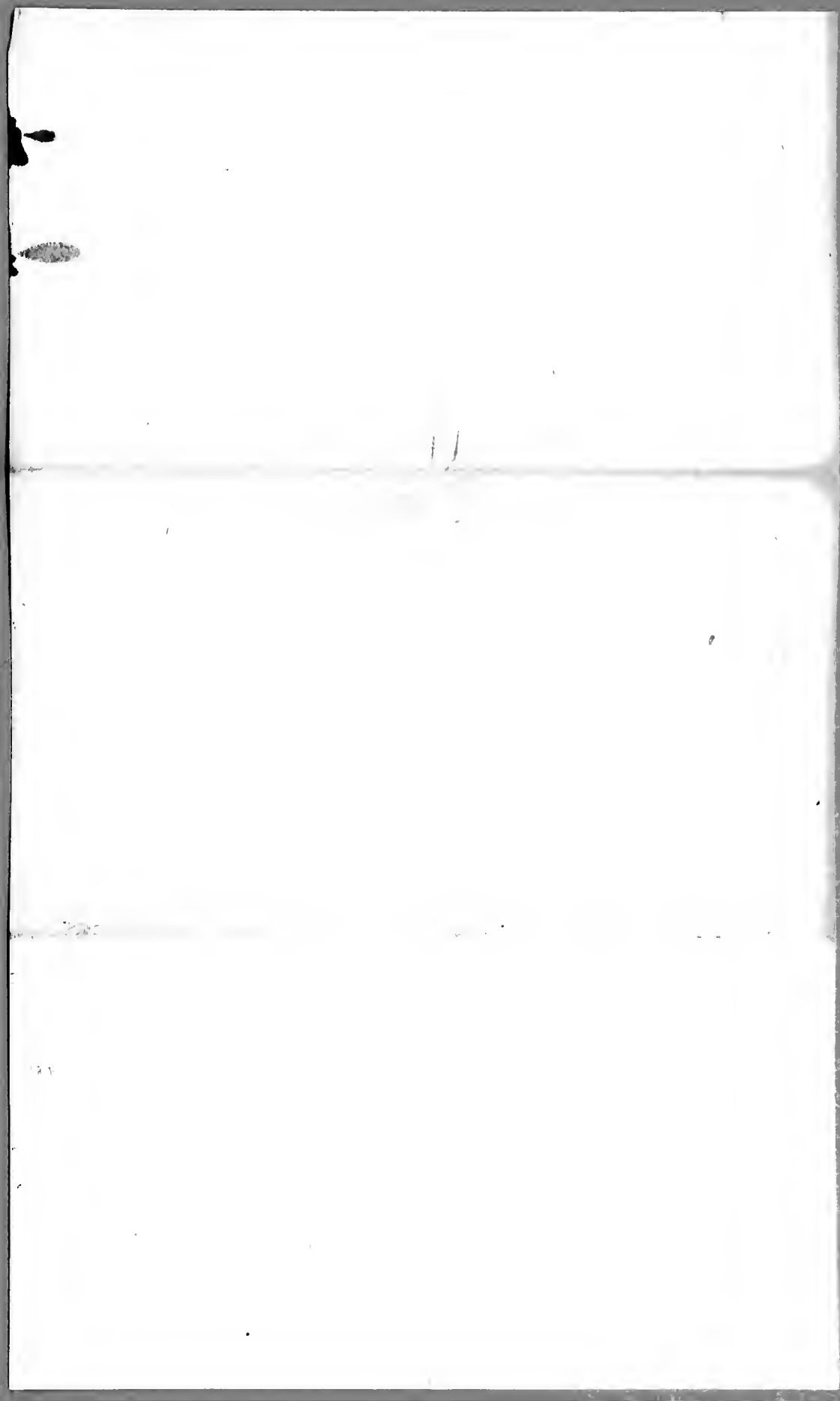


Burlington &



Snake N.E.





August 11-1921. Thursday.

Left St. Albans at 10.15 for the Parkers farm quarry, then the Howland farm, and over the Montcalm farm. The latter purchased the place last year and are French Canadians from east of Ottawa. This farm is in the north-western corner of the Milton Quadrangle, 2 miles north 60 degrees west of Georgia Center. The largest trilobite quarry is back in the field near a large elm tree in dark blue slates. Another one is half way up the hillside near the road and two other small slate quarries are beside the road. In the latter one got three beehiipods ^(see list at back end of this book) in the others we saw nothing. The slate here has a considerable thickness, probably 50 feet can be seen but apparently there is much more.

Above the slate come micaceous, thin-bedded dolomite beneath the ^{large bedded dolomite} that are more crumpled than any of the other rocks. In these occur many iron rust nodules = former dolomite

to any of the other beds. In these occur
modules, and one of the fragments of fossils are
also iron rust, but a few things (see list at end).

Coping all these beds is a solid bed
of salmon colored fine grained dolomite, about
40 feet thick.

These strata have been a wide distribution
and are but little crumpled or metamorphosed.
Fossils of value can be had only after a long
search and protracted quarrying.

Of the Lutaquia bed saw nothing.

We then machined further south and west
along a little used and once a long private
road. Along this road about $2\frac{3}{4}$ miles North
50 degrees West of Georgia Center we saw good
exposures of Hinorahki mottled dolomite. See
the samples. There are occasional small white
beds 2-4 feet thick interbedded with the typical
Hinorahki. Driving along the road to its end
on the crest of the higher land facing the low
land of Lake Champlain, and then going down
the hill (this is 3 miles west of Georgia Center)
one can see a fine contact of the Hinorahki

dolomite on the blue ^{Highgate shing marble} ~~bed~~ ~~mantle~~ dolomite.
Someone not knowing the geology would even sus-
pect here between dolomites that this bedding
like plane is the fault surface of the great
St. Lawrence = ~~of an~~ ~~on~~ ~~thrust~~ ~~fault~~.
The plane of this thrust is here hardly more
than 20 degrees. Furthermore there is no further
deformation of either dolomite, nor did I notice any
tension cracking.

The ~~Green Lake~~ dolomite is here at least 150
feet thick and there may be 200 feet of it. No
Mount Red quartzite is present.

We then drove rapidly out to the main road
and thence 8 miles to Milton, and 17 more to
Burlington, and thence 6 miles more east to Essex
Junction. Put up at a good country hotel
the Lincoln Inn.

It rained much during the night.

August 12-1921. Friday.

It is raining a little this morning and we conclude not to enter until after dinner.

At 1:30 P. M. we are off for Montpelier. At the falls of Binowski river in Essex Junction there is exposed much dark and light grey dolomite. Life unknown. An ornithomir is said to occur here, but a search for it failed to reveal it.

Less than 2 miles east of Essex Junction appears a pyroclastic - a grit and fine conglomerate made up of quartz, feldspar, and some sand - that is regionally metamorphosed. The alteration is least to the west and increases to the east. We see it for many miles, and even ^{east of the one of the} from ~~the~~ ^{some miles to the} lower ~~part~~ - to about ^{2 1/2} ^{miles east} of Waterbury. Towards the east it ~~passes~~ ^{passes} ~~into~~ ^{into} a schist. Then appear sericitic phyllites ^{with zones of black phyllite} - a bluish-green siliceous, a tale like rock. About 2 miles east of Waterbury occurs ^{the} black phyllite of which I have a sample. All these rocks are ^{thought to be} ~~of~~ ^{of} ~~the~~ ^{the} ~~same~~ ^{the} ~~age~~ ^{age}. The black phyllite is only known to be of Ord. age.

At Northfield and for several miles to the south is a slate belt, quarried, and at about one mile south of Northfield we visited a small quarry. Have three samples. Here the schistosity is that of the bedding. This is the region in which Prof. Rich and I got psyllites. Since this black phyllite is of Ord. age much of the sericitic phyllites may also be of the same age. We saw east of the Green Mt no quartzites, nor dolomites, only a great thickness of phyllites. Since these black phyllites are of Ord. age it is possible that the same kind of rock to the west of the Green Mt is of the same age.

From Northfield south to Randolph we constantly see the sericitic and black phyllites. This for the reason that the road runs along the strike of the rocks.

We are stopping at Randolph at the Randolph Inn.

The widely extended gneiss schist of

Handwritten notes at the top of the page, partially obscured and difficult to read. It appears to say "The middle extended grade..."

Postergic age originally iron probably in part
an oxide, and largely a dirty quartz sand.
Such materials with the presence of feldspar
leads to the conclusion that they are of post-
water deposition. This maybe so, but it should
not be forgotten that then there was no land
surface to decompose the feldspars. Therefore
these deposits may after all be a delta or
even a shallow sea deposit.

It may well be that all of the Cambrian
and Ordovician rocks of the Appalachian geo-
syncline change towards the east to mud-
stones. This will explain the absence in the
Green Mt. of limestones and dolomites, and the
great thickness of mudstones here.

August 13-1921. Saturday

Left Randolph at 9 A.M. and passed
through Bethel, Royalton, Sharon, West
Hartford, Hartford to White River Junction
Here at 1.00 P.M. took the train to
Springfield, Conn., where I changed cars
for New Haven. Got home at 7.30 P.M.

Two miles southeast of Randolph we
entered a belt of highly metamorphosed shales
with interbedded limestones. In these further
north Richardson has found Ordovician
fauna. Further east are the sericitic and
black phyllites described the day before.

One-half mile south of Royalton we
entered the belt of Proterozoic gneisses
metamorphosed to garnitic strelitic schists.

Granite occurs at Sharon, and at
about one mile east appear phyllites of
the Proterozoic. Proterozoic then occurs
all the way to the Connecticut River.

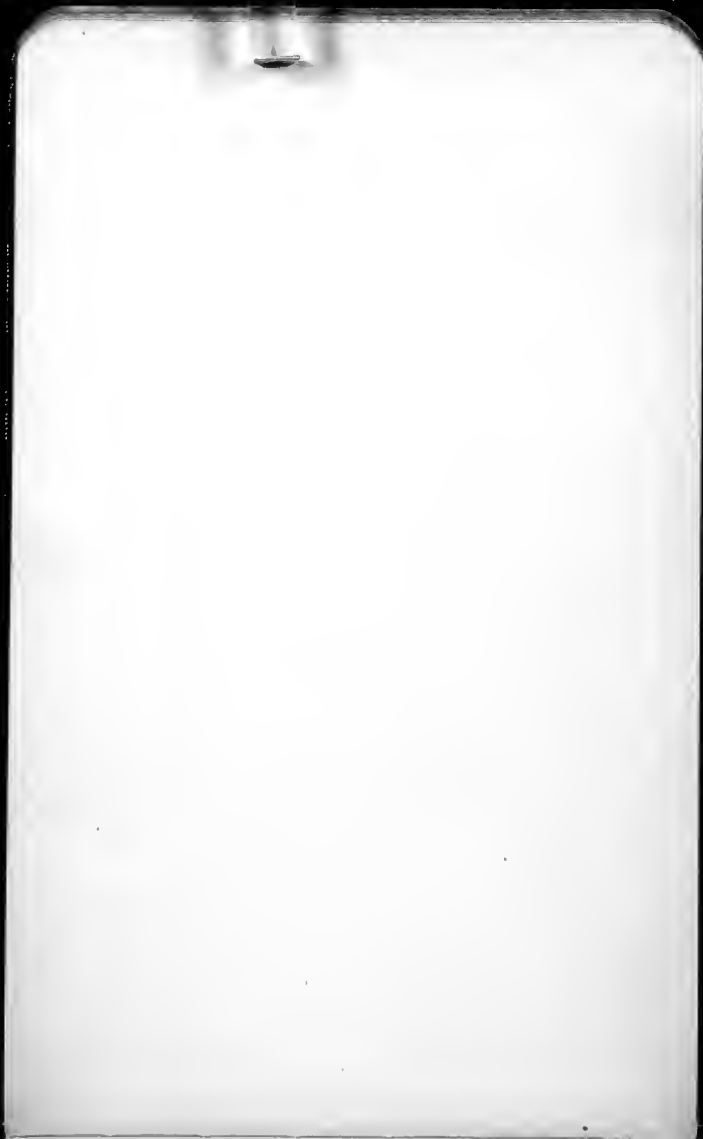
all the way to the Connecticut line
August 11-1921 Parkers Farm in Micaceous
then bedded dolomite.

<i>Trisusia festinata</i> (Billings)	1 sp.
<i>Hyalites americanus</i> (Billings)	1 sp.
<i>Bathynotus holopygia</i> (Hall)	3 tails
<i>Apaulos strenuus</i> Billings	1 head

August 11-1921 Parkers Farm in slate along
road

<i>Obolella crassa</i> (Hall)	1 sp.
<i>Acrotreta sagittalis taconica</i>	1 sp.

Was in Vermont on
train in July 1922. See another
book.



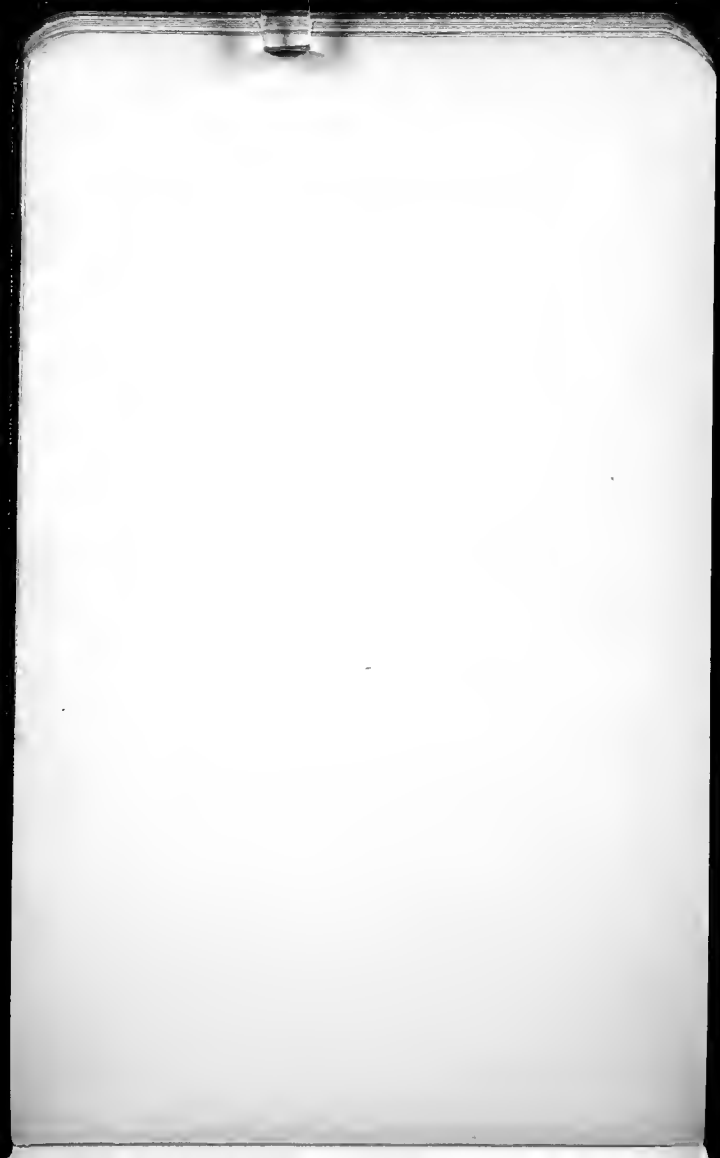
New England Heterology Trip.

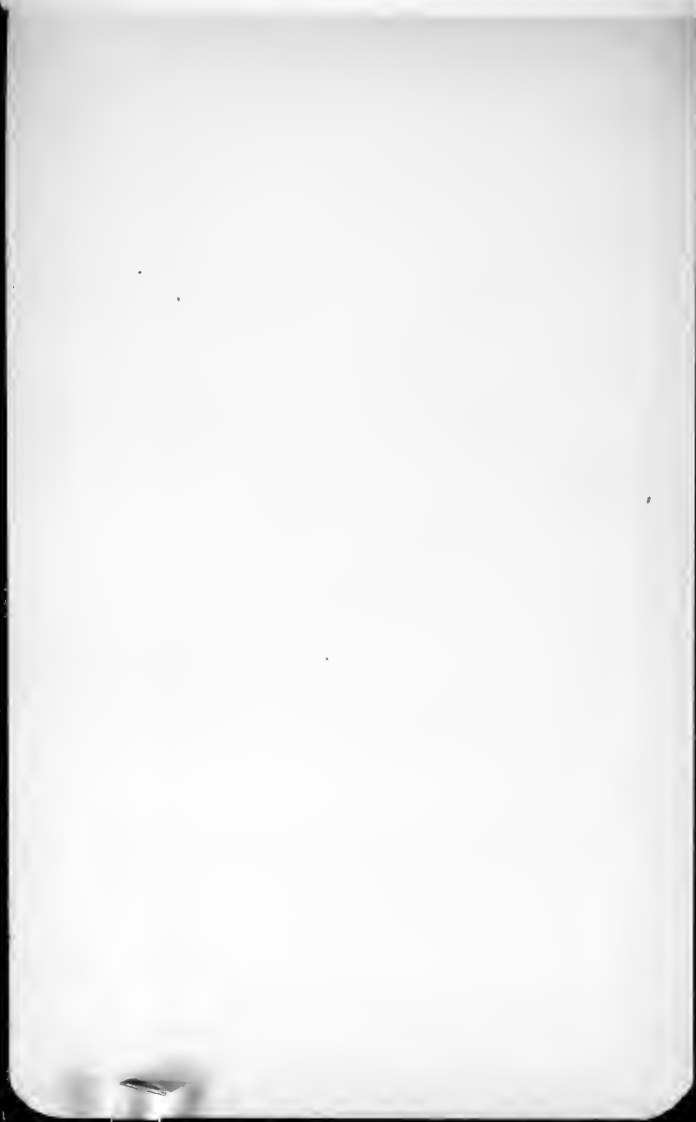
October 14, 1921

At one P.M. started out in Secretary's car
with the Knapps for Attleboro, Mass.







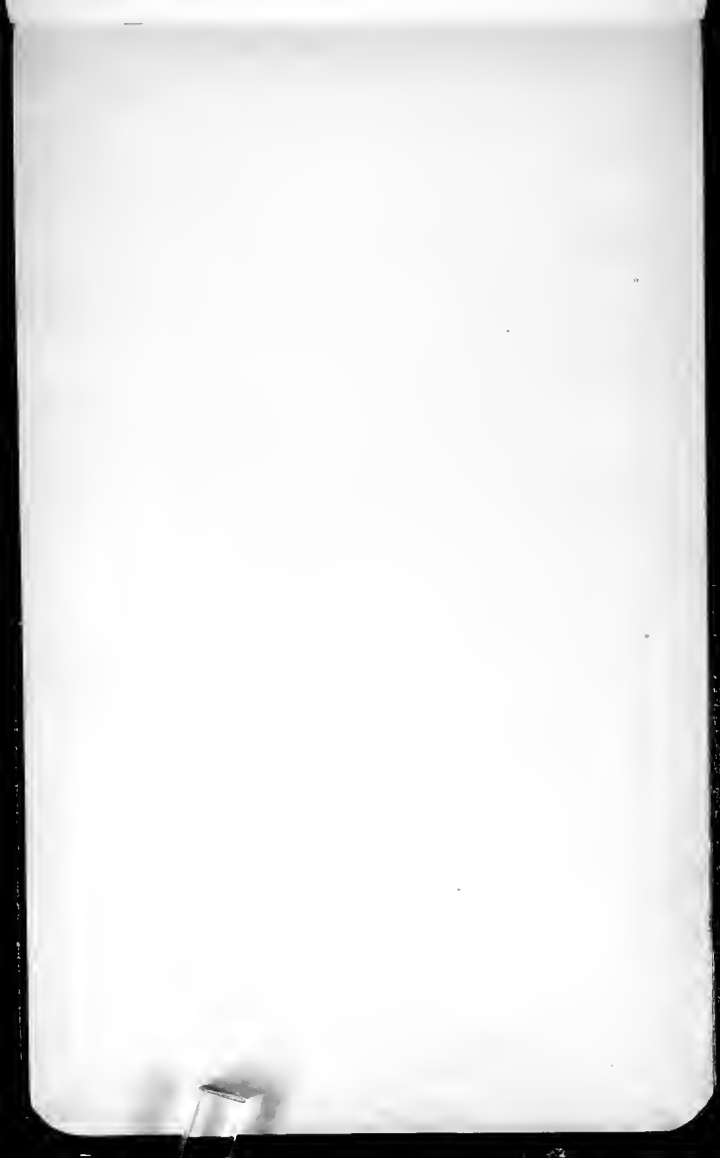


Rustland Q

2 mi. N. to N. of Seay's Cate
Summit

2 1/2 mi. N. to N. of Seay's Cate.

3 mi. N. of Seay's Cate.



3038½



