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GEOLOGY OF THE
VICINITY OF LAKES WAUBESA AND KEGONSA,
DANE COUNTY, WISCONSIN.

-----o-o-o-----

Location General Description of Area.

The following report embraces a rectangular area, 7 x 8 1/2 miles in extent, situated, as shown on the accompanying map, near the center of Dane County, Wisconsin, *its center being about 8 miles southeast of Madison* OVER.

Political. Herein are included all of the township of Dunn, the south third of Blooming Grove, the eastern tier of sections in Fitchburg, and smaller parts of the townships of Rutland, Madison, and Oregon. [In addition to the above, numerous outcrops were visited in Fitchburg, Madison, and Pleasant Springs townships.]

Topographical. The area is of rather low relief, with elevations ranging from 840 to 1060 feet above sea level, with many marshes. Although nearly every map except the New United States Geological Survey sheets, shows some five or six lakes herein, there are actually but *Waubesa and Kegonsa, formerly known as First and Second Lakes respectively,* two-- the others having quite recently degenerated into marshes. These lakes are not of great extent and the deepest spot is but 36 feet. The only river ~~of importance~~ is the Yaharap, which connects these lakes and is called familiarly and on the Geological Survey maps, the "Catfish"

Wisconsin State Geological and Natural History Survey. The shore lines on these have, for the present purpose, needed considerable minor alteration; but the soundings made by Professor Smith seem sufficiently numerous to preclude any serious error in the hydrography. Criticisms ^{of this} have been made, however, but I have been unable to verify them. None of the maps have been published, but I have been kindly permitted to use them.

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Previous Investigations.

In 1874-5, Professor Roland D. Irving, of the University of Wisconsin, ^{conducted} made a ~~very rapid~~ survey of 10,000 square miles in central Wisconsin. (1) This work, which included ~~the~~ ^{the} ~~area~~ ^{has considered} occupied but nine months, ^{and accuracy of detail was therefore not possible} of course Professor Irving did not claim absolute accuracy, for he was hampered by lack of funds, time, instruments, and maps. The generalized results are embodied in Sheet D of the Wisconsin State Geological Survey Atlas. Whether or not he personally did the actual field work, I cannot gather from the pages cited; Mr. E. T. Sweet is mentioned as having surveyed several towns in Dane County. Surveys previous to this, have proved to be practically valueless for the present study.

~~(1) Geol. of Wis., II 409-412~~

(1) Chamberlin, Geol. of Wis., ^{Vol} II, ^{WP} 409-412.

The village of Oregon is located in the extreme southwestern corner of the map of Wisconsin where the Chicago and Northwestern Railroad enters it; the Farland, on the Chicago, Milwaukee and St. Paul Railroad which traverses the north of the area, is situated ~~from~~ ^{some} ~~3~~ ^{10 1/2} miles from the eastern corner.

scope

Geologically. The area lies on Paleozoic rocks, consisting of Upper Cambrian and ~~Lower Silurian & Ordovician~~ sediments, both sandstones and limestones. These rocks are commonly ^{spoken of as} called flat-lying ~~rocks~~, but I hope to show that ~~this is an error. As may be seen by a glance at the accompanying map.~~ All of the ^{district} ~~area~~ has been glaciated. The drift resulting therefrom ^{being} ~~is~~ ascribed to the Wisconsin stage of the Green Bay glacier. A huge recessional moraine extends across the southern part of the ^{region} ~~area~~. According to ^{Dr.} Mr. William C. Alden, (1) this is the ~~second moraine formed by the said glacier, and grades into its great terminal moraine both to the east and west.~~ The remainder of the ^{district} ~~area~~ consists chiefly of ground moraine, drumlins, and veneered hills, ^{with a} ~~The~~ maximum depth of the drift is ^{of} ~~probably~~ some 250 ft.

Maps. In the ^{topographic} maps of the U. S. Geological Survey, the area under consideration lies in the southeast part of the Madison quadrangle and in the north east part of the Evansville quadrangle. ^{The topography of the latter is considerably more detailed than the former.} ~~In 1904 the topography of the former quadrangle was sketched by Mr. Robert Muldrow; of the latter by Messers A. T. Fowler and A. T. Staack. Of the work upon the two quadrangles the latter is somewhat the better. The hydrographic maps of the two lakes were made~~ ^{in 1902} ~~a few years ago~~ by Professor L. S. Smith, of the University of Wisconsin, for the

1902

(1) Wm. C. Alden, U.S.G.S., Professional Paper 20, 34 Series B, Map of Wisconsin
 (1) W. C. Alden, U.S.G.S., Professional Paper 20, 34 Series B, Map of Wisconsin

Previous Investigations.

In 1874-5, ^{the late} Professor Roland D. Irving, of the University of Wisconsin, conducted a survey of 10,000 square miles in central Wisconsin(1). This work, which included the area here treated, occupied but nine months and accuracy of detail was therefore impossible. Surveys previous to ^{Irving's} ~~this~~ were of a still more general character and valueless for the present study. References to this work will be cited where they apply. In that day there were fewer rock exposures in quarries and gullies and practically no deep wells. Considering these difficulties the map is very good.

Mr. E. R. Buckley, now chief of the Missouri Geological Survey, ^{a strip one mile wide on the} in 1895, investigated ~~the western mile of~~ ^{side} he ~~present~~ ^{as} area for his this entitled "Pleistocene Geology around Madison"; No observations there given bear directly on any subject here treated.

omit?
In About ^{the year} 1902 ^{Dr.} Wm. C. Alden of the U. S. Geological Survey investigated a large area in southeastern Wisconsin including ~~therein~~ the present district. This work has only ^(U.S. Geol. Survey) partially been published in his "Delavan Glacial Lobe" ^{no.} Prof. Paper 34, and "The Drumlins of Southeastern Wisconsin" ^(U.S. Geol. Survey) Bull. 273. ^{no.} Although he had topographic maps, which Irving did not, they were very poor. The ^{paper on the Delavan} first ~~named work~~ ~~XXXXXX~~ has been consulted for suggestions

as to the drawing of

Traversing the district from northwest to southeast, along the line of the Yahara valley is a strip along which the Cambrian rocks are exposed; elsewhere they are overlain by younger formations.

2.

Geological. The area lies upon Paleozoic rocks, consisting of Cambrian and Ordovician sediments in alternating beds of sandstone and limestone. These rocks although commonly called "flat-lying", are slightly folded. ~~The district lies across the southern extension of the older rocks down the valley of the Yahara River. The surface features of most of the area are, however, caused by the accumulations of drift resulting from the Wisconsin~~ ^{epoch.} ~~age~~ ^{of} glacialiation. A huge recession moraine, or more strictly a portion of the terminal moraine, of the Green Bay glacier ^{crosses} ~~extends across the south of the area,~~ ^{near its southern boundary} while farther north drumlins are the most striking feature of the topography.

Maps. In the topographic maps of the U. S. Geological Survey, the area lies in the southeastern part of the Madison quadrangle and in the northeastern part of the Evansville quadrangle. The topography of the latter is considerably more detailed than that of the former although both are very good. The hydrographic maps of the two lakes were made in 1902 by Professor L. S. Smith of the University of Wisconsin, for the Wisconsin State Geological and Natural History Survey. For the present purpose the shore lines have needed considerable minor alteration but the soundings were quite numerous. Where necessary the writer has made numerous rough sketches of topographic details, rock and drift exposures and the like.

VICINITY OF LAKES WAUBESA AND KEGONSA,
DANE COUNTY, WISCONSIN.

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Area.

- 4 ☐ The following report embraces a rectangular area, 7 X 8 1/2 miles in extent, situated near the center of Dane County, Wisconsin, as shown on the accompanying map.
- 4 ☐ Political. Herein are included all of the Township of Dunn, the south third of Blooming Grove, the eastern tier of sections in Fitchburg, and smaller parts of ^{the townships of} Rutland, Madison, and Oregon. In addition to the above, ~~I have in the course of the investigation~~ ^{were} visited numerous outcrops in Fitchburg, Madison, and Pleasant Springs ^{townships}.
- 4 ☐ Topographical. The area is ^{of} a rather low-lying ^{relief, with} elevations ^{ranging} from 840 to 1060 ft. above sea level, ~~lake country,~~ with many marshes. Although nearly every ~~common~~ map except ^{the new United States Geological Survey sheets} now extant shows some five or six lakes herein, there are actually but two---the others having ^{quite} recently degenerated into ~~mere~~ marshes. Lake Waubesa has an area of about 3.2 square miles, and a depth of some 36 ft., while Kegonsa's area is approximately 5.3 square miles, ^{and its} ~~with a depth of~~ but 31 ft. The only river of importance is that connecting these lakes-- the Yahara, which is familiarly ~~vulgarly~~ called the "Catfish," ^{indeed, latter} ~~This name~~ ^{has now} ~~being~~ ^{been} ~~was~~ ^{placed} upon the maps ~~just mentioned.~~ ^{of The U.S. Geological Survey.}

as to the classification of the drift, the drawing of maps of ~~the~~ pre-glacial topography, and the depth of the lower Yahara valley. The second contains several references to the present area and some excellent photographs of drumling near Macfarland.

I- STRATIGRAPHY.

Abbreviations. In treating of the stratigraphy of the area, ^{certain} the following abbreviations ^{have been adopted, of which} will be frequently ~~used~~: ~~the following are examples.~~

0-17, Dunn 26 for outcrop number 17, Section 26, Dunn Township

^{plural} W-114, Dunn 36 " well " 114 " 36 " "

875 " elevation 875 ft. above sea level.

U. S. G. S. " United States Geological Survey.

W. G. S. " Wisconsin State Geological and

Natural History Survey.

DATA OBTAINED IN FIELD.

Outcrops.

^{I only} In the course of the work ⁹⁵ ~~94~~ rock outcrops have been visited and examined, ^{and} hundreds of ^{concerning outcrops and wells} inquiries have been made from the ^{residents} inhabitants, and the writer has beaten most of the area on foot. A list of all these exposures is contained in Table I of the Appendix, nine outside of the area being also given. Table II present more detailed information about the better outcrops.

This heading should be distinguished in rank from Stratigraphy.

insert either as a footnote where abbreviation is first used or on separate page following list of maps & illustrations, which should follow Contents.

The three lakes, shown, but now extinct, then existed. The ~~list of~~ barometric observations referred ^N to later, show that a large part of the town was traversed, but no record is published.

~~Other~~ References to this area by Irving and others will be cited where they apply. In general, ^{the farmer's} his map is good, when it is considered that in addition to the difficulties already enumerated, there were in his day fewer rock exposures in quarries, gullies, roads, and wells. The unreliability of barometric readings, and the failure to realize the depth of Pre-Glacial valleys, also influenced his work.

Of later surveys, that by Mr. William C. Alden, of the U. S. Geological Survey, ^{made} ~~about~~ 1902, has not yet been ^{fully} published. ~~I have fortunately had access however, to his general map of the Drift, and also to his geological map of the Madison quadrangle. Mr. Alden was hampered by all of Irving's disadvantages, although perhaps he had a superior barometer. His topographic maps, while~~ ^{superior} ~~better than those at the disposal of his predecessors, bear, I am sorry to have to say, but a slight generalized resemblance to the actual facts. In visiting several hundred farmers, I have but once heard of his work. He himself says that the work had to be left incomplete, especially as regards well records.~~ (1)

(1) ~~Verbal statement made to the writer by Prof. N. M. Fenneman,~~
Nov., 1905

Well Records.

172 records of satisfactory character have been collected within the area and four outside its limits, nearly one half of the time in the field work ~~having been~~ being spent in this feature of the work. At first a house-to-house canvass was made thus obtaining about ^{one} a third of the ~~number of records~~ ^{of} records. Later in the season ~~these~~

The description of the area covered in this thesis
(1)
is thus given by Irving; omitting, however, the section
of Barker's quarry (02, Dunn 26):

"On the west shore of Lake Kegonsa, near the center
of Sec. 26, Dunn, a large exposure shows the following:

X X X X X X X X X

"The lowest layers are unmistakably Mendota, which
is here much less sharply defined than usual from the
Madison. One-half mile north (probably 053) friable,
brownish, entirely non-calcareous, Madison sandstone
is seen on the hill side, corresponding to the upper-
most layers of the foregoing section. A similar sandrock
shows near the roadside on the north line of the N. W.
qr. of Sec. 27, (078) at the Town-House, (now removed.
022) on the center of the south line of Sec. 21, and in
the field near the middle of the S. E. qr. Sec. 21, the
last lying near to, and about 15 feet below one of Low-
er Magnesian (23). All of these exposures appear to car-
ry the Madison to an unusual thickness, 50 or 60 feet."

In addition to the above there are ^{three quarries} plotted on the
atlas sheet, but nowhere described, the following:

{ N. of E. 1/4 post, Sec. 27, Blooming Grove (025? Slm)
Middle S. W. 1/4, Sec. 26, Dunn (017, Slm)
Middle S. E. 1/4, Sec. 27, Dunn, between the two
creeks. (045? Gms) }

Why not speak of doing work in general
and then cite all references where they apply
as on p. 5-

well-drillers ^{were visited} and ^{they furnished} from them obtained most (about 70) of the remaining records, not ^{including duplicates of} counting checks on nearly one half of those previously secured.

In this connection ^{the writer} ~~I~~ desire to express my ^{his} sincere thanks to Messrs. Feeney of Oregon, Oscar Johnson of McFarland, and ^{RA. Gunzburger} ~~San~~ ^{of Sec 2, Rutland,} ~~gersong of Rutland,~~ for their kindly courtesy in furnishing information. ^{He is} I am also indebted to all of those ^{resident who were} inhabitants, ~~I~~ questioned concerning these matters; With but few exceptions ~~my~~ inquiries were met by intelligent and courteous replies.

^{omit heading} Value. The question ^{questioned} is often raised ^{of the} value of well records thus obtained. ^{No doubt it} Of course this is often slight; ^{But the writer has carefully checked all statements made} But I have contrived such a system of checking, ^{to him, by narrow methods} that ^{it has not been necessary entirely} I have not been compelled to discard entirely more than a few of these records. ^{mix} By various devices it has been sought to circumvent any effort at wild guessing, or of deliberate falsification, even ^{replies} if the latter were attempted. But once did I even suspect deceit. Of course the great majority of ^{answers} were ^{as correct} only given to the nearest ten feet. A classification of wells in table XXXXIII, into A, absolutely accurate, B, approximately reliable, C, fair, and D, somewhat doubtful. The table is arranged like that of outcrops.

Formations Present.

Age and Names. The formations of bed rock present in the area, are Paleozoic sediments of Cambrian and Lower Silurian ~~Ordovician~~ age. Reference thereto has been made by paleontological investigations elsewhere in Wisconsin. Six formations are distinguishable. Beginning at the bottom,

<u>Name.</u>	<u>Map Symbol (U. S. G. S.)</u>	
<u>CAMBRIAN</u>		
Potsdam sandstone.	Op	<u>Ordovician</u>
Mendota limestone	Em	Trenton ls.
Madison sandstone	Em	St. Peter ss
		Lower Mag. ls.
LOWER SILURIAN.		<u>Cambrian</u>
<u>Ordovician</u>		Madison ss
Lower Magnesian limestone	Om	Mendota ls
St. Peters sandstone	Os	Potsdam ss
Trenton limestone.	Ot	

The present writer differs, however, from the W. G. S. in referring the Lower Magnesian limestone to the Lower Silurian; but the reasons therefor are beyond his assigned field. He has simply followed Mr. Wm. C. Alden's references, nomenclature, and symbols; and the names, however objectionable, are now well established. followed the modern clarification of these formations but has retained their old names.

is customary to refer to an authority by his last name only except in the first mention.

Write in reverse order

all that this paragraph shows appears in the first paragraph follows the clarification now in use, but not that of the W. G. S.

CAMBRIAN.

Potsdam sandstone. (6p)

Name. The lowest formation constituting the bedrock of any of the area, is the Potsdam sandstone. ~~It has, I believe, by means of its fauna been correlated by Messrs. Hall and Whitney and others (1) with the formation of the same name in New York. Following Irving, I shall rigorously confine this term to the rock below the Mendota horizon.~~

omit? *will be*

Exposures. There are ~~new~~ ^{the} within ~~my~~ ^{covered by the accompanying map} area, ~~no exposures of the Potsdam.~~ The greatest elevation attained by the formation ~~is probably~~ ^{being} about ~~875~~ ^{ft.}, near the center of Sec. 21, Dunn. ~~This conclusion is based on a thickness of 30 ft. for the Mendota, whose top is here about 905. (071, Dunn 21, 073, Dunn 22, 035 1/2, Dunn 16) If so it should theoretically be reached by a slight excavation, but probably the rock is covered by a considerable thickness of drift. It is the bed rock of relatively few wells, save at the northwest of the area. In Sec. 26, Madison. Where struck, the supply of water is excellent. W96, Fitchburg 26, (just off the map) is described by the owner as having the pipe driven 30 ft. into soft sandstone, from elevation 860 down. If correct, and it seems probable that it is, this marks another rise in the top of the formation, near 057, Fitchburg 25.~~

Not clear - probably not in place for drilling not covered under structure?

penetrated by

an elevation of about 860

(1) *Geol. of Wis., II, 527, citing 16th Annual Report, N.Y. State Cabinet of Natural History*

~~It undoubtedly lies below all of the deep wells along river.~~

Physical character. ~~Where exposed to the north,~~

Irving gives the following composite section made up from exposures around Lake Mendota, in the State Capitol well, and in
Prarie du Sac, Sauk Co., Wis., and from the well on the State Capitol grounds,
~~the rock is described~~

~~By Irving~~ ⁽¹⁾ as:

"(1) Alternations of layers of purely silicious white sand, ferruginous brown sand, yellowish calcareo-arenaceous layers, and layers of greensand; the ~~XXXXXXX~~ calcareous bands increasing in ammount of ~~X~~ 'lime' and in number towards the top., as is also the case with the greensand layers.

165 ft.

"(2) Entirely noncalcareous, white and yellow, sandstone; friable to indurated; fine to coarse grained. 602 ft.

"(3) Red shale.

10 ft.

^{study} ^{added no} ^{777 ft."}
~~The present investigator has not seen anything to~~
~~add to the above at the outcrops he has visited,~~ The
 "ferruginous brown sand" of layer 1, is probably weathered greensand. ~~NO~~ OVER.

~~The porosity of the formation is naturally great,~~
^{is} ~~it an excellent source of pure water.~~ 777ft,

Thickness. The thickness of the Potsdam, given by Irving ~~(2)~~, was obtained from the Capitol well mentioned ⁽²⁾, combined with the section ^{at} Maple Bluff ^{formerly} (McBride's point) ⁽³⁾.

(1) Geol. of Wis., II, 535. (2) ~~Ibid.~~, 50, 535, 605
 (3) ~~Ibid.~~, 604

Southeast of the area, the Stoughton artesian well is reported to have penetrated this rock for 660 ft. and it was found ~~to be~~ a poor source of water; ~~the~~.

At the latter the elevation of the top of the formation is 880. Neglecting dip, and taking 100 as the elevation of the bottom of the X formation in the well, the result of 780 ft. (given as 777) was obtained. At ~~any rate~~ ^{all cases}

The Potsdam ^{within} is so thick ^{has treated} on this area that the deepest ^{preglacial} valleys cannot have possibly been cut through it. It is

described as resting on (1) a "dark grayish rock," carrying "patches of a greenish cleavable mineral." This rock

is called a felsite (2), and referred to the Archean. ^{omit} ~~The lake of a basal conglomerate shows that we are not near any monadnock on the amount of pre-Cambrian erosion.~~ Structure and Fossils. ^{These features having no bearing}

^{not} ~~ing on my work, I shall simply refer the reader to Irving's description. (3) No fossils have come to my notice~~ ^{not the writer's} in the vicinity of Madison.

(1) Geol. of Wis., II, 50.

(2) Ibid, 599.

(3) Ibid, 525, et seq.

Mendota Limestone. (Gml)

Name. The next formation above the ~~true~~ Potsdam ^{proper} is the Mendota~~X~~ limestone, ^{the} ^{having been first} a name applied by Professor Irving in 1874, when he ^{distinguished} ^{this} discovered the formation which had formerly been included with the Lower Magnesian limestone. (1) He describes it as a ^e well-marked calcareous horizon, 30 ft. in thickness, and 35-50 ft. below the Lower magnesian. The ^{term} ^{obviously} ~~name~~ is [^] derived from Lake Mendota, where the best exposures are found ~~at Farwell's Point and Maple Bluff. (Formerly Mc Bride's Point).~~

Exposures. Although ~~commonly~~ found farther to the north, ^{exposures are common} the Mendota forms the bed rock of but little of the area under ^{present} consideration. The only really good exposure therein is at Colladay's Point, on Lake Kegonsa, (010 1/2, Dunn 23), ^{where but} some 8 ft. ^{and} only is visible here. ^{There are small exposures} A little ^{also} shows at Barker's quarry (02, Dunn 26), and at the lower outcrops in Secs. 16, and 21, (0s 25 1/2, 71, & 73). ~~Farther north the only outcrops are at the Dane County Fair Grounds under the grandstand (09, Madison 25), and in a barnyard on the Nine Springs Creek (097, Fitchburg 1).~~

Comparatively few wells strike this horizon.

(1) Geol. of Wis., II, 525.

Character. Irving (1) describes the Mendota as "heavily-bedded, dark-yellow and brown, jointed, conchoidal-fracturing rock, which is stained in seams and patches with the red oxide of iron, and leaves on solution 3 to 10 per cent of an aluminous and non-arenaceous residue." This is said to closely resemble the Lower Magnesian. The upper part is "thin, rough surfaced, layers," and has "a somewhat larger percentage of silicious material." The following local analyses are given:

[note] *Sample No. I is from the lower layers of the Mendota, from near the M Madison General Hospital, in Greenbush; and II is a pure phase of the middle layers of the Lower Magnesian, from Williams's old lime quarry, S. line, Sec. 33, Madison, Tp.*

	I (Gml)	II (Glm)
SiO ₂	4.18	1.09% - as sand or in clay
Al ₂ O ₃	2.17	.44 - as clay
Fe ₂ O ₃	1.45	.43 - forms red blotches in I
FeO		.63
CaCO ₃	55.68	66.82
MgCO ₃	36.52	30.40
H ₂ O	.58	.35
	<hr/>	<hr/>
	100.58	100.26

In I, $\text{CaCO}_3 : \text{MgCO}_3 :: 1.52 : 1$ $\text{MgCO}_3 : \text{CaCO}_3 :: .656 : 1$

In II, " " :: 2130 $\text{Geol. of Wis., II, 543.}$ $.455 : 1$

Owing to the scarcity of outcrops of this ^{18.} formation,
The present investigator has ^{study} little to add to the
above. At Colladay's (~~010 1/2; Dunn, 23~~), the rock shows
a crystalline rather than an earthy texture. The structure
^{marked by irregular and imperfect} is concretionary, ^{causing a} producing warty weathering, ^{surface upon} and many
small calcite geodes and specks of greensand are found.
The weathered surface is usually ^l gray, although sometimes
buff or red. Much sand is contained in the Mendota in
all this part of the area; ^{the Hamilton to the Madison being but gradual} The outcrops in Sees. 16 and ^{although}
21, Dunn, showing buff to white or pink, crystalline, sandy,
rock. ~~The upper layers are almost a calcareous sandstone.~~
~~The transition to the Madison is often but gradual (02~~
~~Dunn 26).~~ ^{top of} At Colladay's a greensand layer marks the con-
tact, ^{the formation} but in Sec. 16 it is apparently absent. In the
^{near part} north of the area, ~~the contact is nowhere seen.~~ The rock
is more disintegrated, irregularly and thinly bedded, with
a red to buff or white color, ^{and} At the Fair Grounds (~~09,~~
~~Madison 25~~) it is all red and very argillaceous. On the
shores of Lake Mendota, layers of shale and pseudomorphs
of limonite after marcasite are seen, ^{although none were} but I have ~~XXX~~ found
~~none in the area surveyed.~~ ^{no fossils were discovered}
~~in this formation~~
Internal Structure. The most marked structure is
that termed concretionary, ~~It causes~~ the warty weather-
ing and irregular bedding everywhere noted in these upper
layers.

omit -
see above

Thickness. ~~As~~ ^{it has been necessary} the base of the formation is nowhere exposed, I have been compelled to use Irving's estimate of 30-35 ft. (1). In 1893-4, Mr. C. J. O'Connor obtained similar results west of Madison (2). The ^{writer's} only estimates ^{by the present writer} ~~I have been able to form~~ on the area and elsewhere, agree substantially with the above. ^(See Table) Details will be found in ~~Table of thicknesses~~.

Fossils. No fossils have come to ^{the} notice in the Mendota, ^{although} ~~Possibly~~ longer search, than I could ~~have~~ ^{be made} make would reveal some.

Madison Sandstone. (Cms)

Name. Resting conformably upon the Mendota, with beds of passage previously referred to, is the Madison sandstone. ^{The} ^{was} a name applied by Irving in 1874 from the exposure in the Madison quarries, ~~in its upper layers (3)~~, ^{being taken} He ^{being} the first to ^{distinguish this} recognise it as a separate horizon. ^{formation.}

Exposures. The Madison is the characteristic ^{bed} rock of the area under consideration. ^{as will be seen by} Among the best of many ^{referring to Table I p -} there are many good exposures ^{throughout the south of the area} outcrops may be mentioned: Kivlin's quarry, in shaley, calcareous rock (057. Fitchburg 25); the long gully farther east (Os. 24, 39, 40 1/2, & 41, Dunn 18 & 19), in very friable greensand and wormholes bearing rock; Edwards Park (03, Dunn 3), showing both calcareous ^{and quartzitic} layers; and better yet,

(1) Geol. of Wis., II, 543.

(2) O'Connor, C. J. - Thesis U.W. '94, The Sed. rocks about Madison.

(3) Geol. of Wis., II, 525.

I should add this without I leading to a character.

the numerous exposures in Secs. 23 and 26, Dunn (~~Os 2,~~
~~10, 10 1/2, 43, & 51~~). The Madison is remarkable as being
 the only formation ^{within} on the area furnishing any natural
 outcrops, ^{scattered} and is prominent in escarpments (Photograph ^{next} Page).
 (~~Os 23, part 34, part 35 1/2, & part 76~~).

Character. Irving says ⁽¹⁾ of this locality, "west
 of Lake Kegonsa, in the town of Dunn, the Madison sand-
 stone is as much as 50 feet in thickness, closely resem-
 bling the St. Peters, and grading downwards into the
 Mendota." Of the region in general, he declares that the
 formation is "about 35 ft. thick, and consists usually,
 of pure white, frequently loose, sand, overlain by brown
 and yellow firmer rock." At the Madison quarries, 10 or
 15 per cent of $(Ca.MgCO_3)$ is contained in the upper layers, but
 some analyses have shown as high as 50 per cent, in this
 horizon.

After examining a large number of outcrops, ^{it was found} that
 the statements given above are not always true. ^{within the area under consideration} Four
 very distinct types of ^{the} Madison ^{formation} may be distinguished, as follows.
They are:

(a) Non-calcareous white type. This is nowhere exhi-
 bited for any considerable thickness. At the Rock Cut
 (04, Madison 25, C. & N. W. Ry., off map), there are

(1) Geol. of Wis., II, 544.

transfer
 exposed 45 ft. of non-calcareous white and often very soft sandstone; so far as ^{was} ~~I have~~ observed, the upper limit of the formation is ~~nowhere else~~ ^{so} as sharply defined.

and lower
 (b) Calcareous rock of the Madison building stone type. This is usually ^{found both in the} confined to the upper layers of the formation, but in Sees. 23 and 26, Dunn, through ^{this form} nearly if not quite all of the horizon. ^{and especially in the lower part} On the west side of the area ^{sometimes} this rock contains red blotches and bands, ^{it} apparently of red clay. (040, Dunn 19 & 057, Fitchburg 25)

long
 (c) Greensand, friable rock. This is seen only in the ^{located by} ~~big~~ gully designated as Os. 24, 38, 39, 40 1/2, & ~~42.41~~, & 42. ^{which shows in Secs 18 and 19, Dunn (see p-)}

Here the entire formation, from the lowest exposed at the big springs ~~(033)~~ to the highest ~~(042)~~ is composed of thin, white, soft, sandy, layers, alternating with greensand beds and some shale. The harder layers are perforated with the borings of ~~Scorolithus~~. All stages of greensand weathering are exhibited in these outcrops.

(d) Limestone layers. A very sandy, white to buff, limestone layer, sometimes attaining a thickness of several feet, is met with in the south~~XX~~-eastern part of the area, (~~Os 31, Dunn 21, 35 1/2, Dunn 16, & 53, Dunn 23~~). At the first ^{outcrop} named it is about 5 ft., ^{and} at the second ^{above the Mendota} it is ^{some 5 to 6} 15 ft.; while at the third, ~~15 ft.~~ ^{above the Mendota}.

Of the above-mentioned phases, (a) and (b) are the most important. In general, the statement may be made

in which case it is non-calcareous - 21

^{except} that where the Lower Magnesian above is lacking, ^{type (a) is seen} the rock is ~~non-calcareous~~. An apparent exception is the Rock Cut (04, Madison 25), where non-calcareous sandstone ^{and often very friable} is overlain by 50 ft. of limestone. ^{On the other hand} Again at Edwards Park (03, Dunn 3), and at Colladay's Point (0s 10 & 43, Dunn 22), ^{although near} calcareous rock extends to the surface. At a few other points in that vicinity, the formation is somewhat calcareous. However, it should be observed that the Rock Cut is really at the edge of the limestone cap,

while the other outcrops are usually much less calcareous in their upper layers. Possibly in some cases, as at Ed-

wards Park, there may be some Lower Magnesian in the hills above the outcrops. ^{This association with the limestone} ~~may be due either to impregnate cementation by carbonates~~ ^{As will be explained later} No rock seen on the area has been in the belt of cementation longer than since the glacial epoch. In general, ^{leached from that formation or to weathering of the} calcareous material where the protective cap is lacking, however, it seems safe to say that the non-calcareous phase of the Madison is ^{found where it is not overlain by limestone} in part due to weathering.

Reverse position! Type (b) is best developed on the west shore of Lake Kegonsa, and ^{along} up the valley to the ^{southwest} now extinct Hook Lake, ^{where} Here it comprises nearly all of the ^{Madison} formation.

Often the rock is buff in color, with white sand grains in a calcareous matrix (046, Dunn 27); again the rock is white, with yellow specks, but not showing the "oolitic" texture. Polished sections show that the grains are pure, angular to rounded, quartz grains and that the matrix is crystalline calcite or dolomite.

Nebraska State Historical Society, Lincoln, Nebraska.

Historical Society of New Mexico, Santa Fe, New Mexico.

Pacific Coast Branch of the American Historical Association.

Oklahoma Historical Society, Oklahoma City, Oklahoma.

Oregon Historical Society, Portland, Oregon.

Washington University State Historical Society, Seattle,
Washington.

Washington State Historical Society, Tacoma, Washington.

Decatur County Historical Society, Lamoni, Iowa.

Historical Society of Linn County, Cedar Rapids, Iowa.

Lucas County Historical Society, Chariton, Iowa.

Madison County Historical Society, Winterset, Iowa.

The following are the names of organizations from or
concerning which no adequate information has been secured:

Arizona Historical Society, Prescott, Arizona.

Historical Society of Northern California, Sacramento, Cal.

Minnesota Valley Historical Society, Morton, Minnesota.

Utah Historical Society, Salt Lake City, Utah.

State Historical Society of Wyoming, Cheyenne, Wyoming.

Society of California Pioneers.

No serious effort was made to secure information relative
to Old Settlers Associations, or Associations of Pioneers; nor was
satisfactory data obtained concerning the existence of small
local historical societies in the States and Territories outside
of Iowa.

Where well developed, type (a) is a very hard, almost quartzitic, white sandstone, weathering brown or red to a depth of usually less than half an inch. In part at least, the quartzite is due to case-hardening. Much of this rock is heavily bedded; but again, as at 031, Dunn 21, it is very thinly bedded, friable, and largely yellowish in color, ~~it bearing~~ all the characteristics of a shallow water formation. 078, Dunn 27, described by Irving ^{as} "friable, yellowish, entirely non-calcareous" sandstone, ^{described by Irving found to be} is actually pure white, quite hard rock, bearing some greensand in the more friable layers, ~~and~~ also ^{occasional} quartz veins and concretions. It is apparently yellowish only through alteration. Nowhere have ~~it~~ ^{is} been seen rock which is yellowish throughout, except through calcareous admixture.

The red-spotted calcareous rock (b) is merely the upper layers of type (c), and is nowhere else found.

~~It, as well as much of the calcareous buff rock, is undoubtedly original in origin. This and much of the other calcareous with it certainly not ^{caused by} subsequent cementation from the overlying limestone.~~ ^{OVER} Internal Structure. Where non-calcareous, the Madison

is notably a shallow-water formation, ^{which} This is attested by the cross lamination, ~~and traces of contemporaneous~~ ^{flow and plunge structure} and lines shown in ^{features} ~~excision~~. These are best seen in Os 22, 23, & 31, Dunn, ^{Sec 21}

~~24~~, But cross bedding is not confined to this type of

(1) overl. of Wis. II, 606.

Is this not the order you want?

Please consult me on this fact.

and lines shown in the accompanying sketches

and the various tribes of the
STATE AND LOCAL HISTORICAL SOCIETIES WEST OF THE MISSISSIPPI

RIVER.

Investigation made by Benj. F. Shambaugh as a member of
the Sub-Committee of the American Historical Association on "The
Best Methods of Organization and Work on the Part of State and
Local Historical Societies."

Information through correspondence was obtained from
the following organizations:

Alaska District Historical Library and Museum, Sitka, Alaska.

Historical Society of Southern California, Los Angeles, Cal.

California Historical Society, San Francisco, California.

State Historical and Natural History Society of Colorado,

Denver, Colorado.

State Historical Society of South Dakota, Pierre, South Dakota.

State Historical Society of North Dakota, Bismarck, North Dakota.

State Historical Society of Iowa, Iowa City, Iowa.

Historical Department of Iowa, Des Moines, Iowa.

Kansas State Historical Society, Topeka, Kansas.

Minnesota Historical Society, St. Paul, Minnesota.

State Historical Society of Missouri, Columbia, Missouri.

Missouri Historical Society, St. Louis, Missouri.

Montana Historical and Miscellaneous Library, Helena, Montana.

The essential feature is the greater induration of an outer crust or shell of the rock, by the evaporation of ~~its~~ ^{and} ~~underground~~ ^{surface} water, leaving behind its dissolved silica ^{as additional cement in the outer crust.} 24.

rock, being also found in the calcareous layers in Sec.

26, Dunn (1), ~~and~~ throughout the formation in Sec. 19

Dunn, and in the lower ^(calcareous) layer at 03, Dunn 3. The bedding

of the Madison is ^{ranges} ~~anything~~ from almost massive to layers of not over an half an inch in thickness; In the non-

calcareous rock in Sec. 21, Dunn, this variation is ~~very~~ quite rapid. In general, the calcareous rock is thicker and

more evenly bedded. Layers up to 4 ft. in thickness ~~are~~ ^{being} seen (057, Fitchburg 25). Locally wavy or crumpled beds are seen (053, Dunn 23)

Case-hardening is developed in two or three different phases. At 03, Dunn 3, white to pink chert-like spots

are found on the rock surfaces of the lake cliff. They may be a century old, but are probably much less. At

other places in the middle part of Dunn, the entire sur-

face of the rock is indurated for a depth of several inches, of which none or little can be over 50 years old.

^{Why?} ~~for none of the rock has been exposed for more than that time.~~ It is quite probable that wherever the rock is very hard,

it is due to this ^{cause} and is purely superficial. Farther

south, quartz veins were found in the upper layers ~~at~~

(0s 76 & 78 Dunn 27). At the ^{04 Sec 25, Madison 35} Rock Cut, one or two thin

layers at the top of the Madison ^{have been} ~~are~~ cemented to a pure white quartzite. in the last eight years, since the cut was deepened,

Iron concretions, although occasionally seen, are in no wise abundant or remarkable. On the north side of

the valley at 070, Dunn 20, a peculiar crescent-shaped

(1) Geol. of Wis., II, 606.

rock, being also found in the calcareous layers in Sec.

26. Dunn (1), and throughout the formation in Sec. 19

Dunn, and in the lower layer at 03. Dunn 3. The bedding

of the Madison is everywhere from almost massive to layers

of not over an half an inch in thickness in the non-

calcareous rock in Sec. 21. Dunn, this variation is very

rapid. In general, the calcareous rock is thicker and

more evenly bedded. Layers up to 4 ft. in thickness are

LOCAL HISTORICAL SOCIETIES IN IOWA

phases. At 03. Dunn 3, white to pink chert-like spots

are found on the rock surfaces of the lake cliff. They

may be a century old, but are probably much less. At

other places in the middle part of Dunn, the entire sur-

face of the rock is indurated for a depth of several

inches of which none or little can be over 50 years old.

It is quite probable that wherever the rock is very hard

it is due to this and is purely superficial. Further

east, quartz veins were found in the upper layers at

(03 78 & 79 Dunn 27) At the Rock Cut, one or two thin

layers at the top of the Madison ~~is~~ cemented to a pure

white quartzite. ~~In the last part of the rock~~

Iron concretions although occasionally seen, are in

no wise abundant or remarkable. On the north side of

the valley at 070, Dunn 20, a peculiar crescent shaped

25.

A red-colored quartzitic concretion ^{together with similar white and gray knobs} ~~was~~ found in soft white sandstone. ^(070, Dunn 20) Other similar knobs of white or gray color ~~were discovered but could not be removed from the ledge with the tools at my disposal.~~

Thickness. Irving's estimates of the thickness of the Madison are 35 ft. in general, and 50-60 ft. for the middle of Dunn(1). Mr. O'Connor gives about 40 ft. from actual measurement (2) west of Madison. Details of determinations of thickness will be found in ~~the~~ Tables().

In general ~~the thickness is~~ ^{usually} about 50 ft., and

ordinarily throughout the area under consideration, ~~it~~ ^{it} appears to be ^{quite} independent of the kind of rock; ^{although in general the calcareous regions have a less thickness.} The greatest measurement ^{being} ~~used is~~ in Sec. 19, Dunn, ^{for} about 60 ft. Unfortunately ~~all of~~ these figures are merely estimates, as the entire formation is nowhere exposed.

Fossils
Life. The most abundant remains of organisms are worm-holes (Scolithus?), ~~and greensand (glauconite).~~ ^{which are best seen} Both are characteristically developed in the long gully in Sec. 19, Dunn (041), in a shallow-water formation.

^{quite} All is very siliceous, and ~~is~~ sometimes accompanied by

(1) Geol. of Wis., II, 544, 606.

(2) O'Connor, Sed. Rocks about Madison.

The committee will urge that all work done shall be as scientific as possible, and university and college interests should be enlisted.

State societies should see to it that state archives are properly cared for and all of value to historical students published. There should be one place in the state where everything historical should be centered --- that is, if possible; but each state must work out its own problem according to conditions. The committee will strongly urge co-operation between societies along state and sectional lines. It will recommend that each state society or department of archives should be given the custody of the public archives when these have ceased to be necessary in the conduct of state business. District or sectional conferences will be urged and such national conference of societies as was inaugurated at Chicago in the round table, and will be repeated at Baltimore next month. Co-operation in the publication of bibliographies, original documents of a sectional character, and lists of manuscripts will be urged.

The various societies will also be urged to enlarge membership in the A. H. A. within their various states, on account of its important reflex action.

The committee finds such diversity in aims, methods, aspirations, and resources of societies that more practical co-operation would seem to be impossible at this time, but there should nevertheless be a strong moral co-operation and frequent getting together in conferences. It is difficult to make over men, or old methods, but in general the societies need stiffening up and mere

thin shaley layers. In one of the latter a peculiar nodule was found, resembling the head of a trilobite, ^{and} Excavation would probably reveal better specimens. It is difficult to see how the occurrence of greensand as described ^{coincides} fits in with the conclusion of the "Challenger" expedition, that glauconite is not a shallow-water deposit. (1)

~~LOWER SILURIAN or ORDOVICIAN~~ (~~Formerly Lower Silurian~~)

The three remaining formations on the area surveyed are all referred by paleontologists to the ~~Lower Silurian~~ ^{Ordovician} of the U. S. G. S.; or, as it is ~~more commonly~~ ^{now} termed, the Ordovician. Chamberlin formerly placed the base of his Lower Silurian at the top of the Lower Magnesian, presumably because of the unconformity ^{which} he made out there.

Lower Magnesian Limestone. (~~Ottawa~~)

Name. Resting conformably on the Madison, is the Lower Magnesian limestone, a name applied by Dr. Owen, before Chamberlin's time (2). "Magnesian" is obvious from the composition, even when purest (see page 17^{note}); and "lower" distinguished it from the Trenton and Galena.

(1) Report of the Voyage of H. M. S. Challenger, 1873-4; "Deep sea deposits," p. 382.
(2) Geol of Wis., I, 138; II, 547.

antiquarianism must be relegated to the background. But even at best each community must work out its own ~~salvation~~ salvation amid local conditions. The committee found that the preliminary survey made by Professor Bourne last year very valuable and suggestive and considers the present work but an amplification thereof.

It is considered the equivalent of the Calciferous sand-rock of New York, and the Knox dolomite of the Appalachians. However objectional ^{to} the present name ~~it~~ is apparently a fixture.

Exposures. Although widely distributed, the Lower Magnesian is seldom well exposed. The best outcrops on the present ^{here treated} area are in quarries, being 0s 25, 26 & 29, Blooming Grove 26, & 35. Farther south, the quarries at 012, Dunn 48, a natural exposure (023) in Sec. 21, and Ellingson's quarry in Sec. 26 (017), are notable. Full particulars will be found as usual, in the accompanying tables.

Although the formation makes scarps and breaks in the topography, it is naturally exposed (excluding gullies) in but ^{one} the single locality ^{nearly in Sec. 21, Dunn} mentioned above; ^{blatant error} ~~the cause of this exception is~~ Irving shows two of the above outcrops on his map but ~~does not mention them in his report.~~ An excellent exposure is furnished by the old quarry (01, Pleasant Springs 18) on the east side of Lake Kegonsa.

Character. Irving describes the Lower Magnesian in the vicinity of Madison (1) as a magnesian limestone---grayish white when pure, otherwise earthy, sandy, ^tbloched with yellow, sometimes buff-colored, and then granular. The bedding ~~is said to~~ ^{is} vary much, the middle being ~~the~~ thickest at

(1) Geol. of Wis., II, 549.

Does this not credit your own observation too little?

Riley heard from about 35 societies. Shambaugh about 25 Societies, and Thwaites 140.

Our report will consist of a general account of the organization and work of local historical societies to be followed by observations, classifications, suggestions, and recommendations --- 1, on organization; 2, on scope and purposes; 3, on methods of presentation; 4, on the museum; 5, on the library; 6, on publications; 7, on co-operation; 8, on the relation of state and local societies to the A. H. A.

Then will follow synopses of returns from state and local historical societies in the United States, one paragraph to each classified under the headings of sectional, state, district, and local societies, alphabetically within each class.

We propose to give tables by states, showing money expended for various purposes, and other interesting data collected.

1. In our opinion, state societies should collect all material genealogical, anthropological, archaeological, historical.

2. Disseminate this material as far as possible through publications --- these to consist of original documents which should embrace state archives as far as practicable, and monographs. Each society should also have a museum containing relics, portraits, etc. It should arouse and maintain interest in things historical stimulating such movements as conventions, anniversary celebrations, lectures, historical pilgrimages, and in general arousing popular interest. Placing tablets upon historical sites and objects is also urged. Publications should be in presentable, popular form.

Chert, including oolite, nodules, and layers, is said to be characteristic. Dendritic markings, confined to the buff layers, ^{by Irving (?)} are mentioned as being probably composed of MnO₂. An analysis of oolitic chert is as follows, it being of the loose, white variety of the Madison quarries; ~~I have seen~~ ^{there is} comparatively little like it on ~~the~~ ^{the present} area.

SiO ₂	98.01%
Al ₂ O ₃	.52
FeO ₂	.73
CaO?	.67
MgO?	.21
HO	.24
	<hr/> 100.38

unit?

Throughout the area ^{under consideration} the physical character of the formation is extremely varied. The ~~normal~~ ^{usual} rock of the lower layers is a hard, white, crystalline, limestone, in rather thick to very thin and irregular beds. Cherts in layers and nodules, but chiefly the former, ^{varying from} abound especially near the base and top ^{of the formation}. In the middle, as well as near the bottom, sandstone, ^{and} shaley, and glauconitic strata ^{are common} abound; Among the characteristics is oolitic chert in a layer at the base and disseminated through the lower ^{beds} layers. Chert as a vein filling is locally found (029, Blooming Grove 35). Geodes also abound, ^{containing} being usually quartz, ^{calcite, limonite after malacanthite} but also dolomite ^{sometimes} and paragonite (017, Dunn 26); ^{for section}

If this is all to be credited to Irving or Judge, from the following I, I should have said his exact words with x x x for omission. Otherwise it is following sound like a repetition.

Write with statement above

The committee will urge that all work done shall be as scientific as possible, and university and college interests should be enlisted.

State societies should see to it that state archives are properly cared for and all of value to historical students published. There should be one place in the state where everything historical should be centered --- that is, if possible; but each state must work out its own problem according to conditions. The committee will strongly urge co-operation between societies along state and sectional lines. It will recommend that each state society or department of archives should be given the custody of the public archives when these have ceased to be necessary in the conduct of state business. District or sectional conferences will be urged and such national conference of societies as was inaugurated at Chicago in the round table, and will be repeated at Baltimore next month. Co-operation in the publication of bibliographies, original documents of a sectional character, and lists of manuscripts will be urged.

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These are best illustrated in

29.

Secs. 26 and 35, Blooming Grove, constitute the home of

the geodes, ~~Here whole layers are permeated with them.~~

Calcite inside of pink quartz, or less often altered marcasite, ~~are~~ the most common, ~~Occasionally there have been~~

~~noted~~ sandy spots inside of calcite. Some of the masses

of ~~calcite~~ ^{the last mineral} are several feet long and nearly a foot in

thickness (~~0.25~~). ~~Some geodes occur in bedded and joint planes but~~

~~the relation of others is more obscure, some being so irregular as to~~
domorphs of limonite after marcasite are, sometimes found

017, Dunn 26) occasionally these assume a very red color, ~~presumably through dehydration~~

~~The beds of passage at the base of the Lower Magnesian are of great interest. As already referred to, at the~~

~~north of the area the transition from the Madison is~~

~~sharp (04, Madison 25, off map), A greensand layer, often~~

~~weathered on the outcrop to loose white or yellow sand,~~

~~and accompanied by one or more pure white quartzite~~

~~bands, is overlain by a more or less distinct layer of~~

~~oolitic chert. The first 10 ft. or so of limestone carry~~

~~disseminated oolite. Farther south, around Lake View,~~

~~the change is less well marked, A greensand layer only being there~~

~~is found. At the west quarry, 012, Dunn, 13, on the lime~~

~~kiln hill, huge concretions are seen about 10 ft. above~~

~~the base of the formation. The rock (here) is often buff,~~

~~in layers or blotches, and carries dendrites (see the~~

~~accompanying photograph). In the center of the area (016,~~

~~Dunn 9) there is a layer of hard nodular to disseminated~~

~~characterized by oolite in nodular or scattered form,~~

this does not agree with what

resemble a section.

change

it carries a small amount of iron - will be good

antiquarianism must be relegated to the background. But even at best each community must work out its own celebration salvation amid local conditions. The committee found that the preliminary survey made by Professor Bourne last year very valuable and suggestive and considers the present work but an amplification thereof.

oolite, overlying ~~of~~ calcareous sandstone. Farther east, the well driller, Mr. Johnson, showed ^{the water was shown} ~~me~~ some white, soft oolite ^{a well} from (W161, Dunn 12). In the south of the area the actual contact is never seen. Q17, Dunn 26 is near to it; a detailed description of this exposure will be given later.

The ~~summit~~ ^{now} of the Lower Magnesian is nowhere exposed within the limits of the area; but about 60 years ago it was uncovered by excavations for a mill dam on the Oregon Branch (061, Rutland 4). The rains and frosts of more than 40 years have since covered it. ~~I spent several~~ ^{were spent by the present writer in} hours attempting to again uncover this ~~horizon~~ ^{spot,} but without accomplishing more than to ~~confirm the fact that~~ ^{ascertain} the sandstone ~~does~~ ^{on the north side of the stream} overlie the limestone. Large blocks of chert several feet in each dimension, show a brecciated structure and ^{the usual} quartz geodes. The breccia appears to be bedded and to have a chert matrix ^{softer than the fragments.}

Internal Structure. The internal structure of the

Lower Magnesian limestone is worthy of more detailed study than ~~any one~~ ^{been} seems thus far to have ^{to} given it.

Perhaps the most interesting feature is the brecciated strata of limestone or chert, ^{which} These occur throughout the formation; the chert, however, being ^{apparently} confined to the upper layers. Concretions, both calcareous and silicious, ranging from the size of a pin head ~~XXXXXX~~ up to twice or three times the ~~size~~ ^{size} of a man's head, ~~are~~ ^{are} another peculiarity ^{is found in the}

5

Miscellaneous.

MUSEUMS

Prof. B. F. Shambaugh: Shall historical museums be fostered?

Miss Salmon: Establishment of historical museums, by historical societies.

Prof. Caldwell: Shall historical societies attempt to collect museums; if so what shall be the field covered? Relationship to other state museums, etc.

HISTORICAL LECTURES

Prof. B. F. Shambaugh: The value of historical lectures given under the auspices of historical societies.

The accompanying photographs show the best exposure of brecciated rock upon the area (O-17, Dunn 26); further details will be found under this head in Table III 32.

The features shown in the above cross-section would bear much more careful study than the present writer was enabled to give them. We apparently have here one of the brecciated layers mentioned by Chamberlin and Irving (1). Other evidences of brecciation are seen at Ol, Pleasant Springs 18, but these are of doubtful origin.

At the ^{latter} exposure the rock is often made up of rounded, considerably weathered pebbles of ^{from} buff to white color, sometimes cherty ~~(2)~~, and bearing ^{marked by} dendrite. Apparently this type of rock ends at joints which ^{is taken with the shape of the nodules and the dendrite} suggest a secondary origin, probably the weathering out of concretions.

No such origin seems applicable ^{at the quarry shown in the photographs} at Ellingson's, curved layers resembling the structure of the top of the formation as described by Chamberlin (2) ~~seem to~~ preclude this. ^{theory} **OVER** The writer will not venture to formulate any hypothesis.

The brecciated chert from the upper layers of the formation has been alluded to. Similar ^{previously} pieces have been seen in the drift. One has come to my notice from near Madison, which is entirely oolitic, but from what ^{is it} have seen ~~I doubt~~ its clastic origin is doubtful.

We ^{find} have here ^{somewhat exceptional} a rather unusual occurrence of oolitic chert. ^{being white and soft and often in ellipsoidal masses.} Ordinarily the nodules or layers are harder and yellowish in the center, and (whiter and softer) on the outside. The central part then breaks through the grains.

(1) Geol. of Wis., I, 139; II, 549.

(2) Ibid., I, 139; II, 270, 551-553.

7

CO-OPERATION BETWEEN AMERICAN HISTORICAL ASSO-
CIATION AND STATE AND LOCAL SOCIETIES

Prof. M. S. Brown: A discussion of ways in which the American Historical Association and State and local societies could co-ordinate and make mutually helpful their activities.

Miss Salmon: The American Historical Association as a clearing house for all other historical societies.

Prof. M. S. Brown: Relationship of the state historical societies to each other. Can any organization be made so that they may aid each other? So that they may in part supplement, rather than duplicate?

Various hypotheses ^{have been advanced to explain the} ~~regard this bed as an interformational conglomerate, but none are~~ ^{origin of these intraformational conglomerates.} ~~conglomerate, a shear zone, or a zone of crushing~~ ^{satisfactory} ~~due to contraction during dolomitization.~~ Possibly the wavy bedding which is noted in the layer below may have some significance; It certainly does not mark an unconformity for the Madison is found below a few hundred yards to the west (O-48)

The fragments are generally angular but quite often rounded and ~~and~~ are harder than the matrix. ^{which} ~~matrix~~ also contains broken fragments of shells similar to those found higher in the same exposure (See Table III and p. 11)

The ~~doecia~~ is confined chiefly to the spaces between the wavy layers but also occurs beneath ^{them} although a less well developed. ~~Further descriptions of this exposure~~ ^{will be found in Table III p. 11}

^{remarkable} ~~The associated chert~~ ^{from the top of the formation} ~~has been already alluded to~~ ^{it seems to be a bedded deposit with a chert matrix which} ~~weathers easier than the fragments.~~

OVER

33.

more clearly only
The wavy bedding of layer 6 is ^{quite} very marked, it shows only on the weathered surface--- similar but less marked, it occurs elsewhere in the lower beds. The forms are here most intricate, ^{and some in chert; it shows both either on the weathered surface or a polished section.} being possibly analogous to some false bedding, like that in the Potsdam at Devil's Lake.

The geodes are also excellent at this exposure; sometimes, as elsewhere, they are in joints and bedding planes; Quartz is commonest, and quite good crystals may be obtained.

The upper surface XX of the rock is ^{nearly always} typical, being seen to be rough and ridged by silicious seams and nodules. The lack of heavy tools prevented excavation to ^{ascertain} see, if this is the case (farther back, under more soil). As no quarry in the formation had been recently stripped, this opportunity of examining the fresh surface was not afforded ^{the writer} me.

How much of this is quartz and how much is only to Ellingson's?
The only feature not well shown here at Ellingson's is that of concretions. Nearly all outcrops are rough or warty weathered, and this is ascribed to the concretionary structure of the rock (1). The best exposure for studying this phase ~~XX~~ is 012, Dunn 18, at the westernmost quarry in the pasture. Here was found a calcareous concretion approximately 8 x 12 x 18 in. In the accompanying photograph ^(See 1) it is shown in the lower left-hand corner of the loose block of stone there depicted.

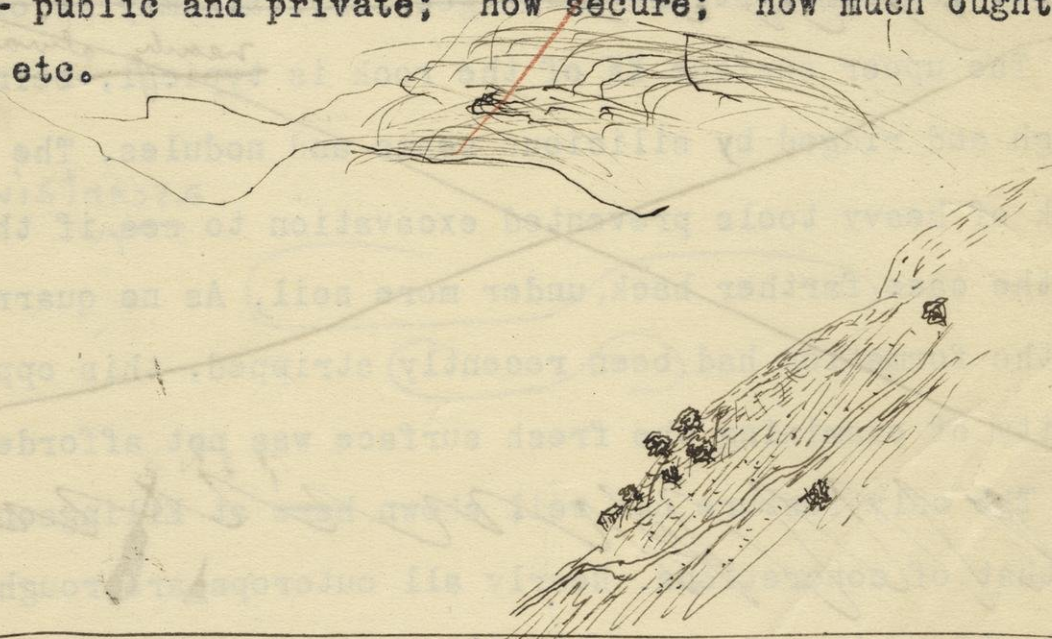
(1) Geol. of Wis., II, 550.

ORGANIZATION AND SUPPORT OF STATE AND LOCAL SOCIETIES

E. O. Randall: How should the governing authority of state historical societies be appointed.

B. F. Shambaugh: The organization and support of State and local historical societies.

Prof. H. W. Caldwell, Univ. of Nebraska: The problem of support - public and private; how secure; how much ought to be secured, etc.



~~The~~ Wavy bedding has just been mentioned; it is best seen at the exposure then considered (O-17) but less well marked, it occurs elsewhere. This feature shows best on the weathered surface or a polished section and is sometimes ~~associated~~ ^{found} with ~~extensive silicification~~ in cherty rock. ~~cross-bedding~~ has been ~~suggested~~ ^{as an origin}.

The bedding here is very irregular, locally dipping 30-40 degrees from the usual horizontal. At some exposures

what is probably cross bedding may be seen.

Thickness. Irving gives the thickness of the Lower Magnesian around Madison as 50 to 80 ft. (1).

Within the area now under treatment, the presence of a terminal moraine over the northern edge of the formation, in the south, prevents anything more than a mere *surmise* ^{could} as to the thickness. So far as ^{in this portion of the area concerned,} can be ascertained, this does not exceed the lower figure (given above), so far as this section of the area is concerned. But farther north, in Sec. 35, Blooming Grove, where the whole of the stratum may not be present, ^{there will} measured about 147 ft. ~~There is a suspicion that the St. Peters may be entirely lacking in that locality.~~ Details of this and other estimates will as usual be found in the Tables.) -

As is well known, (2) the upper surface of the Lower Magnesian is a series of rounded mounds, said to be mostly lying in an east and west direction, and having brecciated interiors, while the outside inclined layers are firm ~~(8)~~. Unfortunately, ^{there is a} ~~where~~ ^{the existence of} suspicion of these mounds ^{within the present} exists upon my area, the middle layers are not well exposed. As already stated, Layer 5 at 017, Dunn 26, presents a striking resemblance in parts to the occurrences described by Chamberlin in Eastern Wisconsin.

(1) Geol. of Wis., II, 554.

(2) Ibid., 138; II, 270, 551, 553, 672; IV, 68, 82, 124.

ORGANIZATION AND SUPPORT OF STATE AND LOCAL SOCIETIES

E. O. Randall: How should the governing authority of state historical societies be appointed.

B. F. Shambaugh: The organization and support of State and local historical societies.

Prof. H. W. Caldwell, Univ. of Nebraska: The problem of support - public and private; how secure; how much ought to be secured, etc.

Fossils

Life: All investigators have found the remains of life in the Lower Magnesian very few and far between. Excluding those fossils from inside the Baraboo valley, (1) the species given by Chamberlin may almost be counted on the fingers of one hand. I understand that it has never been materially added to.

On the area under discussion, Ellingson's quarry (017, Dunn 26) alone shows unmistakable fossils. Here a layer ^{2 feet} ~~a foot~~ in thickness is filled with silicified and usually shells, ^{broken} ~~that~~ they do not show until weathered out. Mr. Blackwelder states them ^{that they are probably} ~~to be~~ *Ctenodonta*, and in no way distinctive. The same layer recurs a few hundred yards west, at 045 and drift ^{remnants similar fragments are seen throughout most of the district} ~~A similar stratum west of Madison will be found mentioned~~ in the table of outcrops not on the area. At one of these, 01 Pleasant Springs 18, fecoidal markings resembling seaweeds, or casts of shells, are found in ~~the~~ sandy & glauconite layers, ~~but~~ None are recognizable.

St. Peters Sandstone. (Os)

Name. The next formation in our geological column is the St. Peters sandstone. The name was applied by Dr. D. D. Owen (1) from the St. Peters (now Minnesota) River, in Minnesota. It corresponds to no horizon of the New York standard column. Mr. Hall and others quoted by Chamberlin called it the equivalent of the Chazy limestone, but he himself placed it as the base of the Lower ^{Chamberlin} ~~(1) Geol. of Minn. I, 144. (1) Geol. of Minn. I, 145; II, 555~~

SECURING POPULAR INTEREST AND CONSEQUENTLY STATE APPROPRIATIONS

Prof. B. F. Shambaugh: The problem of securing appropriations for the State historical society, and of keeping the public in sympathy so far as possible with the work of the State historical society without turning the organization into a "museum of popular attractions."

E. O. Randall: Financial aid of State historical societies by the State.

~~Silurian or Ordovician.~~

Exposures. No really satisfactory outcrop of the St. Peters occurs within the limits of the accompanying map. ~~A very small abandoned quarry (062, Fitchburg 36) and a roadside outcrop (058, Oregon 1) are the best, although~~ ^{these are quite} ~~very poor~~ ^{the writer} was therefor compelled to go west into Sec. 26, Fitchburg, to Mr. Fox's farm. Here (090), on the south side of a large bluff, ^{nearly} ~~upwards of~~ 100 feet of the formation are exposed. Several smaller outcrops were ~~also noted for the benefit of future investigators.~~

Character. Irving describes the St. Peter's in the region about ~~my assigned~~ ^{the} area ^{marked} (1) as a friable, mostly massive, although frequently thin and cross-bedded, round and even-grained sandstone. The impurities of oxide of iron are said to cause the yellow, brown, and red colors of outcrops. Case-hardening, banding with different colors, and absence of consolidation or fossils ^{features} are also mentioned.

At the large outcrop in Sec. 26, Fitchburg, the present writer noted characteristics similar to those just described. The loose fragments are often yellow, and show shiny crystal faces; evidently ~~then~~ ^{here} some cementing agency has ^{of the} been at work. Most ^{of the} fresh rock is pure white, and softer than at the surface. Superficial discolorations

(1) Geol. of Wis., I, 145; II, 556.

4

CHARACTER OF COLLECTIONS AND PUBLICATIONS

Prof. B. F. Shambaugh: The extent to which local historical societies should be encouraged in making collections of historical material and in issuing publications - the scope of such collections and publications. Publication of State and local archives, bibliographies, check lists, and indexes of publications relative to state and local history.

E. O. Randall: Character of publications by State historical societies and methods of their distribution.

Miss Salmon:

Preservation of historical material (the State of Arkansas recently cleaned house when moving into New State House and destroyed accumulated State records and reports, - so The Evening Post).

Preservation of local newspapers.

Trained secretaries for historical societies.

Dr. Loeb, of State Historical Society of Missouri:

1. Methods of gathering and shifting local material, especially from old settlers, contemporaries, and the like; and the feasibility of an Historical Society organizing such an effort on an extensive scale.

2. The public duty of a Society to secure the preservation and proper arrangement of local records, and the preservation and marking of buildings, locations, etc. of historical importance.

3. The place of genealogy in the work of historical societies.

4. The desirability and the legitimate means for stimulating a popular interest in a Historical Society.

37
of different colors,

are black, red, and yellow often producing banding. Iron
concretions, producing warty weathering, are ^{also} abundant.
Much of the rock here is very thin or cross-bedded.
To the south-east, in Sec. 36, of the same town, several
inferior exposures show a more uniformly yellowish stone; but
This color is apparently ^{entirely in large degree} superficial. Quartzitic
fragments are common, but ~~none~~ ^{were found} in place. The farmer
who owns W132 said that he had opened several quarries
on his place, and that in each the rock degenerated into
nearly loose sand, at a slight depth. He stated, as did

Mr. Morris Fox (U. W. '04), that, (rock), although very much
weathered, exists at the Oregon cemetery (036, Oregon 1).

the importance of this does not appear

I have ~~Contrary to Irving's statement,~~ ^{report, that there is found} found some vari-
ation in the size of the sandgrains. ^{is found; nor} Neither are they
always much rolled. ^{well rounded} On the north shore of the Oregon

Branch (061, Rutland 4), some rock resembling oolite was
found (not in place) mixed with yellowish, massively bedded

On the north side of
sandstone. ~~On the north side of the terminal moraine~~
in Sec. 28, Dunn (068), ^{shows on its north side} ~~was found~~ a light yellow, iron-
banded, cross-bedded, greensand bearing rock. In Sec.
26, Blooming Grove (084), ^{these} a similar red to yellow stone,
often with light specks, ~~is found in an old quarry~~

Throughout the remainder of the area the rock is
a yellow to red, ~~speckled~~ soft, cross-bedded stone
often speckled with white or green specks.
Locally it has greensand layers. (068, Dunn 28)

OVER

CO-OPERATION BETWEEN AMERICAN HISTORICAL ASSO- CIATION AND STATE AND LOCAL SOCIETIES

Prof. M. S. Brown: A discussion of ways in which the American Historical Association and State and local societies could co-ordinate and make mutually helpful their activities.

Miss Salmon: The American Historical Association as a clearing house for all other historical societies.

Prof. M. S. Brown: Relationship of the state historical societies to each other. Can any organization be made so that they may aid each other? So that they may in part supplement, rather than duplicate?

an ~~enormous~~^{large} amount of this formation is found in the glacial drift forming fantastically, weathered or fretted boulders. Sometimes fragments containing fragments of white chert are seen; they are thought to come from ~~an~~^{an} ~~undiscovered~~ basal conglomerate marking an unconformity at the base of the St. Peter. Locally (O 61, Rutland 4) some calcareous ~~rock~~^{soil} was found near ~~an~~^{an} ~~outcrop~~^{concealed} ledge ~~which~~^{which} ~~presented~~^{presented} the appearance of oolite.

As the St. Peters is readily confused with the Madison, I ~~will~~ (summarized) the chief points used in ^{distinguishing them} making correlations. ~~and here~~ ✓

- (1) ~~Hardness~~. The St. Peters is usually much softer.
- (2) ~~Color~~. ^{The} Colors of the St. Peters are generally much the brighter.
- (3) Case-hardening. This phenomenon is deeper and more wide spread in the ^{younger} ~~older~~ formation.
- (4) Greensand is practically lacking in the St. Peters.
- (5) Iron concretions are more numerous in the higher horizon.

Internal Structure. Owing ^{both} to its inherent characteristics and the scarcity of outcrops the present writer has found little of interest under this head. Cross-bedding is seen at nearly every outcrop, and Case hardening, as has ^{above} just been mentioned, is nearly universal. ^{The latter} ~~It~~ seems never to produce chert-like patches or definite quartzite layers. The iron concretions have also just been received referred to ^{attention}.

Thickness. As the St. Peters overlies the irregular top of the Lower Magnesian, its thickness is extremely variable. Approximate figures can however, be given for Sec. 26, Fitchburg. ^{where it is at least 160 feet} Here, below the large exposure 090, there is a break in the slope of the hill which both Mr. Morris Fox (U. W. '04) and myself regard ^{The writer may represent} as the top of the Lower Magnesian. On this assumption, the thickness

Cross beddings is the only thing here and it might be mentioned under "Structure".

What is the top of the hill?

Prof. B. F. Shambaugh: The problem of collecting historical material for the library of the State historical society - books, pamphlets, manuscripts, etc. The scope of such collections, methods of collecting (the State Historical Society of Iowa has just employed a "Collector" who will devote all his time to collecting historical material for the society).

Prof. H. W. Caldwell, Univ. of Nebraska: The problem of gathering, storing, and making available the material for the history of the State.

What field ought the historical society attempt to cover?

Prof. Marshall S. Brown, New York University: A discussion of methods and means by which State and local societies could make possible the accomplishment of work in finding, preserving, and in making available for use local records in each State along lines similar to those adopted by the Massachusetts Public Records Commission.

is ~~not less than 160 ft.~~ To the southeast, in Sec. 36, of the same town, a good well record gives a minimum thickness of 120 ft., while just ~~over~~ ^{on} the eastern border of the area another gives 100 ft. As ~~has been previously~~ ^{a portion of} stated, the entire formation may be absent in Sec. 36,

& Blooming Grove, (see structural cross-sections). Some observers regard the sum of the thicknesses of the formation in ^{St. Peter's}

^{certainly} question and the Lower Magnesian as being about 250 ft. (1); ~~but it is~~ ^{much less}.

~~Fossil~~ ^{greenish} The sole evidences of life found by the writer ~~was~~ some fucoidal markings from (087, Fitchburg 36). The

owner of the quarry called them "ferns," which indeed they much resemble. ~~They may be seaweeds preserved in glauconite layers.~~

Trenton Limestone. (St)

Name. The last member of our geological column of bed rocks is the Trenton limestone. The name of ~~this~~ buff to white or blue, fossiliferous limestone is derived from its ^{supposed} eastern equivalent. ^{although} Correlation is ^{not definite, in spite of} simple because of the abundance of fossils. The transition from the St. Peter's is said to be remarkably sudden (2). The local name of "Plataville limestone" has been recently suggested.

(1) Weidman, The Baraboo Iron-bearing District, Bull.

XIII, W. G. S., p. 97.

(2) Geol. of Wis., I, 151.

CO-OPERATION WITHIN EACH STATE OR LOCALITY

Prof. B. F. Shambaugh: The establishment of local historical societies and their co-operation or affiliation with the state historical society. Also the co-operation between public libraries and the State historical society.

E. O. Randall: Relation of State historical societies to State libraries.

Prof. M. S. Brown: Co-ordination of work of local societies under the direction of the State society for certain specific purposes. Protesting against the too exclusive absorption of many of the local bodies in genealogy. *Scope*

Miss Salmon:

Relation of societies with State and city libraries (libraries in some towns often duplicate each other). Delimitation of the field of work of each class in order to avoid duplication.

Importance of scientific methods of investigation (it has seemed to me that the local societies in particular often do slipshod work and do not always realize the necessity of reporting and preserving their work properly).

System by which annual reports may be made by every local society to the State society (in June?) and by the State societies to the American Historical Association (in September?). *relation with AHA*

Prof. H. W. Caldwell:

Methods of co-ordinating local societies, old settlers

Exposures. But one satisfactory outcrop of the Trenton was found within the area surveyed, ^{and this} in an old quarry (081, Blooming Grove 36). ~~On the east line of the same section, much weathered buff rock bearing cherts is exposed in a gully by the roadside.~~ Several other ^{outcrops} ~~exposures~~ ^(see photograph p. 1) are met with in this vicinity, but ~~the suspicion that~~ ^{other outcrops are poor and in doubt the rock may have slid down hill.} (see p -) the rock is not in place, is attached to all of them.

Character. Owing to the poorness of the Trenton outcrops, ~~I have been compelled~~ ^{it was necessary} to go beyond the area, to the west, and to ~~use more of Irving's work, than usual in this investigation.~~ ^{refer largely to} He describes the formation as an evenly bedded, close textured, rarely cherty, aluminous, dolomitic limestone. He ~~dividing~~ ^{usually} it into four parts, of which he says ^{only} the lower two ~~parts alone~~ occur in Dane County. (1) They are:

4 Upper blue beds 15 ft.

3 " buff " 55 "

~~XXXXX XXXXX~~

2 Lower blue " 23 "

1 " buff " 23 "

116 ft.

The only analysis given of the Lower Buff from within the County runs as follows:

CaCO₃ 56.07

MgCO₃ 35.32

SiO₂ 4.45 ^{largely as clay}

Al₂O₃ 2.08 ^{as clay}

(1) Geol. of Wis., II. 559.

Kochin
SiO₂ - 46.5
Al₂O₃ - 39.5
14.20 14.0
2.45
2.08

societies, etc. with the State historical society. What shall be their relationship, etc.?

Relationship of historical society library to other public libraries, as State law libraries, college and university libraries, etc. Shall they duplicate or shall they supplement? If the latter what field shall be cultivated by each, etc?

Fe ₂ O ₃	.69	gives color
FeO	.58	
H ₂ O	.46	
	<u>99.65</u>	12

~~He~~ ^{Irving} also gives some analyses of the blue beds, which show them to be more aluminous and less magnesian. The color of the buff beds is ascribed to superficial oxidation of the ferrous iron (1), the original color being a bluish gray.

^{present} The writer ascribes the beds within his area to the Lower Buff, ~~explaining the great thickness by the sliding of the rock down hill. This is a common phenomenon being probably induced by the softness of the underlying St. Peters. Further mention of it will be made under the head of Structure. I also find~~ ^{apparently} ~~The buff color~~ ^{is found} to be due to weathering. ~~The normal fresh rock is whitish and hard, bearing numerous fossils; Those beds which show the most marked buff color contain the fewest fossils. The area underlain by this formation has been mapped as Lower Magnesian, by both Irving and Alden. Were it not for the discovery of fossils, the present investigator fears he~~ ^{there is nothing to make one} ~~might have done likewise.~~ ^{believe otherwise.}

(1) Geol. of Wis., I, 162; II, 560.

Riley heard from about 35 societies. Shambaugh about 25 Societies, and Thwaites 140.

Our report will consist of a general account of the organization and work of local historical societies to be followed by observations, classifications, suggestions, and recommendations --- 1, on organization; 2, on scope and purposes; 3, on methods of presentation; 4, on the museum; 5, on the library; 6, on publications; 7, on co-operation; 8, on the relation of state and local societies to the A. H. A.

Then will follow synopses of returns from state and local historical societies in the United States, one paragraph to each classified under the headings of sectional, state, district, and local societies, alphabetically within each class.

We propose to give tables by states, showing money expended for various purposes, and other interesting data collected.

1. In our opinion, state societies should collect all material genealogical, anthropological, archaeological, historical.

2. Disseminate this material as far as possible through publications --- these to consist of original documents, which should embrace state archives as far as practicable, and monographs. Each society should also have a museum containing relics, portraits, etc. It should arouse and maintain interest in things historical stimulating such movements as conventions, anniversary celebrations, lectures, historical pilgrimages, and in general arousing popular interest, Placing tablets upon historical sites and objects is also urged. Publications should be in presentable, popular form.

Thickness. As the Trenton is the highest formation in the district, its full thickness is not present. If all the rock seen on the east side of the area is in place, the thickness must be some 60 ft., which would place the ^{topmost} upper layers found in the Upper Buff. ~~However, structure~~ ^{zone} OVER natural considerations seem to render this unlikely. ~~It probably does not exceed 20 ft. and I will return to this subject later.~~

Internal Structure. The internal structure of the Trenton Trenton is of no especial interest. Bedding is rather thin, and the rock much broken by joints. Disintegration has gone much farther than with the ~~other~~ ^{most double bedded} limestones.

Life. Fossils are relatively abundant in the Trenton, especially in the fresher beds. Where absent, their former existence is suspected from cavities out of which they have apparently been weathered. All that the writer found were at 081, Blooming Grove 36, ^{a list of which is} ~~contained in Table III. For further information, as this is beyond the present subject, he will refer the reader to the lists and cuts in the Geology of Wisconsin (1)~~

(1) Geol. of Wis., I, 152; II, 561.

Since you have said that your Trenton was proved by its fossils, the species used in determination should be listed.

5

Miscellaneous.

MUSEUMS

Prof. B. F. Shambaugh: Shall historical museums be fostered?

Miss Salmon: Establishment of historical museums, by historical societies.

Prof. Caldwell: Shall historical societies attempt to collect museums; if so what shall be the field covered? Relationship to other state museums, etc.

HISTORICAL LECTURES

Prof. B. F. Shambaugh: The value of historical lectures given under the auspices of historical societies.

The presence of a small museum for the purpose of collecting and preserving the history of the State, the great thickness of the hill will be treated in September, the work down hill will be done in the month of October. The thickness of the hill will be treated in the month of October.

Higher Formations.

Although no ^{younger} ~~later~~ bed-rock formation is found on the area surveyed, than the Trenton, the studies of the geologists of the W. G. S. (1), as shown in their maps and reports, demonstrate that others must formerly have existed. The discovery of outliers of the Niagara limestone at Blue Mounds (Dane and Iowa Cos.), Sinsinawa Mound (Grant Co.), and at Platteville Mounds (Lafayette Co.), taken with the ^{in connection} ~~of~~ Niagara fossils, in pre-glacial gravels on the Baraboo Range (Sauk Co.) ^{discovered by Mr. R. D. Salisbury} (2) ^{make a}

^{all} ^{points} leads us to the conclusion that all of the area between these points was once covered by ^{the Niagara} ~~this~~ formation. The elevation of the West Blue Mound is given by Mr. Moses Strong as 1729 ft. (by aneroid), but the thickness of Niagara ^{there} is unknown (3). Chamberlin ^{estimates} gives the total thickness as being from 450 to 800 ft. (4). Assuming ^{in the eastern Wisconsin} ~~this data to~~ be correct, and the rocks to be flat-lying, and ~~the thickness of the Niagara to be 700 ft.~~ ^{thick} it is found that the top of the formation near Madison must have been at an elevation of about 2200 ft. ^{at least 1300 ft. more than that of the present surface} ~~What higher formations than this,~~

~~if any existed~~ It is now impossible to say. On this

(1) Geol. of Wis. I, 254, 259; II, 661, 686.

(2) Pre-glacial gravels on the Baraboo Quadrangle Range, (R. D. Salisbury), Journal of Geology, Vol 3, p 655, 55.

(3) Geol. of Wis., II, 650.

(4) Ibid, I, 182.

CO-OPERATION BETWEEN STATE SOCIETIES

Prof. Alc  e Fortier, Tulane University, N. O.: With regard to problems to be discussed at Chicago it seems to me that one of the most important is the transcription and publication of the documents to be found in France and in Spain.

Prof. B. F. Shambaugh: The scope and character of such publications. The possibilities of co-operation among the State historical societies of the West in the publication of matter relative to the history of more than one state. --- I have in mind (for example) co-operation in the publication of documentary material relative to the early history of the Louisiana Purchase.

W. S. Laidley, Charleston-Kanawha, W. Va., editor West Virginia Historical Magazine, suggests a national organization of societies, chiefly to save publication expenses.

Prof. B. F. Shambaugh: The problem of co-operation among State and local historical societies in the matter of research work.

Prof. H. E. Bourne, Western Reserve University, says he hears the Carnegie Institution is preparing a list of MSS. in possession of the State and local historical societies. Inquire into this.

Dunbar Rowland, Mississippi, also wishes inquiries concerning this.

^{to be assuming}
 basis, and calling 600 ft. the elevation of the bottoms
 of the pre-Glacial valleys in the area under consideration,
 it appears that some 1600 ft. of rock has been eroded
^{from the valley areas}
 away. If we regard the average height of the ^{entire} area as
^{average amount of denudation has been at least 1300 ft.}
 900 ft., the result of 1300 ft. is obtained, while again,
 if we regard the disputed peneplane of the Driftless
 Area to have been at about elevation 1100 or 1200 ft.,
^{thickness eroded during}
 the erosion of the last epoch is less than the above.
^{some 1000 ft.}
 by some 1000 ft. Of course these figures are more spec-
 ulation, but the ammount eroded away was certainly very
 large.

Do not understand

omit?

1000

1000

Quaternary
PLEISTOCENE.

Resting unconformably on the Paleozoic bed-rocks,
 are thick deposits of gravels, clays, and sands. That these
 are of glacial ^{and glacio-fluvial} origin, none now question. Under the present
 head the glacial drift will only be considered from the
 lithological side. Its topographical features, relation
 to the bed-rocks, and areal distribution will be later
 treated in detail in Section IV. ^{Later than these Pleistocene}
^{deposits are minor accumulations, chiefly of heat, formed}
^{in the recent epoch.} ~~Pleistocene Drift.~~ (P) - glacial drift.

~~Drift~~
 From the standpoint of composition, the glacial drift
^{classified into two divisions:}
 may be divided ~~in two ways.~~ First into:

(a) Drift of foreign origin; erratics, chiefly of
 Pre-Cambrian rocks from the Fox River Valley and ^{still} farther
 north. This foreign material, or at least all that can
 be certainly identified as such, ^{by the naked eye} is in the form of boulders.
 According to Alden's work, but some 11 per cent of the
^{pebbles are} ~~coarser drift~~ is of foreign origin, while but 10 per cent
^{The statement applies to that part of southeastern Wisconsin lying south of 43° N. latitude and east of 89° W.}
 of the boulders are of local derivation (1). "Local" is
~~practically the same as saying defined as being nearly~~
 the same as ^{Algonquin.} "Post-Cambrian".

(b) Drift of local origin; chiefly pebbles of lime-
 stone, sand, and clay. No II

(1) Alden, Proff. Paper No. 34, Series B, p. 75, p. 78.

Much of this ~~drift~~ can be proved to have ^{come but} ~~only come~~ a few miles, and some only a few hundred yards.

Second, into:

(a) Till ^{or boulder clay} composed of clay, and boulders and pebbles of all sizes.

(b) Gravels composed, over most of the area, of limestone pebbles with subordinate amounts of erratic pebbles, embedded in very clayey sand. Only exceptionally is the sand pure, and less often ^{it is} still, very red.

(c) Sands, composed chiefly of much-worn quartz grains, with small amounts of feldspar and other minerals. They is but rarely ~~XXXX~~ free from clay.

(d) Clays, which are almost always present on the surface of the ground, being then ^{red} and sandy; when found ^{interbedded with} in stratified beds, they are often light-colored.

(a) ~~Stratified~~ Unstratified material which is comparatively rare. It consists of till or ^{boulder clay} containing boulders of foreign origin or of unsorted clayey gravel.

(b) Stratified and hence assorted material.

This consists of gravels, which are generally more or less clayey with chiefly limestone pebbles; clay, which are generally sandy, and calcareous red; and sandy, composed mainly of well-rounded quartz grains which are often stained red, together with minor amounts of feldspar and other minerals from the ^{igneous crystalline rocks}. It is rarely free from clay.

Not sufficiently explicit -

The main distinction here is between boulder clay and stratified drift.

Overlying the glacial drift of ^{the} Pleistocene age, are subordinate deposits, chiefly of peat, ^{the latter} now forming or of but recent origin; ^{have been to form} some must however, begun during the retreat of the ice-sheet, ^{while interglacial beds are reported in certain wells}. They are comprised under (a) Peat, and (b) Lake-shore and minor deposits.

(a) [#]Peat forms the filling of many extinct lakes, whose former existence is shown by the boulder lines and other marks of the action of waves, which are nearly universally found around the borders of the present marshes. These beds must have begun with the mechanical and organic lake deposits, and progressed through shallow water to true marsh deposits. Thorough studies of the origin of peat have been made in other localities, but a few remarks on the local conditions will not ^{here} be out of place. The first beginning of peat ^{formation} is ~~from~~ the decay of the numerous ^{aquatic} ^{that} sea-weeds which choke our lakes and streams throughout the summer. In the autumn these die, and, drifted by the wind or current, form compact masses through which it is often impossible to force a ^{weeds} boat. Before the ice forms, these ^{weeds} usually sink to the bottom, and there, protected by the water, form the "muck" of shallow ^{boals} waters. Next come bull-rushes, cat-tails, wild rice ^{now however, fast approaching extinction} and other aquatic plants; following which, when the conditions become

favorable, appear the various marsh grasses, willows, and ^{various} other shrubs. Among ^{Prominent} a large number of plants may be men-

tioned the wild iris and the arrow head, ~~and the various marsh~~
~~It is noticeable that in late years the amount of wild rice has considerably~~
~~decreased for unknown reasons.~~
 Thickness. The question of the thickness of the

peat beds has recently assumed considerable economic ^{and will be treated in section III on Economic Geology,} importance, for it enters into the problem of reclaiming

the marshes, the use of peat as fuel, and, around Madison,

the excavating of waterways. The depth of peat is pop-
 ularly overestimated; from purely theoretical grounds

it is evident that it must be slight. If the basins con-

taining it had been very deep for any wide extent, their
 areas would still be lakes; ^{vegetation is not sufficiently luxuriant} The country is too young

for extensive deep deposits to have formed. A list of

a few localities where evidencies of great depth of peat

have been found, ^{is given} will be found in the tables. Most of

these localities, which are all of slight lateral extent,

were found by the ridges of peat which ^{have been raised by} the filling of
^{making}

the railway embankments, have raised. These ridges are

^{Geological} of some interest, as in a way they are analogous to the
 upheaval of mountains after great sedimentation. At all

other points where measurements have been made, sand or
 clay were found at a depth of 4 or 5 feet.

Transfer to
 Sec. III

not in place
 here

(b) Minor accumulations of gravels, sand, mud, and shells are found on the [~]bordes of and in the lakes, both ancient and modern. The study of those upon the lake shores and those derived from the fields by rain erosion will be considered in Sections IV and V. Shell deposits are usually of slight extent for the shells are floated ashore until the weeds become too thick to allow this. From the prevalence of iron in the ground water of certain localities there is a remote possibility of the discovery of bog-ore. The iron may be derived from the basic boulders of the drift. *Lead ore is said to be found in the drift in Secs. 14 and 23, I am near the river in masses up to 15 pounds. If this is the truth it was probably derived from a point not far distant but as the country to the north east was not surveyed it is impossible to say what source it might have had.*

GENERAL GEOLOGICAL SECTION.

49.1

Pleistocene Recent
 Peat

- Peat--- in marshes. Thickness generally 1-10 ft.
- Lake shore and minor deposits--- muds "in lakes" 1-10
wash from fields. slight
- Glacial and fluvio-glacial deposits, boulders both
deposits of the Green Bay
Lobe of the Wisconsin age. erratic and local,
gravel and sand. 1-300
Thickness - - -

UNCONFORMITY.

ORDOVICIAN

- aluminous and magnesian
Whitish, hard, fossiliferous ls.;
 - A
weathering buff; sometimes cherty; *bedding thin;*
 - Trenton Limestone
 - much disintegrated; *Thickness* ~~20~~ *20*
 - ~~never complete~~ 20
 - White to yellow, red or speckled
ferruginous, very friable but case-
hardened ss; bedding variable, but
usually thin and cross-bedded; grains
generally round; *base somewhat calcareous and* thickness variable. 20-160
 - St. Peters Sandstone . . .
 - UNCONFORMITY? *possibly a chert conglomerate*
 - Cherty, hard, white, crystalline ls.;
 - extremely magnesian ~~and~~ *arenaceous and cherty.*
 - concretionary and irregularly bedded;
 - sometimes weathers buff; *contains* quartz, cal-
cite and other *minerals* geodes; beds of cong-
lomerate, sometimes cherty; glauconite
and sandy layers; at base oolitic
chert, disseminated, nodular and in
layers; Thickness variable. 40-147
 - Lower Magnesian Limestone . . .

CAMBRIAN

Madison
Sandstone . . .

Very variable in character;

(a) Non-calcareous, white, quartzitic, case hardened; bedding variable; shallow water deposit with cross-bedding, worm holes, ^{etc} and ~~contemporaneous erosion~~.

(b) Calcareous; generally at base or top grading into adjacent formations; ^{sand grains angular to subangular;} color buff; ~~thick~~ bedded; locally seen as a thin bed of limestone; many glauconite layers in both types; thickness.....50 ft.

Mendota
Limestone . . .

White limestone weathering red to buff; very magnesian, aluminous. and sandy; bedding thin and irregular; concretionary; texture earthy to crystalline; thickness.....30

Potsdam
Sandstone . . .

White to buff ss.; thin bedded with many greensand layers; calcareous; shale at base very soft; ~~thick~~ thickness.....777

UNCONFORMITY

ARCHEAN?

Unnamed

Dark gray "felsite"; exposed in ^{dup} wells at ~~State Capitol~~ ^{Madison}; thickness..unknown.

II- STRUCTURE.

Former Investigation. Having ~~XXX~~ treated the formations of bed rocks present upon the area, we will now turn to the consideration of their structure as a whole. These strata have commonly been considered as "flat-lying", and inclined or distorted layers have been regarded as laid down in that position; while the discrepancies in the elevations of contacts were ascribed to faults (1). However some investigators especially in the Lead Region have noted a system of folds, running east and west, and having steeper dips to the north. An inspection of Irving's barometric altitudes (2) shows one reason why he did not notice some features which are now quite evident; his elevations are often 30 to 60 feet in error being generally too low.

The Structure Map. The structure has been worked out chiefly from the elevations of a definite datum plane, the base of the Lower Magnesian Limestone. This was chosen as the best defined and most widely spread horizon in the geological column of the area; a list of elevations of it and other contacts is contained in Table IV, p. . Less emphasis has been placed on the measurements of strike and dip for the smallness of the outcrops and the low angle of dip render both subject to uncertainty. With this data a contour map (p.) has been constructed of the datum plane.

Two main features are shown on this map: an elliptical swell or anteline with an east-~~and~~ west

(1) Geol. of Wis., I, 136; II, 613.

(2) Ibid, II, 436.

to coercive imprisonment, as in the case
of His Majesty's own moneys and affairs.
Done at Montreal on the Day And in
the year first above written.

(Signed) Oligivancourt, Moniere,
L'ebelle, Beaureaux And Michel.

True copy,

Michel.

axis in the south of the area, and to the north, a trough or syncline pitching to the east. Smaller anticlines, which are continuations of the large one show at both sides of the map. The structure of the north of the area is involved in considerable obscurity, it seems to be more complex and at least one fault is suspected from evidencies of dynamic action.

Hypotheses of Structure.

Original Deposition. As has been stated, the earlyier geologists held that the features such as have just been outlined, were due to the original irregular deposition of the sediments. This would involve the local thickening of one or more formations to the extent of 200 feet or more in ^{about} a mile or so.

It can be demonstrated (see Table IV, p.) that such is not the case with any formation above the Potsdam and that the slight variations in thickness of the Madison at least, have no reference to the structure.

Faulting. A second theory is based on the actual occurrence of normal faults in Southern Wisconsin; some are also inclined to beleive that these rocks are more likely to be deformed by faulting than by what is really the more gentle process of folding.

Two faults are seen at Basco on the Illinois Central Ry. about 8 miles west of the area; they strike N.-85-W. and inclose a depressed block. That on the south has sunk some 20 feet on the north side and the other but six feet in the reverse direction.

They are accompanied by distorted strata, inclined joints, and shear zones which do not, however, have the same strike, *as the faults themselves (?)*

meaning?

them to have one for the use and convenience of the savages; the profit thereof shall, however, belong to them.

Article 12th and last.

In consideration of the above stipulations the said Sieurs Clignancourt, Manierre And L'ebelle, jointly and severally, and willingly, undertook to exploit the said Post of la Baye, to enjoy the same for the period and space of three consecutive years, from the month of August next, to the same Date in the year one thousand seven hundred and Fifty, on the condition of paying into the hands of Monsieur the General, in the month of October of each year that this covenant shall last and Beginning with this year, The sum of Five thousand Livres. In War time, when a sufficient quantity of goods will arrives to enable them to obtain what they need to supply the said

as what?

Suspected faults were discovered in Sec. 26, Fitchburg, where one had the same strike and was crossed by another at N.-46-W. which dips ~~at~~ 72 degrees to the north; the rock was massive sandstone and showed none of the evidencies of dynamic action just described. Within the area a shear zone is occasionally seen (see p.).

In spite of all these evidencies, the hypothesis seems inadequate to explain the observed facts except very locally. Wherever the beds may be actually followed they are found to ~~follow~~ have an even and gentle course. Nevertheless it must be considered that faults are plains of weakness (those at Basco are filled with a foot or ^{more} so of clay) and would very likely be followed by valleys and are therefore liable to be ^{escape notice}.

Folding. The last hypothesis of complex folding, seems to find ample evidence to support it. An average dip of but one or two degrees is sufficient to account for all the observed facts while actually even higher dips were recorded.

The map drawn on this basis, indicates two sets of folds similar to those discovered in the Lead Region (p.), those running east and west being the major set.

Joints.

Nearly all of the rock exposures upon the area surveyed, are so small that it is possible to miss some of the more widely spaced fractures. Usually there is afforded no opportunity of following up a joint, or of determining its relative importance.

port; but if the ships fail to come,
 And they are unable to find foods in
 the country, And little, or no powder
 And cloth, they shall be bound to pay
 the sum of Three thousand livres only
 in any year in which such accidents
 shall happen, Exclusive of the present
 year, inasmuch as they have their
Outfit. Likewise, should peace be
 declared and goods of all kinds be
 abundant in the country, the said
 farmers shall pay for each of the
 said years of abundance - not including
 the present one - The sum of six
 thousand livres. And to secure the
 payment of the price of the said lease
 the said Sieurs de Blignancourt, Mon-
 iere And l'Eschelle have jointly and
 severally pledged and ^{mortgaged} ~~hypothecated~~
 all their ^{chattels personal} ~~moveable~~ and ^{real estate} ~~immovable~~ prop-
 -ties present and future; for the pay-
 -ment of ^{which} the sums hereinabove
 stipulated they consent to be liable

For this reason the groups in the accompanying table (p.) have been largely made up on the basis of numerical importance. The tabulation of the observations consists in plotting them on coördinates, with the values of the bearing ^K reckoned from the true north, as abscissae and the locations as ordinates. In the arrangement of the latter an attempt has been made to give them in their relation to the folds. For example they follow around the ~~EMM~~ great anticline from the northwest in the direction of the hands of a watch. An inspection of the table shows that there are many different sets of joints very scattering in direction but on the whole those west of the meridian are both more numerous and more uniform in bearing in direction than the others.

The chief directions followed by joints are shown on the diagram. It must be observed that all do not occur at any one outcrop; at each locality there are seldom more than five sets that are important. The summary agrees substantially with the measurements made by Buckley at the Madison quarries (1).

Relation of Joints to Folds. The relationship of these major joints to the folds cannot be determined with certainty. Some hold that there is no relation at all with such low dips but according to the theory, they should follow the contours on the map and cross them at right angles. ~~There~~ in other words they should follow the strike. The average dip of

(1) Buckley, Bull. IV, W. G. S., Building and Ornamental Stones of Wisconsin, plate xlix, p. 458.

This certainly a large number

provided they are + clearly defined joints - Be sure of that

we cannot settle before the departure
 of the ships, but, until things change,
 it cannot be expected that the posts
 will yield any profit. Monsieur
 The ^{Count} Comte de la Galissoniere is even
 very uncertain whether he will be
 able to have the commanding officers
 paid the gratuities allowed them. He
 will report to you the arrangement
 he may have made or been able to
 make ^{in this matter} with Monsieur de Beauharnois.

Of all the canoes that started
 this year for the Upper countries
 And of those that left last year to
 return this year, 33 only have arrived
 that came from Michilimackinac,
 under the command of the Sieur
 Duplessis, Ensign. ✓ We are expecting
 the others which will arrive late, if
 they come at all. The same applies
 to those from Detroit. In any case,
 the returns in furs cannot fail to
 be very small And we do not think

✓ Probably François Antoine Lefebvre, Sieur Duplessis, born in 1703,
 he was appointed ensigne in 1741, ^{and} lieutenant in 1750. He was a
 younger brother of the Duplessis who commanded at La Baye
 in 1726; see ante, p. 5, note, p. 94.

the region is southeast thus explaining the major, northwest and northeast joints. With regard to the local folds, a similar relation appears to hold true; but the table in which observed and computed dips and strikes have been shown, fails to reveal it. With so many joints of undetermined or nearly equal importance it is easy to think that one sees what he is trying to prove, a remark that applies to all theories of joint-controlled drainage or rectilinear topography. It cannot be denied however, that wherever the dip is great enough to enable its direction to be observed accurately, there is a notable accordance of the joints with the dip and strike.

Relation of Joints to Drainage. The relation of the joints to the lines of pre-glacial drainage is also not capable of exact determination. The Yahara valley was made up of a series of straight reaches, bearing a little west of north and north of west and following the general southeasterly direction of the average dip and major joint set. Moreover it follows a minor synclinal depression. Most of the tributaries on the south are quite uniform in direction at right angles to this but no special relation to the folds can be determined. Where the drift is thin in the southeast of the area, and the smaller valleys are exposed to inspection there seems to have been a marked influence of joints.

Shear Zones. At but one locality (O-81) in Sec. 36, Blooming Grove, was a definite shear zone distinguished but traces of them are found elsewhere.

Monsieur de Beauharnois 400 livres each,
 on condition that they would ^{each} carry
 800 pounds weight for The King;
~~and~~ the 10th ^{paid} 700 livres but ^{it} carried
 nothing.

4 canoes to the Miamis;

4 to Chogouanigon.

2 left for port Dauphin, on the Western
 sea. ✓

6 for La Baye.

2 for Michipicoton.

4 for the Ouistanois.

2 for Nepigon.

4 for ^{The River} La Rivière St Joseph.

1 for the post of Vincennes.

2 for Camanistigoya.

The farmers of all these posts
 have made representations ~~to~~ in
 order to be relieved from the pay-
 ment of the amounts due on their
 boxes, alleging that they have
 incurred heavy losses. This will
 cause difficulties which we foresee

✓ This post was built by the Vérendryes in 1741. There has
 been some doubt as to its exact situation, but it was on or near
 the western shore of Lake Manitoba. - Ed.

At that exposure the position of the Trenton almost on a level with the Lower Magnesian near by points in itself to the existence of a fault (see sketch p.). Moreover, the close spacing ~~XXXXXX~~ of the ~~XX~~ joints, the dip set being but half ~~X~~ an inch or so ~~apart~~ and the others but little more, shows that we have to deal with a greater amount of disturbance than elsewhere. The plain of the north ~~and~~ south or dip joints is inclined to the east at some 85 degrees ^{to the east, then including} and ~~points~~ according to theory ~~to a downward movement on that side,~~ ^{forming a fault or} with a similar strike for the fault. ^{monocline}

Slumping. Sliding of the beds of rock down hill has been referred to several times. A notable locality is shown in the photograph on p. ; there the coincidence of the dip of the beds with the slope of the hill, their disintegrated condition, and the inclined joints expose the deception. It is not very common for the slopes are generally too steep or glacial erosion has removed the disintegrated material.

Conclusion. The writer concludes that the rocks of the area were deformed chiefly by folding under a rather light load (cf. p.) with an unknown amount of faulting; that the larger valleys of pre-glacial times followed synclines and the lesser ones were joint-controlled.

sight of that object, but the season
is too far advanced to allow of new
measures being taken. He will wait
until he is informed of the effect
~~that will be produced~~ by the former
ones. If we learn anything before
the departure of the last ships, as
we ^{we may} hope, we shall have the honor
to report the same to you. Mean-
while we must notify you that
far from the Posts yielding any
Revenues, they have been the cause
of considerable expenditure, both ~~as~~
owing ^{as much to the consignments that} ~~to~~ what had to be sent to
Michilimackinac And to Detroit for
the King's account, ^{as to} and for the con-
voys of the trading canoes; that
9 canoes only have left for Detroit
and Messieurs de Beauharnois and
Hocquart could induce them to go
up only by granting them licenses
free of charge. 10 canoes have gone
to Michilimackinac, 9 of which paid



III. ECONOMIC GEOLOGY.

Although there is little of economic importance within the area surveyed, nevertheless a few products are of some value. These are water, building stone, limestone for lime, sand, peat, clay, and possibly some minor substances.

Water. The best water-bearing formations are the sandstones but the other rocks are ^{likewise very} ~~so~~ pourous ~~that there~~ is little difference; occasionally the sandstone is too fine or too ~~clayey~~ clayey to furnish good water free from sediment. The wells in the ^{which derive water from head} rock are esteemed superior to ^{those in the drift} others both in quality and quantity of water. ^{that from} Very shallow wells ^{although having cold water at first this is a very bad taste when warm, probably showing contamination} All the water is quite hard containing chiefly the bicarbonates of calcium and magnesium; very little difference can be noted between wells in different kinds of rock as all the water has passed through more or less calcareous drift. Although no analyses are available it seems certain that the water is much softer than that from the deep wells at Madison; that from the lakes and certain springs is known to be so ^{and these former being quite soft}.

As no wells on the area extend below the bottom of the pre-glacial valleys ^{where the Potsdam is continuous}, the source of the water must be local; indeed from the absence of "head" in all the wells it seems unlikely that water is ^{leaving} ~~entering~~ that stratum ^{and it may even be entering} from the lakes and else-

obscure
 Where. The close correspondance of the level of ground water ~~with~~^{to} the rainfall is also another line of evidence; it is not ~~so strong~~^{one}, however, as the weather ~~condit-~~
~~ions are regional and migh produce an effect even if part~~
~~of the water came from some distance.~~

Madison
~~The notion that spring water is superior to the harder city water is fallacious; in general the deeper the well the better the water. Shallow wells are probly more dan-
 gerous than springs as they may reach comparatively stag-
 nant ground water and are also traps for many animals and insects. With regard to artificial pollution, it is the introduction of any dangerous matter near or below the water table that is most to be feared; otherwise unless the ammount is too great, it will be largely des-
 troyed by the bacteria of the soil. The village of Oregon is supplied by a well in the St. Peters sandstone.~~

The reason to have no place here
 In certain localities springs are abundant and the larger ones generally flow from crevices in the bed-rock. In general it seems safe to say that such large springs at the edge of the high land are sure indications of the presence of rock although it may not actually show. The cause of this relation may lie partly in the action of the rock as an impervious basement but the writer is inclined to think that the concentration of flow in joints is also a ~~cause~~^{factor}. Being thus concentrated, the flow is sufficent to cause the head of the spring to ~~reced~~^{reced} and enlarge itself. (see photograph p-)
 Those far from the high land often have open throats of some depth and may use

through a break in an impervious layer of drift. No influence of impervious basements in the rocks ~~has been~~

~~seen~~ could be definitely determined. ^{the dolomitic} both limestones and sandstones are very porous and are much fractured.

Only The chief springs ~~alone~~ have been shown on the map of the Drift, ^{but} there are hundreds of ^{minor} smaller ones. The relation of nearly all to the terminal moraine across the south of the area, is worthy of note. Those along the Hook Lake valley undoubtedly derive their supply from the undrained depressions ~~XX~~ to the south. Two of these springs furnish sufficient volume and head of water to operate mills, and if improved the south side of the valley, which is ~~all~~ ^a bog ^{from} with seepage, would furnish ~~a~~ ^{large} ~~enormous~~ ^{more} volume of water. All the springs and wells of this vicinity carry much iron in solution and a small spring (W172, Dunn 28) is actively depositing limonite. Mr. Wm. All (W48, Dunn 28) reported a hard red deposit, in his field, which may be bog ore. He says that several large springs in that vicinity have gone dry since the disappearance of Hook Lake in 1898; they were some 15 feet below, ^{from the lake.} ~~the lake~~ and not over 200 yards distant. ~~The source of the water is obvious. The writer believes that the iron therein in the water is derived from the disintegrating basic boulders of the terminal moraine. Farther east, in Sec.~~

Why from boulders rather than
fine materials and why
not from the sandstones
around?

25, a spring is found at a considerable elevation above the lake (W131). A well which is said to pass through clay into gravel, has been sunk alongside it, ^{which} in The water flows from the pipe ~~which is~~ some 10 feet above the spring, ~~it~~ also bears much iron. Other wells in this locality are reported to rise in a similar manner, but ^{this statement} ~~it~~ could not be verified ~~this~~.

By far the largest ~~X~~ single springs within the limits of the area under consideration, are in Section 18, Dunn (038). The photograph ^(p-) shows the largest of the three, which has cut back into the drift some 40 yards, and is there about 8 feet below the original surface. People living in the vicinity say that the flow is much less than formerly; this ~~is of course~~ due to the cultivation of the soil, but, as ~~might~~ be expected, it has affected these terminal moraine springs to a less extent than ~~it has others~~ ^{just by drawing their water from depressions & that}. All of the springs mentioned flow from ~~the Madison sandstone (except W131)~~. A few large springs occur along the Nine Spring Creek, but none worthy of ~~X~~

mention fall within the limits of the area ^{here under treatment.} ^{a large spring is found 10 ft. above Swan Creek near W 16, Dunn}
Building Stone. No ~~first-class~~ ^{flowing from sand} building stone is

found in the formations which underlie ^{the} the area. The Potsdam is nowhere exposed, and ^{is} too friable ^{if it were}; ~~W131~~ while the Mendota is rather shaley, ^{bloched} ^{with not} and irregularly bedded. Nevertheless, if the demand for stone

Till many years upon the rough & narrow

The removal of the trees and sod both increases the evaporation from the surface and the runoff thus lowering the water table. All old wells have had to be deepened in the last few years but they derive their water from the undrained, and forested moraine. Another factor in the great decrease in the number and flow of springs was the prolonged drought of 1887, 1900 (which followed a rainy cycle of a longer duration) (pp. 100, 111)

135, 138)

warrented it, exploration would probably be repaid. The Madison sandstone seems to afford the best rock. Where calcareous, in Sec. 26 Dunn, a considerable quantity has been taken out at Barber's quarry (02). ^{which is} ~~This~~ the best and most worked quarry in the township. Attempts to quarry the non-calcareous phase, have failed because of its rapid variation from too thin to too thick beds. On the west of the area, at Kivlin's quarry (057, Fitchburg 25), ^{small amount of} a little calcareo-argillaceous stone has been removed. Exploration would ^{possibly} only be profitable in the south east, where the formation is calcareous.

The Lower Magnesian is rarely of ~~any~~ value, on account of its cherts, irregular bedding, geodes, and such peculiarities. Just ~~east~~ off the map, on the ^{east} ~~other~~ side of Lake Kegonsa, a large quarry ^(0-1, Pleasant Springs 18) was formerly operated, which furnishes a more or less geodic and iron-stained rock. ^{The product} was shipped to Stoughton by barge (1). ^{Several quarries north of Westfield (02 25, 26 and 29) and a have been extensively worked} The St. Peters, although not generally considered as a building stone, ^{already} is quarried for local use in the west of the area. As ^{was explained}, only the case-hardened portions are available. ^(p 32)

The Trenton is too much weathered and cut up by joints ^(p 32) to be of any use within the region under consideration. Heavy stripping might reveal firmer rock, but it would be rather thinly bedded.

With the growing use of concrete, sand and gravel ^{promise to} will soon become of more importance than building stone.

Limestone The limestones in all this part of Wisconsin are too impure to furnish good white lime. Analyses of the several formations have been given ^{in footnotes} in Section I; they all show too high a percentage of magnesium and aluminum. A little lime is burned for local use at Ol2, Dunn 18. It seems to have a good reputation, while that formerly made at Ol7, Dunn 26, is said to have been ^{indifferent} very poor.

Sand and Gravel. ^{Pure sand and gravel are, rather} These, in pure condition, rare in the area under consideration, in spite of the prevalence of sandstone. The largest deposits are in Sec. 1, Fitchburg, west of Lake View, and farther east, in Secs. 29 and 30, Dunn. A list of a few minor deposits will be found in ~~the~~ Tables. ^{why not treat this?}

Peat. The subject of the importance of peat and of the thickness of the beds has been considered in Section I. ^{None} so far as the writer could learn, is now being used. In this connection attention may be called to the number of marshes which the new map shows to be capable of drainage without pumping. The only attempts ^{at any kind of reclamation} of this sort have been abandoned, but land is now becoming so valuable that it may soon be profitable.

Clay. ~~As~~ Important clay deposits are naturally not conspicuous, & none have come to ^{my} notice, ^{but} they undoubtedly exist in the outwash plains in the south of the town of Dunn; ~~if~~ fact, a brick works was formerly operated at Oregon. ~~Clay has been struck in the new canal between Lake Monona and Lake Wingra.~~ All of the surficial clay beds ^{appear} to be ^{quite} sandy.

Minor Substances. As an impure marl is reported to have been struck in Lake Wingra, and is seen at a few points within the area, considerable deposits may exist. Accumulations of shells, ~~as has been explained,~~ are ~~very~~ likely to be small in extent, for the wind drifts them on shore, soon after the animals die, and calcareous plants are not known to be abundant. These deposited in the more open waters are also liable to be mixed with mechanical sediments; while in quiet places, ^{the} organic material probably predominates. The possibility of the presence of bog-ore has been mentioned, but it would probably be of no value. Lead is reported to be found in Secs. 14 and 23, Dunn (1), south of the river. ~~Its source,~~ ^{neighboring} if this statement ~~is~~ ^{is} true, its source cannot have been far distant, ^{for} it is known in all the Ordovician rocks. Drift, or float, copper is also seen, ^{and} a diamond was ^{discovered} ~~found~~ not far south of the area (2). These minor substances are, however, of scientific rather than economic interest.

(1) Madison, Dane Co. & Dunn. Towns (Wm. J. Park & Co., 1877) article by Wm. E. Colladay, p. 489
(2) ~~alder~~ Prof. Paper 34, p. 84,

IV- TOPOGRAPHY.

Part I- Facts observed.

Pre-glacial Erosion. Immediately following the emergence of the area from the ancient seas in which its bed rocks ^wre deposited, the forces of erosion began their work upon it. Some think they see evidencies that all this part of Wisconsin was reduced to a ~~penplain~~ about the time of the Cretaceous., while others ~~deny~~ this. However that may be, the oncoming ice sheet of the Pleistocene found the area dissected by a system of branching valleys, each the course of a stream or run. The structural relations and orientation of these has been already discussed with the conclusion that the influence of joints in the rocks was the predominating feature in their growth, but that the larger ones follow synclinal ~~valleys~~ depressions.

Map of Pre-glacial Topography. The writer has drawn a hypothetical map of ^{displaying these features approximately} the area as they must have appeared at the close of the Tertiary erosion period. So far as is possible, all data from which the contours were drawn ^{have} been there plotted; taken in connection with the principles assumed. the ^{method} of its construction will be readily understood.

Data. This map is based on about 260 observations of the elevation of the rock surface; of these 170 are from well records which in many cases only afford ^{only} negative evidence when not reaching the rock.

you will with us; we are ready to obey you.

By a collar.

10 pt. Ital.

My Father, it is the custom of all the chiefs to advise us not to go to the English. Monsieur de Noyon, who is at Detroit, told us, on your behalf, not to go there ^{any more.} My Father, I have encouraged my young men to ^{obey} ~~follow~~ your will, saying to them: I have never been there and I have not died of it. I think, My Father, they will listen to your ^{message} ~~word~~. I ask for them the same token you have given the others.

My Father, I have come to see you. As I am an aged man, I expect it will be the last time. I appear before you with empty hands, because I am no longer capable of anything, and I came here solely to obey the Commandant.

By two Calumets.

10 pt. Ital.

except in the larger valleys, in general it may be assumed that if the drift could now be removed the distribution of hills and valleys and even their ^{approximate} heights would correspond approximately to the same elements in pre-glacial time. 70.

In addition, in many places the drift is so thin that the present contours have been ^{approximately} followed, save for some "sharpening" where they have been smoothed by glacial deposition. *not likely to be understood*

Assumptions. In the drawing of such a map, several assumptions are necessary. First of all we must assume that the present rock floor is approximately the surface of the pre-glacial ground. The residual soils of the Driftless Area are negligible in thickness (cf. p.) except in the larger valleys, but we have no evidence to show that those of the Tertiary were of like amount. The errors in well records which all tend to make the elevations of the bed rock too low are treated in Table II of the Appendix (p.). Glacial erosion must also be neglected and is treated later (p.) with the conclusion that it was of little importance. *many mistakes*

Post-glacial tilting of the country can hardly be considered in so small an area. The data at command will not justify its use to explain any phenomenon, for the ancient valleys were so deep that few wells reach the bottoms of even the smaller ones. Only from work extending over a considerable area, can any conclusions on this head be safely deduced.

The depth of the pre-glacial Yahara valley, the controlling feature of the area, is not well known. It has formerly been greatly underestimated. The deepest wells (see table III) reach an elevation of some 630 feet ^{above sea level} without striking the solid rock and

It should be borne in mind that this map shows the contours of the underlying rock as it exists at present. There differ somewhat from the pre-glacial forms on account of a small amount of glacial scour (see p. 96). In determining the actual pre-glacial topography, the thickness of the soil and disintegrated rock must also be taken into account. It is pointed out in p. 70 that in the case of the present Driftless Area of southeastern Wisconsin, this element is practically negligible.

Koyelle who was our Father at Detroit,
and ~~he~~ told us to travel at night and
~~be diligent.~~ make haste.

My Father, when we arrived at
Detroit, we heard all the bad news;
we ^{wished} ~~would~~ not ^{to} listen to ~~them~~ ^{it}, because
we were returning from our Father's.

My Father, our young men are
not at our village; they are all on the
war-path. Those who remained have
come down to see you, and they greet
you by this present.

By four Branches of Porcelain.

My Father, I clear your sight so
that you may more easily see the
Warriors who are here. I have brought
with me those who had most sense.

By a Collar.

My Father, when we came here you
said to us: My children, I do not
want your Furs nor your presents,
I ask but your Hearts. We bring them
to you as well as our bodies. So what

are unfortunately in side valleys, leaving us in great doubt as to the depth of the main channel. However, using the data on Alden's map (2) which shows its ~~XX~~ floor to be at an elevation of but ^{430?} 500 feet ~~XX XXXX~~ where it joins the valley of the Rock River some 20¹ miles south of Lake Waubesa, and assuming a fall of five feet to the mile and a depth of 50 feet of pre-glacial soil, the result is obtained of 600 feet for the elevation of the pre-glacial Yahara at that lake.

dr { The course of this valley (see profile p.) between Mud Lake and Lake Kegonsa is subject to much uncertainty. That shown on the map is the most natural, but it may well have been farther south in a somewhat more direct line although nearer to the high plateau.

Wherever the course of the contours is uncertain, they have been dotted. Such is the case south of the terminal moraine in the southern part of the area where nearly everything is covered under a deep deposit of outwash. It seems reasonably certain, however, that the facts are as represented and that the drainage of this area escaped through the ancient valley whose presence is shown by the gap in the moraine where the railway crosses it ^{just} west of the area; an alternative outlet is possible to the southeast into the valley extending south of Lake Kegonsa. The contours below the level of the lakes and beneath the large marshes are also involved in obscurity.

(1) Alden, Prof. Paper 34, plate II, p. 14.

Another assumption (see .) is that the hills of the present surface generally correspond to the elevations in the rock floor, excepting drumlins and much of the terminal moraine. The hills shown in the beds of both the lakes rest largely on this assumption although it is also believed that the waves would have cut them lower if they had not been of rock (see. pp.).

Pleistocene.

We will now leave the further consideration of the pre-glacial topography of the area and proceed to study the present aspect of the country as brought about by the great ice invasions of Pleistocene times.

At least two and probably more, ice sheets are known to have once covered the area in question, there being apparently a long period of freedom from ice before the last, although there is little trace of ~~this~~ here. The ~~Y&N~~ portion of this last or Wisconsin Glacier, ^{which covered this area} is termed the Green Bay Lobe, its shape and direction having been controlled by that depression (1); it is with the work of the ^{margin} outer end of this lobe that we have to deal.

Topographic Divisions of Area. From a topographic standpoint the area ~~shown on the accompanying map~~ is divisible into four parts as is shown on the accompanying sketch on p. . At the north, and comprising nearly half the ~~XXXX~~ district, is a region of marshes, with many drumlins and low ground moraine. Small portions of recessional moraines are scattered

(1) Alden, Prof. Paper 34, pp 19, 22, maps

(11) ~~some accident might happen to you.~~ ^{be fall}

You know that people are killed at that place every year through drink.

As you have come to see me peacefully, I shall be much pleased to have you go back in the same manner.

10 pt. 2nd.

To the Kikapous and Maskoutins:

My children, here is a collar that I give you to ask you, as I have asked your brothers the Ouyatanous and Petiskias, to continue to strike the Chicashas.

That is all I have to say to you.

- 4/2m

objectionable. It would convey a wrong meaning if used instead of veined. Better use simply veined.

through this belt while in its eastern portion the influence of the preglacial topography becomes important (see sketch p.). These types of country will for convenience be termed the "marsh-drumlin" and "veneered-drumlin" areas' Within the ~~XXXXXX~~ former the pre-glacial valleys, are generally nearly obliterated. ~~discussed~~ *have little or no influence on the present topography*

South of the region just described, and comprising a relatively narrow belt across the area, is a zone marked by its predominating erosional topography covered by a ~~very~~ slight thickness of drift. Along the north side ^{and locally on top} of this pre-glacial upland, however, are thick deposits of drift, while ~~locally there are considerable depths on top~~. Drumlins are rare and of small size but there are several rock cored hills ^{of approximately drumloid shape} which resemble them.

Passing rather abruptly from this region, we find a huge terminal moraine which to a large extent simply masks a range of rock hills. Pre-glacial ^{crossing the line of this moraine} valleys are usually but not always, marked by sags in the crest. The southern side and eastern end are ~~largely composed of stratified and pitted gravels~~ ^{characterized by} forming many areas of "kame gravels" topography.

This kame country, which has been mapped along with the terminal moraine grades into the great, slightly undulating, "Oregon outwash Plains", through which extend several rock hills and patches of ground moraine.

~~of a former glacial deposit~~

10 pt. Ital

To the three Nations.

My children, it is impossible for me to consent to give you the permission you ask, to pass by the South side of the Lake to shorten your Road. I have traced out one by which you have come, you said you would not deviate from it. I have reason to believe that you have not two words.

My Children, the season is not so far advanced as to not give you time enough to return to your homes. This will not lengthen your road more than two or three days. The Frenchmen I give you will soon enable you to make up that time. Moreover, if the bark is ready, I ^{will} give orders to embark you in it to cross the Lake. If not the French will take you to Niagara.

My children, I take this precaution lest you should mix my Milk with that of the English by passing by Chouéghen, and lest

has not to be taken under consideration for some time

Direction of Glacial Movement. Before proceeding to the consideration of the topography, we will turn for a moment to the direction of movement of the glacier which controlled most of its features.

But two kinds of evidence of the direction of glacial movement are available on the area: ~~glacial~~ striae and the trend of the longer axes of the drumlins. The former are rare, both because of the slight glacial erosion and the unsuitable character of the rocks *to retain them*. ~~all striae were~~ found on the Madison Sandstone, but ~~more extended excavation might have lengthened the~~ list given in ^{(see} Table p. . ^{derived from the axes of} Evidence of the second ~~kind is now considered superior, it resulting from~~ *drumlins necessarily relate to the last glacial invasion, while that taken from striae may relate to a former epoch,* a later stage of glaciation than do the scratches; ~~however,~~ the two generally agree perfectly. *cloudy*

Do you imply that the striae belong to several epochs?

The general direction of the ice movement was southwesterly, but a marked spreading out of the glacier is noticeable on the map, p. . The striae range from S.-60-W. at the far west of the area to S.-25-E. at Colliday's Point on the west shore of Lake Kegonsa(1). The latter are apparently the newer of the numerous scratches found at that ~~point~~ ^{spot}. A little farther west, however, the normal trend to the west of south is resumed; the discovery of these last striae seems to weaken the force of certain of Alden's remarks on the divergence of the axes of drumlins from ^{The other} ~~this~~ form of evidence in that locality (2)

meaning obscure

(1) Alden, Prof. Paper 34, map.p.72; Bull. 273, map p. 10.

(2) Alden, Bull. 273, p.11.

thee here again.

My children, as soon as I see
your fire well lighted, I will send
you a chief, a blacksmith, and French-
men to take you what you need.

10 ft. Seal.

To the Maskoutins.

My children, you are right in
thinking that I shall have pity on
you, and that I shall always continue
to show you the same kindness.

My children, I rejoice that your
having taken the road I traced out
for you, and at your having come
to listen to my word. You did right
in following the chiefs who decided
to come and see me.

Begin

I have always included you in
the number of my true children.
You see that I treat you all equally.

My children, you will be free to
leave whenever you like. I will
give Frenchmen to you, as to the others, to
take you back.

Classification of Drift Deposits. Turning now to a consideration of the present glacial topography, we find that glacial erosion, even if present (and we shall find (p.) that it probably was very restricted), is far outweighed by features of glacial deposition. Upon the map of the drift (p.), following Alden, there have been shown only terminal moraines, outwash, drumlins (including under a separate color rock cored drumloidal hills), unclassified ground moraine (including most veneered hills), and peat deposits of Recent age. It is to be observed that the distinctions are wholly topographic and genetic, not being based in any way on the composition of the drift. There is naturally considerable gradation between the different types and the exact location of the division lines is sometimes rather arbitrary.

Terminal Moraines.

Johnstown Moraine. According to Alden's maps,

The Wisconsin glacier extended no more than four miles to the southwest of this area where it formed what ^{Alden} he has termed the Johnstown Moraine, a northern extension of which barely touches the southern border of the district mapped.

Lake View Moraine Retreating farther, the glacier halted for some time with its ~~XXXXXXXXXX~~ ^{edges} ~~end~~ across the southern part of the area, there forming another terminal moraine which apparently merges into the older one at ¹Elton, Rock Co. (1), and then joining Alden's Milton Moraine. For this

(1) Alden, Prof. Paper '34, maps pp. 64 and 72.

that thou wishest to have the sky clear.
I will always strive to have it so.

To the Kikapoux.

10 pt. Ital.

My son, I know that thou hast
never deviated from the road I traced
out for thee. To give thee proofs of my
satisfaction, I change thy medal; and
I give thee thine for thy son, that he
may be recognized as a chief through
that mark of distinction.

My son, I know that I have given
thee my heart and that thou bearest
it continually with thee.

My children, I am pleased that
you have ordered the road I
traced out for you.

My son, I leave thee at liberty
to settle in the meadow of the Maskan-
hins.

My son, I hope the master of life
will preserve thee long enough to allow
of my having the pleasure of seeing

reason the writer will use a local name, the Lake View Moraine.

At first sight this moraine would appear to be massive, but careful search reveals the fact that nearly everywhere it simply masks a range of rock hills, many of which are of the friable St. Peters Sandstone. As is well known, the topography of such a moraine is of the most irregular character; ~~the~~ hummocks, pits and ridges are intermingled in the greatest confusion. Although the slopes often appear very steep none were found to exceed 25 degrees; the steepest are generally on the stoss or north side then forming what will, for convenience, be termed "ice faces" from their origin as explained on p. . The normal trend of these ridges in the moraine is approximately transverse to the direction of the glacial movement but there are also hills in a longitudinal direction. The latter are often found in the gaps where the moraine crosses pre-glacial valleys; the abundance of stratified drift in these depressions bears witness to the fact that they were the channels of the streams derived from the melting of the ice. (see p.).

To the south, the type of moraine just described is confusedly intermixed with areas of stratified and pitted gravels (see fig. p.); these constitute what is called "kame gravel" topography. The pits, although generally smooth in outline, may have very steep sides which simulate those slopes due to pre-glacial water erosion; this is most prominent

not a true
in good message

evil will ^{Come from} escape thee.

My son, I am delighted that thou hast the same heart and the same sentiments as thy brothers, and that thou followest the traces of thy Father and of thy ancestors.

My son, I know thy heart is sincere; thou art right in saying I have only one word.

My son, I am delighted that thy young men are quiet in your village; thou seest that I have pity on them.

8/11/18
✓ Note on original mss.!

My son, I know what thou hast done with regard to the Nation whereof ^{thou hast spoken} ~~thou speakest~~ to me. ✓ It has acknowledged its error and I have forgiven it.

It is right, my son, that thou shouldst continue to avenge the Blows struck by the Chicasas upon the French and upon Monsieur de Vincennes. I ask ^{thee} ~~you~~ to join thyself to the collar I have just given for all your Nation.

My son, I am pleased to see

when there are irregularities resembling side valleys. It is not possible to separate this type of topography from the moraine proper as the two seem to be intimately related in origin (see p. 93).

To the east, the moraine itself becomes predominantly composed of stratified materials and grades into the same topography just described. The drift is deeper and completely conceals the pre-glacial valleys.

In spite of the large amount of undrained ~~area~~^{surface} in the Lake View Moraine, there are now no lakes within its limits but ~~to~~^{area} to the east of the ~~map~~^{area} it crosses the lower Yahara River forming part of the dam that ~~encloses~~^{retains} Lake Kegonsa. A large portion still remains wooded (photo. p.) being too steep and stoney for cultivation. As was suggested in the Section on Economic Geology, p. , the water collecting in the numerous depressions protected by these woods, probably escapes underground to feed the large springs to the north.

A mile west of the area the most southerly ridge of the moraine is found to end sharply against a rock hill at an elevation of about 1080 feet. This circumstance gives us a good estimate of the ~~thickness~~^{depth} of the edge of the ice sheet where protected by the hill; there is thus determined a thickness of about 280 feet above the bottom of Lake Waubesa.

The subject of the materials of the drift will be treated later (p. 88) but it is worthy of note in this connection that at the western side of the area,

My Father, what I have just said to you is without design. I have experienced difficulty in reaching here, because my canoe is worthless. I hope you will give me another ~~one~~ ^{for the} ~~for the~~ ^{home and journey.}

My Father, I said to the Commandant. that so long as I lived, nothing evil would happen at Detroit, because my Father's heart and mine were the same. Something might occur after my death.

Mékinac.

My Father, this is not the first time we have come to you; they who have the medal have already been here; we beg you to give us others.

My Father, here we are with you; it is Ohicatalien who ^{has} come to take your hand with these three other Chiefs.

My Father, you alone have strength, we know that you are the master of the whole country, and of all the

10 pt. total
Mékinac (Mikinaq, Mikinas, Miquinas) as early as 1696 was one of the leaders of an attack on the Iroquois, which broke for a time the peace made with the Iroquois of the Ottawa River. Later (1747), his loyalty to the interests of the English. Later (1747), his loyalty to the French weakened, as did that of all the Ottawa tribes except Linasabie's. - Ed.

where the moraine is at once highest and least in volume (see structure section G-H, p.) it is composed almost entirely, so far as can be ascertained, of ^{eratic} boulders and clay. Farther east ~~the~~ drift is more nearly of the usual character and in places sandstone boulders predominate over the ^{crystalline rocks,} ~~eratics~~. The north ^{most} of the moraine contains large sand deposits which were mentioned under that head in Section III and will be treated from ^a ~~the~~ the ~~therotetic~~ standpoint at the end of the Section (p. 97).

Wingra Moraine. During the further retreat of the ice front, a smaller moraine, which is not continuous, was formed. It is best developed north of the area in the Dead Lake or Wingra Hills and west of University Bay on Lake Mendota, being therefore termed the Wingra Moraine by the writer. This feature (within the present area) has heretofore escaped notice and ~~it~~ will therefore be treated in somewhat greater detail than its importance would ^{otherwise} warrant.

Former investigators have made the morainic deposits on the south shore of Lake Monona the continuation of this moraine, which indeed they are but dating from a later stage when the ice had retreated until its border was about east and west; this will be termed the Monona Stage by the present ~~Writer~~ ^{Writer}.

~~There is~~ ^{There is} little difficulty in following the moraine into the borders of the map for excavations show that it persists even underneath the marshes at Murphy's Creek near South Madison. Where it enters the ^{low-lying} ~~area~~ south of the Cranberry Marsh it ~~shows~~ ^{shows} the

flicted by the loss you have experienced through the death of your Warriors who were killed by the Chicachas. Here is a leaf I throw on their Bodies, and *Begin* a drink of Milk to wipe away your Tears.

My children, you have given me pleasure by following the Road I have traced out for you. It will always be clear, and you will never find any Ambush in it.

My children, I have already told you that I received with pleasure the Hearts of all your young men. I receive yours and your Calumet with Equal satisfaction.

My children, I know that you are not accustomed to Canoes. I will therefore give you Frenchmen to convey you.

By a collar.

My Children, you do rightly in weeping for the death of Monsieur de

10 pt. Ital.

characteristic "ice face" and boulders with gravel on the lee side overlying sand. Throughout the moraine, within the district surveyed, the surface clay layer (See p. 82) is nearly absent. A break occurs at the Nine Spring Marsh but on the south side the road follows a ridge of gravel and boulders which resembles a lake bar; it is really the stoss face of the moraine of a glacial lobe which once occupied the valley.

Upon the hill to the south the ice face and boulders are again well shown and there is much sand, which indeed is characteristic of most of the moraine.

Rock is believed to exist beneath the highest part.

The lenticular hills to the west are the tails of buried drumlins. Farther to the south breaks are

more common and the moraine is but locally developed as mounds of gravel or pitted hills; several drumlins are more or less covered by these. South of this portion, on the west of Lake Waubesa, there is much sand. On the east shore of the lake the evidences of this stage of the ice front are less marked but they may be followed, with many breaks, to some well marked morainic deposits on the east shore of Kegonsa.

In the northern part of the area are two small patches of sandy kames which are believed to date from the Monona stage while the small moraine at the far northeastern corner ~~off~~ the map is also provisionally correlated with it.

Outwash.

Lines of Glacial Drainage. The Oregon Outwash

Plains south of the Lake View Moraine were formed

If all this can be followed on the map it is all right.

Archives Coloniales.

Canada.

Correspondance

générale.

C. II, Vol. 77,

fol. 187.

Reply of Monsieur the Marquis de
Beauharnois, Governor-general of
New France, to the ^{speeches} words of the
Ouyatanous, Petikokias, Kikapout,
and Maskoutins, (12th July 1742.

To the Ouyatanous.

My children, I have smoked your
calumet with much pleasure, to show
you how I love you all.

My children, I am sorry that the
Chief who was bringing me the Hearts
of the young men should have been com-
pelled ^{by illness} to discontinue his journey.

~~through~~ ^{message} Illness. I have received his
word with joy, and I charge you to
bear him mine. You may say on
my behalf to all the young men,
that so long as they listen to my
words, I will always include them in
the number of my true children.

My children, I am greatly af-

by the debris carried by the glacial torrents that flowed through the several gaps in the moraine (see map p.). All of the waters from the western part of the area where most of these ^{depressions are found} ~~gaps lie~~, after depositing part at least of their load to form the present beds of clay and sand, escaped through the narrow valley of the Oregon Branch. This valley contrasts sharply with the usual topography of the area. Both sides are underlain by disintegrated rock, and although covered with boulders, suggest post- or interglacial erosion; but the side gullies, which, discounting the drift, are adjusted to the main stream, refer it to the Tertiary, it being a col between pre-glacial hills. This valley which lies just north of the Johnstown Moraine, may have been ^{have} blocked with some drift and thus backed up the water into a lake above until reexcavated. The smoothness of the plain to the west supports this view. East of this point the outwash plain turns south to the Badfish Creek.

At several points near the village of Oregon other channels of glacial drainage were distinguished and doubtless they are to be found elsewhere. The best example seen was just west of O-58, Oregon 1; this ^(which) valley along with others to the south, leads from the high, slightly undulating plain to the northwest of the village, down to ~~the~~ what may be, as just suggested, a lake bed to the east, and ^{(pres-}ents a smooth, U-shaped cross section.

If the Wingra Moraine formed any outwash plains they are buried by peat in the marshes; as a matter

Transfer
to Gl. Lakes

and we would settle together in the
 meadow of the Maskoutins, where we
 think the Chaouanous^[Shawnee] will also come
 and settle with us, as they have prom-
 ised us to do so.

— 4/8m

of fact. records of The railway bridges show that there is little drift in ^{a large part} ~~much~~ of the Nine Spring Marsh although there is much in all the others (cf. p. 38)

Drumlins.

Definition of Term The writer has followed Alden's definition of a drumlin as "a hill of glacial drift which approximates to the form of a segment of an elongated ovoid, of which the widest part of the ~~W~~ basal outline and the highest point of the crest are not more distant from the stoss end than one third the length of the major axis, and whose major axis is oriented parallel to the direction of the glacier which formed it!"(1). Of course variations from the ideal are common and it is a matter of judgement what hills shall or shall not be classed as drumlins; the writer has made a separate class, however, of all those in which a rock core is known to be present, but otherwise no consideration of their material has been taken. He has ^{however,} ~~not~~ ^{insisted} ~~insisted~~ ^{very vigorously} upon the position of the summit.

Types. The several types of drumlins are best seen on the accompanying map and sketches although the contours of the former do not always show the forms adequately. The smaller and less prominent ridges have not allways been mapped. Hills of the drumlin type may have more than one summit; when these follow one another along the major axis the term "head" is here employed but when they are ranged along the minor axis the name "crest" will be used for distinction. The writer has distinguished

(1) Alden, Bull. 273. p. 18.

Vincennes. I had given him to you because I knew he loved you and you loved him greatly. By this collar, I ask you to continue to avenge his death.

My children, here is some of my milk for your young men; they will see that I have listened to their request.

My children, you are aware that it costs a great deal to convey Goods to your villages, and that there is a considerable difference between your cost and that of Detroit. Nevertheless, I take your request into Consideration. There will be several traders, and you will be Masters to seek a cheap market.

My children, I will have an answer given to your request for Monsieur Denoyelle. I must first know how your villages will be arranged.

To the Petikokias.

My son, although thou hast never appeared in Councils, I think nothing

"Simple", "Multiheaded", and "Multicrested" drumlins.

Simple Drumlins. Simple hills of the drumlin class are of all sizes from mere mounds of less than a hundred yards in length to such ridges as 958 Ft. Hill in Sec. 12, Fitchburg, but usually the length does not exceed 600 yards, or the height, 60 feet. When many such hills lie alongside one-another as on the east side of Lake Waubesa, Alden has likened the ~~resulting~~ striking topography ^{thus produced} to a school of dolphin backs. Occasionally overlaps are seen such as is shown in the sketch on p. (1)

The profile of a drumlin is almost always a continuous curve with but minor irregularities although the tops of the longer ridges sometimes approach flatness; according to the definition the stoss side must be the steeper but this is not always very marked. The transverse section often does not show the same inclination---which is ^{frequently} ~~often~~ very steep---on both sides and never a flat top over any considerable portion of the summit. Some hills are ^{approximately} ~~very close to~~ a perfect hemi-cigar-shaped.

Multiheaded Drumlins. From coalescing drumlins ^{or those with very long tails} there is an insensible gradation to multiheaded ones. This type is quite common and the best examples are to be seen in the long ridges west of Lake Waubesa. ^{where one} ~~There 958 Ft. Hill~~ has four distinct summits. These long hills are often somewhat curved and with their steep sides form the most striking feature of the landscape (see photo. p.). The heads ^{of which that at the stoss end is the longest and highest} need not always be in the same straight line but irregularities in the side slopes may produce more or less of an offset.

your other Children.

My Father, we have come to see you and to listen to your words. We hope you will have pity on us.

We hope, my Father, that you will send us away soon lest ^{the inclement} ~~we be caught~~ season overtake ~~us~~ on our journey, by the season being too far advanced.

My Father, as we know not the Road, we hope you will give us Frenchmen to lead us above the Rapids.

My Father, we ask your permission to go by the South of the Lake to shorten our road.

Maignomba in the private Room.

My Father, the Puants came to me in my village last Summer to seek a refuge and to form but one Body with us, because they could no longer live with the Renards, who attacked them continually. I gave them my word that they had only to come to me,

10 pt. Ital.

Multicrested Drumlins. From overlapping normal drumlins ^{or those with side spurs} we also see gradations to those of the multicrested variety. Their summits may or may not be exactly tandem but are joined by a well marked saddle or col. These summits are the most ever seen and the best examples ^{being} ~~are~~ near Macfarland (see photo. p.) XX XXX (X 2). Instances are seen where one of the hills is much smaller than the other; ~~two of these are illustrated by the accompanying~~ (sketches ~~pp.~~ ^{pp.} ~~These smaller side hills grade into main~~ ~~ridge spurs or lobes~~)

Axes. The ratio of the major to the minor axis of a drumlin seems never to fall below 2 : 1, and is generally much greater. The directions of the longer axes are conformable to those of the glacial striae (cf. p. 74) but are not always uniform among themselves. Notable divergencies occur ^{ing} along all of the east side of Lake Waubesa.

Other features. One of the most striking minor features of the drumlins of the present area, is the scalloping of their flanks. This is often symmetrical thus dividing the hill into a series of lobes or it may be asymetric or confined to but one side ~~(of the hill)~~. In the last case that side is generally ^{the} that farthest from neighboring hills. Few drumlins are free from these depressions which have sometimes been ^{the} accentuated by gullying.

While the stoss side of a drumlin is usually rather rounded many have sharp cigar shaped noses. The lee ^{slopes} side are more gradual, often running out into tails longer than the hill proper, and then tending to develop minor summits and pass to the

(1) Alden. Bull. 273, plates V & VI.

and drove them away because we knew they would not do your will.

My Father, our sole occupation will be to avenge the blows struck by the Chicaebas upon your French and upon Monsieur de Vincennes.

My Father, this Calumet is for the purpose of making the sky clear and dissipating the clouds.

The Kikapour.

My Father, I think you will have pity on us because we have never deviated from the Path you traced out for us.

My Father, I think your Heart will have pity on me. It is contained

✓ Note on margin of original mss.!

* "it is a commission of great Chief of a village!"

in this Paper.* ✓

My Father, we have widened the Road you ^{laid} traced out for us, in order to follow the traces more easily.

My Father, I have a Desire to leave the Oujatanous and settle in

8/10/13

multi-headed class. Others have steeper lee slopes being frequently more or less forked into tails. ^{similar to the normal tails,} Ridges rising from the stoss end are less common but the easternmost drumlin in Sec. 34, Blooming Grove possesses examples of both, thus having a shuttle-shaped outline. ^(see sketch & -) Drumloidal lobing of the stoss slopes of other hills is quite common, though never very well developed. ~~Side spurs frequently mar the symmetry of drumlines grading into separate crests.~~

Distribution. Drumlins are notably concentrated in a ^{glacial drift} belt some three miles north of the Lake View Moraine although small ones are found within a half mile of it; some of these last may have rock cores. No such relation holds with regard to the ^{smaller} recessional moraines, several drumlins being partially buried in them. In general, this type of hill is confined to the zone of maximum glacial deposition; they are not found, however, in trunk channels of the glacier such as the beds of the lakes. There is no evidence that drumlins are in any other way related to the pre-glacial topography although Alden states that this vicinity is an exception to the general rule, that they are concentrated on the uplands(1).

Composition. So far as can be observed from the existing excavations, there seems to be little or no difference between the drift in the drumlins and that of the ground moraine; it ~~is~~ usually varies from a very clayey gravel to sandy till with pebbles of local material predominating. Stratification, only part of which can possibly be cleavage such as is

(1) Alden. Bull. 273, p.16.

usages and is accustomed to our ways.
We beg you to give him to us.

The Petikokias. ✓

My Father, as I have never appeared in Councils, I beg you to excuse me if anything escapes me in my discourse.

My Father, what the other band has said to you is the same thing that I wish to say to you.

I am of the same mind as my Father who has already come here twice. I follow the ^{footsteps} traces of my ancestors and my heart is the same.

My Father all that I have said is said in all sincerity. I know that you have but one word.

My Father, all our young men are quiet in our village. They hope you will have pity on them.

There was an evil nation, that of the Remards. We waged war on them.

10 pt 2nd. - Ed.
A Aniatanon (Uea) tribe; see Wee, Hist. Colls., xvi, p. 376.

described by Alden (1), is exceedingly common. Often the beds are contorted (see photo. and sketch pp.) and practically always they dip with the slope of the hill. Exceptions to the last fact are sometimes caused by cross lamination. A cubic cleavage is commonest in the clay which generally contains interstratified beds of sand whose laminae end against the imbedded stones; at other places beds of clean, water-washed gravel are seen. Many drumlins are ^{very} sufficiently sandy ~~as to repay excavation~~ and in none was ^{ordinary} pure boulder clay discovered. The proportion of foreign material ^{being} is never conspicuous. The boulders found below the surface clay layer ^{are} being most frequently of local derivation.; ~~near Macfarland many of the pebbles show much disintegration and their character changes as we pass from the area of outcrop of one formation to that of another (cf. p. 20).~~

Rock-cored Hills. Several hills upon the area under consideration strikingly resemble drumlins but are known to contain a core of rock. Examples of this class are the summits of the high limestone hills in Blooming Grove; there the rock is much weathered and grades into the boulder clay above. To the west, the sketch on p. , shows a hill of soft sandstone which lies between two beautifully shaped drumlins; from the south there is nothing to show its true character but from the north the flat top, gullied sides, scarp, and blunt nose become conspicuous. ~~XXXXXX~~ The reverse of this

(1) Alden, Bull. 273. p.29.

The more sandy character should not necessarily preclude the name of boulder clay. I should not think it proper to make a material distinction.

the meadow of the Maskoutins.

My Father, I do not think I shall ever come back here because I am very old.

My Father, we ask you for a blief, a blacksmith, and Frenchmen to bring us what we need.

The Maskoutins in two bands.

My Father, you have always had pity on us; we think you will continue to show us the same kindness.

My Father, we have followed the road you traced out for us. We have no news to tell you. We come to listen to your word. We Hope you will have pity on us.

The other band.

My Father, when we saw that the bliefs had decided to come and see you, we followed them. We Hope you will have pity on us as on

V This is apparently a well known landmark, see N.Y. Colon. Docs., 1897, and 1898, where it is identified as inconspicuous. The edition is inclined to think it was at or near the site of South Bend, Ind.; but the evidence is inconclusive. See Carr, "The Maskoutins," in Amer. Antiqu. Soc. Report, April, 1900, for wanderings and relationships of this tribe. - Ed.

this phenomenon is believed to exist at 0-72, Dunn 15, in the shape of a stoss side deposit against a rock hill instead of a tail on the lee. The long, symetrically lobed hill south of W-62, Blooming Grove 35 (1) is not thought to belong to this class in spite of the rock at its stoss end; rather it overlies an pre-glacial irregular hill, indications of which are seen to the west. At no point was any marked amount of glacial erosion observed on one of these hills. General theoretical conclusions from the facts stated above will be given at the end of the Section.

Ground Moraine.

The ground moraine, which is chiefly developed in the north of the area, calls for no special remark. It is low and rolling, the highest points generally occurring above elevations of the rock floor and being more or less parallel to the direction of the glacial movement. South of the Lake View Moraine no important hills are composed of drift. Generally the preglacial topography is completely concealed in the area of "marsh-drumlin" topography but in the other districts rock scarps and valleys are often seen (sketch, p.) they being naturally best observed in the veneered belt north of the great terminal moraine.

The northern edge of the pre-glacial upland which forms the last named district is exposed only in Secs. 15 and 18, Dunn. At those points no glacial erosion is observed, for the soft rock and terraces are still preserved with but a slight masking of drift. The stoss slopes of the plateau are elsewhere deeply

(1) Alden, Bull. 273, p.27.

young men have been brought to you.
Here is mine which I also bring to you.
The ^{message} word of the young men is the balu-
-met that fills hearts with gladness.

My Father, as we cannot swim
and are not familiar with Canoes,
we beg you to give us somebody to con-
-vey us.

My Father, we cease not to weep
for the death of Monsieur de Vincennes,
and we are continually on the war-
path against the Chickasaws to avenge
it. ^v

My Father, our young men hope
you will be good enough to send them
some of your Milk. ²

My Father, goods are sold us at
very high prices. We therefore beg that
the Post of the Ojigatawons be under the
system of Licenses like Detroit, so that
everybody may go and trade there. ³

My Father, we love Monsieur de
Noyelles; he is familiar with our

^v On the Ojigatawons post, and licences therefor,
see manuscript of 1731, pp. □, ante, -Ed.

^v For the capture and death of Vincennes at the hands of the
Chickasaws, see ante p. □, -Ed.
² French "milk", i.e. Indian parlance, signified brandy or alcoholic liquors, -Ed.

covered by glacial deposits, which are sometimes stratified, and cause the flowing contours observed. On the contrary, the lee side are often seen to have been left untouched. On the top of the larger summits the drift is quite thick but generally it is negligible. The features due to the underlying rock are ^{easily} ~~easily~~ overlooked but are soon perceived by the practised eye in the steep slopes, ~~and~~ escarpments and terraces such as are illustrated in the several accompanying photographs. The recognition of the terraces at the contacts of the different formations of bed rocks lead to the discovery of many outcrops and the unraveling of the structure and pre-glacial topography.

In many places the preservation of the ancient valleys is remarkable, and sometimes, but for the omnipresent erratics, one might almost imagine himself in the Driftless Area. These features are not confined to any one kind of rock but occur everywhere although the bottoms of the larger valleys and some of the scarps along the sides, have naturally been considerably smoothed by glacial

deposition.

near 0-40, Dunes 19 a ridge of clean gravel resembles an ash; no other features of this kind could be
Relation of Drift to Rock Surface. As rock *recognized*

exposures are naturally found where the drift is unusually thin, the opportunities for studying the ~~relation~~ ^{relation} of the drift to the rock surface are few. However, it seems safe to say from the few deep cuts seen and the experience of well-drillers, that the transition is generally gradual and that the drift overlies weathered and disintegrated rock. Although ~~XXXXXX~~ most ^{commonly} ~~often~~ this loose rock extends to the surface (see photo. p.), it is sometimes impossible to predict

1742: Indians at Montreal.

[MSB. in archives of Ministère des Colonies, Paris: premark "Canada, Correspondance", vol. 77, c. 11, fol. 181-235.]

Archives Coloniales.

Canada.

Correspondance

générale.

C. H. Vol. 77,

fol. 181.

Speeches ~~Words~~ of the Oujatanons, Petikokias,

Kikapour, and Maskoutins to Monsieur

the Marquis de Beauharnois, Governor.

General of New France, 8th July 1742.

The Oujatanons

We are rejoiced at our Father being pleased to smoke our Calumet.

My Father, this is the ^{message} word of a Chief who was obliged to discontinue his journey on account of illness, and who was bringing you the hearts of all the young men.

My Father, we weep, we are broken-hearted because the Chicachas killed us last Spring. We beg you to have pity on us; we are quite naked.

My Father, we have followed the road you traced out for us. We again beg you to have pity on us, and to always look favorably upon that road.

My Father, the Hearts of all the

the presence of rock where the contact is sharp. Nevertheless, the rock surface is rarely striated or smoothed (~~smooth~~). In this connection the effect of the rock on the vegetation where the drift is thin, may be noted. Such localities dry out sooner than others, and hence have few, or stunted trees often with their roots on top of the ground; certain grasses and poplars are typically developed above limestone outcrops. Where the drift is very stoney, however, and the clay layer is absent, these phenomena may be simulated very closely.

Materials of the Drift. Although the materials of the drift have already received some attention in the consideration of its topographic and lithologic form, they may well be reviewed here ^{with reference to their proportion} in greater detail. In Section I (p.) the drift was classified into (A) local and erratic material and (B) ^{un3} stratified and unstratified material.

According to Alden's analyses (1) 87% of the drift below the surficial layer of boulder clay, is of local origin but within that stratum the proportion is reversed. He (only considered) boulders and pebbles and concluded that the proportion of local to foreign material is independent of the topographic form of the drift. How much it might vary if the loose material were included is unknown but the writer believes that in the kames and outwash plains which are the topographic expresion of water laid and hence assorted material, it probably is different. He also dissents in holding that the higher levels of the Lake View Moraine are predominatly composed of foreign

(1) Alden, Prof. Paper 34, p.86.

men, that they should take there in
war time only those indispensably re-
quired, being careful to obtain a license
from Monsieur the General for every
canoe in the usual manner, which
shall be endorsed by Monsieur The
Intendant. To such Licenses shall
be appended the Roll of the said ^{Engagés}
~~Engagés~~ ^{employees} accepted by Monsieur the General
aforesaid. The Licenses and Rolls
shall afterward be Registered in the
usual manner in the Office of the
Jurisdiction of Montreal.

Article 3rd.

The said farmers shall ^{not} load in
their canoes ~~not~~ more than the quan-
tity of four pots of Brandy for the
use of each ^{Engagé} ~~employee~~ during the
journey; they shall further be per-
mitted to send every year in their
canoes thirty or forty casks of six-
teen pots each for consumption at
the post.

89
material. However, north of the moraine no line can be drawn on the basis of the composition of the drift.

The usual drift ~~of the ground moraine~~ is a clayey gravel with pebbles chiefly of limestone and often striated. This grades imperceptibly into sandy till and thence into boulder clay or in the opposite direction to more or less clean gravel ^{or sand}. Quite often the pebbles are subangular and much weathered while many are of chert or silicious limestone. A large number of the erratic pebbles and boulders are in such a disintegrated state that it is obviously due to post-glacial weathering but this is less seen in the more resistant sedimentary rocks. Boulders are stated to be never found below a depth of 60 feet and generally ^{they cease} ~~at~~ less than half ^{depth} of that (1).

Above the usual drift the surface of the ground nearly always is covered with a stratum of clay which frequently contains boulders of foreign origin. ~~XX~~ Often however, large areas are stoneless except for a few pebbles near the gradation to the gravel below. As has been mentioned, the Wingra Moraine forms the chief locality where this layer seems never to have been present, but there are ^{also} other places ~~also~~ where it is lacking.

Most of the sandstone mentioned as occurring in the eastern portion of the Lake View Moraine is derived from the St. Peters formation and is frequently found as large, fantastically weathered or case-

(1) Statement by R. A. Gunsalous, well-driller, see p. .

Article first.

The said Sieurs Olignamecourt, Moriere, And l' Behele shall Themselves or through their ^{Engagés} employees carry on the Exclusive Trade with the Savages and the French Settled throughout the whole extent of the said post, & Wit: with the Puants, folles armoines, Renards, Sakis, And Scioux, Being careful to treat the latter with circumspection and to attract them as ~~much~~ as much as possible; The whole within the usual limits And as far as la Riviere a la Roche which will serve as a boundary in the event of the nations aforesaid going to winter there.

Article 2nd.

The said farmers may send to the said Post such number of Canoes and such quantity of goods as they may deem necessary. With Regard to the ^{Engagés} employees, it is advisable in order to not deprive the country of

The greater part ~~is~~ of rather large rounded
hardened boulders but ~~most~~ is in pebbles. The Madison is also a contributor and when non-calcareous resembles the younger formation so closely that the drift from the two cannot be separated. None can be identified as being derived from the Potsdam although it has previously been considered the source of the great sand deposits. As will be explained later in the theoretic ~~see~~ portion of the section, other causes may explain the observed relation of these to valleys underlain by it. (p. 97).

In certain localities, as near Macfarland, a marked change in the character of the drift may be observed ^{when} as we pass from the area of outcrop of one formation to that of another. The Potsdam generally furnishes sand ~~and~~ which is mixed with limestone pebbles; the Mendota Limestone is not an important contributor but the Madison furnishes sand and pebbles; the Lower Magnesian is the source of most of the limestone pebbles and all of the cherts, while the contributions of the St. Peters have just been considered. This last formation is the source of the red color of some of the drift. As the area of Trenton is limited it does not often appear very conspicuously ~~in the drift~~ but where it does the fragments are all angular and weathered. There are naturally many exceptions to this order due to mixing from several sources.

Average Thickness of Drift.

Method of Estimation. The average thickness of the glacial drift may be estimated in several ways:

1747: Lease for the Post at 10 1/2 1042
Green Bay.

[U.S. in archives of Ministère des
Colonies, Paris; pressmark, "Canada,
Corresp. gén.; vol. 89, C. 11, fol. 146"]

Archives Coloniales,
Canada.

Correspondance
générale.

C. 11, Vol. 89,

fol. 146.

Agreement regarding the exploitation
of the Post of la Baie des Puants.

On this day, the Tenth April, one
thousand seven Hundred and Forty-
Seven, We, Josue Boisberthelot de
Beaucours, Governor of Montreal,

And Honoré Michel de Villebois,
Commissary General of the said Place,

In Accordance with the orders of
Messieurs the Marquis de Beauharnois,
Governor General, And Hocquart, Intend-
ant, we have entered into the follow-
ing stipulations And Agreements
with the Sieurs de Clignancourt,
Moriere And l'Échelle, jointly and
severally accepting, And one for all
to Exploit the post of la Baie des
Puants on the following conditions.

Whereby: To Wit:

Honoré Michel de la Rouillière, Sieur de Villebois, was born
in France. Coming to Canada sometime before 1737, he married in
that year Catharine Bégon, daughter of a former intendant. In 1748
he was appointed Intendant of Louisiana, where he served until his
death in 1752 - 2d.

Sons-Mattheu Danvers, Sieur de Clignancourt, was born in France in 1715, emigrating to
Canada in 1760. He established himself at Montreal, where he
married in 1760.
Jean Morier was born in France in 1715, emigrating to
Canada in 1760. He established himself at Montreal, where he
married in 1760.
Jean l'Échelle was born in France in 1716, and at the
age of thirty-two married Marie Anne Decoyne at Montreal. - 2d.

9/

an average of the various borings that reach bed rock is the most natural method but is open to the objection that the distribution of the data is not uniform; measurements at equal intervals on a profile drawn from the map of the pre-glacial topography are more satisfactory; while rough approximations may be obtained from Chamberlin and Salisbury's observations in the Driftless Area (1).

Results. The first method has been modified by supposing the deeper wells which do not reach rock as extending to the depth at which it is believed to lie; the average of 136 well records then gives 60.2 feet. Following the second method on the profile ^(fig. --- p. ---) C-D and J-K, a result of 55.5 feet is obtained from 209 measurements at intervals of 400 feet. Under the last method it was first assumed that the average depth of the pre-glacial valleys was 200 feet and their volume one third that of the uplands. Then if the drift would just suffice to fill the valleys, its average thickness is 50 feet. Again if an average depth of 200 feet would nearly bury all the ridges of the Driftless Area, and here they are but two thirds covered, in a region where the valleys are but half as large as where the estimate was made, the result of 66 feet is deduced.

Comparison of Results. Of the figures just arrived at ^{the} first two alone are to be considered as reliable and their mean of 57 feet will be accepted as correct; however, this agrees very closely with

(1) Chamberlin and Salisbury, 6th. Ann. Report U. S. G. S., pp. 257-8.

of fort St. Frederic Is 93 soldiers and
the officers. All these Posts are at
present well supplied with provisions
and munitions of war.

One P

We remain with very profound respect,
Monsieur,

Your very humble and very Obedient Servants,

Beauharnois.

Hoequart.

the average of the last two, 58 feet.

Inter-glacial Periods. The only evidencies of inter-glacial periods discovered within the area mapped consisted in the ^{unverified} records of some wells said to be in muck in the Yahara valley. Certain dark clay layers seen at various points were also thought to owe their color to glacial vegetation.

Transfer to p. 94? { Glacial Lakes. No direct evidencies of glacial lakes were discovered but in all probability they existed at several points. Of these ^{one} that east of Oregon ^{is best substantiated} has been mentioned; ^{others} are found near Lake View and at the western Grass Lake; moreover at the Wingra stage of the ice front a large lake may have existed along its border (cf. p.) while one certainly must have existed in the upper Nine Springs valley.

Recent.

The topographic features of Recent age are of slight extent; but the processes at work are of the greatest importance. They are ^{exemplified in} ~~comprised under~~ ^{the formation} of the bars, ice ramparts and cliffs ~~formed~~ in the efforts of the lakes and streams to adapt their shores to ^{movements} ~~them by~~ ^{the} action of waves and expanding ice; in the extinction of lakes and springs through deforestation and ^{wash} ~~increased~~ sediment from the ploughed land; and increased growth of weeds; and ⁱⁿ ~~subaerial~~ erosion and deposition by streams and rain.

Many examples of all of these processes will be given in the following Section on the Topography of the Lake Shores, while the ^{manner} ~~process~~ of the formation of peat was discussed in the Section on Stratigraphy (p)

Exploitation of that Post as on those
above mentioned. Nevertheless, Monsieur
de la Corne, the Commandant at
Michilimackinac, provided for the Safety
and indifferently for the Trade of that
Post, by allowing two private individ-
uals to fit themselves out at
Michilimackinac for the said Place
of la Baye, on condition that they
^{pay} paid 1000 livres each.

The farmers in charge of the
Posts of the Anishinabes and of ^{the} la
^{River} Rivière St. Joseph were allowed to remain
^{for another year} free of cost, in order to Maintain the
savages of that Post until times
change.

Other farmers have begun to make
representations to us whereon we cannot
for the present Report to you.

The garrison of Niagara has, since
the war, consisted of 62 men, including
5 Officers; that of fort Frontenac of 41
men, including 4 Officers; The garrison

If the narrow passage for the escape of such a large volume of water
as must have there formed was ^{even} slightly blocked it would certainly
have backed up the water into a large lake; the smoothness of the
plain to the west supports this view of the origin.

✓ For further reports from the post at Green Bay, see N.Y. Colon. Docs., x, pp. 37, 38, -54.

while
 and the causes of the extinction of springs in that
 on Economic Geology (p.). These ~~denudating~~ agents
 must all have begun their work as soon as the ice
 retreated but the ^{exact} amount of erosion before veg-
 tation got a foothold on the drift is unknown.

*Ought not to
 have some
 evidences*

*Only indirect
 evidence apparent
 I find right.*

how?

Most of them, even including the growth of weeds in
 the lakes and marshes seem certainly to have been
 vastly accelerated by the removal of the trees and
 sod after the settlement of the country. An increase
 in the run off and in the opportunity for erosion
 naturally followed, thus filling lakes and marshes
 and depleting the supply of ground water. What
 earthy matter was carried into the lakes is believed
 by some to have favored the growth of sea-weeds
 while ~~the~~ others blame the sewage formerly discharged
 into the lakes at Madison; however that may be,
 once started they are self perpetuating in that
 they diminish wave action and furnish organic matter
 to mix with the sand and ^{so} promote the growth of
~~bull-rushes~~ and ^{*the like*} ~~so forth~~. Not all of the soil removed
 finds its way so far but is deposited as soon as
 the gradient of the slope decreases, but there is
 always more or less of a delta at the mouth of ^{*each*} ~~all~~
 runs which do not enter ^{*the lake*} through marsh.

The formation of gullies in the fields and along
 the roads, however convenient to the geologist
 when searching for outcrops, is a source of great
 concern to the farmer; the preventatives of this
 form of erosion lie, however, in more scientific methods
 of agriculture. When we compare the dry and bare

we could do to Engage Voyageurs, in consideration of the full remission of the price of the License and of the obligation to Transport the munitions required for the service, to Send there some goods they collected in the store-houses of Private Individuals.

The Post of Michilimackinac has been in the same Position. Only 5 Licenses have been sent for that post and nothing has been paid for them.

We induced The Sieur Gatineau, the farmer of Michipicoton whose Lease had expired, to send a canoe to that Post, on his paying 1000 livres instead of 3750 livres, the amount of his rent.

We endeavored to find a farmer for La Baye but without success. The last Lease in favor of Monsieur de Lagorgendiere had expired. The lack of goods had an effect on The

oak groves of today with the luxuriant vegetation of a few protected spots, we cannot fail to see why the climate has apparently "changed" and many things will no longer grow. The effect of civilization is apparently to limit the number of plants and animals merely to those that are directly usefull.

All the smaller streams have cut ~~small~~ channels for themselves in the drift but now, with increased sediment and intermittent flow, they have become mere runs. So far as can be seen the Yahara has lowered its bed by a foot ^{lost one since glacial time (?)} or so but has been checked by the enormous growth of weeds. These weeds in the river are not wholly harmful in that during the dry summer they prevent the water flowing away too rapidly and lowering the lakes.

The lakes have become nearly adapted to their shores ~~also~~ and ceased erosional work. The ice is hence proportionally more active and has modified ~~all of~~ the earlier features, pushing up all low shores into ramparts. This action is a result of the expansion of the ice sheet with rise of temperature in the spring when the protective snow has melted for that which takes place in the early winter results in only ⁱⁿ an expansion crack.

Moreover when the country was first settled it was during a cycle of ~~weak~~ years which was followed by the great drought of the 90's which gave the death blow to all the smaller lakes and to many springs.

Is there positive evidence of diminution?

Has this effect any significant?

This would almost be definite.

Archives Coloniales.
Canada.
Correspondance
générale.
C.11, Vol. 15,
fol. 15.

1746: Difficulties at Western

Posts occasioned by War. 10pt. 5c.

1038

[Extract of a letter from ~~Minister.~~
Beauharnois and Hocquart to the
French Minister, dated Sept. 22, 1746.
MS. in archives of Ministère des
Colonies, Paris; pressmark, "Canada,
Consp. gén., vol. 85, c. 11, fol. 15." ~~in 1746.~~]

8pt

Monsieur — x x x x x x x x

8 clare

~~[The first part of the letter relates to posts Ten-
tative and Niagara.]~~

10pt

With Regard to the other Posts
of the Upper Countries, The orders you
gave to form them or have them ex-
ploited by means of The purchase of
Licenses, were followed until last
year, but the circumstances in which
we were placed this year through the
lack of goods, added to their dearness,
have not allowed of our continuing
the same arrangement for all. In fact
of the 12 Licenses granted for Detroit,
there was only one for which 500 livres
were paid to Monsieur de Beauharnois;
with Regard to the 11 others, it was all

Part II- Theoretical Conclusions.

Certain conclusions, in part theoretical, have been arrived at from the foregoing facts; the writer does not hold himself responsible for their application outside of the present area. *although they will presumably apply to all the Four Lakes Region*

must allow minor changes by ice erosion.
The net result of the glacial & invasion was deposition and not erosion; the rock floor of today is *approximately* the surface of pre-glacial times except that there may have been a greater thickness of soil ~~then~~ than there is today in the Driftless Area.

Behavior of Ice. The glacier smoothed its path over plateaus by the formation of stoss side deposits, in part stratified. But when the hill to be surmounted stood alone a ~~water laid deposit on the~~ ~~XXXXXX~~ lee side resulted.

Possibly in a few of the higher drumloidal hills *(of the former soil)* greater erosion on the flanks and stoss side may have been more important *but* in no case does the rock seem to have been eroded to any *considerable* extent. The tails are exactly the same in ~~shape~~ as those of drumlins being apparently controlled by the movement of the ice. The influence of the *glacier* ~~ice~~ was therefore constructive and not erosive. *In the case of these hills.* In general deposition was at a maximum in valleys transverse to

not clear
Is this true?
the glacial movement thus *forming* ~~enclosing~~ the lakes. *basins in the longitudinal portions. The sketch on p.*
Glacial Erosion. It was formerly believed that *much of* the entire topography of the drift covered regions, both in the rock and loose materials was controlled by the direction of the glacial movement (1)

(1) Geol. of Wis., II, 613, plate XXVIA.

shown that the ice apparently followed preexisting valleys and was divided around large hills or plateaus

to supply them. This News has produced so great an Effect in the Villages of this post, that they are leaving continually without saying a word.

I have represented to the chiefs that such Conduct Was absolutely contrary to your Will. They answered me that they could not do without Brandy, cloth and porcelain and that all those Goods Were too dear here and at Niagara.

I remain, etc.,

(Signed) Longueuil

However the converse of this statement that the ice was influenced by the pre-existing valleys was never disproved; it is acknowledged by all that the great glacial lobes were so ~~caused~~ caused. Even if the map of the several formations "carved out by the glacial forces" were correct, which it is not, it would not ^{materially} affect this question. As a matter of fact the old geological map was drawn as though the rock followed the present contours which are of glacial origin and hence could not help giving the impression of ~~glacial influence~~ ^{by the ice}.

Arguments against the importance of glacial ~~of solid rock~~ erosion have been mentioned at various places but without stating their significance; they may be based on:

(1) Presence of weathered rock in situ, even where some erosion has taken place.

(2) Presence of isolated hills and ridges of sandstone even near channels of the most active glacial flow.

(3) Scarcity of ground or polished rocks and the crossing of several sets of striae.

What is the point of this argument? (4) Rarity of large fresh blocks of limestone unless with a silicious skeleton.

(5) Preservation of true and almost unaffected water erosion topography even in the softest rocks.

(6) Apparent adjustment of valleys transverse to the glacial movement to those longitudinal to it.

(7) Nearness of the area to the ends of both the newer and older ice sheets.

^{being} based on deductive reasoning. This last consideration

Archives Coloniales.

Canada

Correspondance

générale.

C. 11, Vol. 83,

fol. 61.

1745: Desaffection of the 10 pt
Indians at Detroit. 5. C. saint

[Letter of Longueuil, commandant at Detroit, to Beauharnois, dated July 28, 1745. Source, same as preceding document, but vol. 83 fol. 61.] 8. C. saint

10/11
I have just learned from the
hurons who have come back from
Chouaquin that the English Com-
mandant had assembled the Nations
that were at his post, amongst whom
were ours, to make them a present
of a large cask of Brandy for each
village, which they accepted, and by
which the Englishman told them they
must in future look on them as
the only ones who will be able to
supply them with goods, because fleets
are to put to sea to take Canada
and become the absolute Masters
thereof; that ^{consequently} ~~there~~ the French will
have no more goods this year wherewith.

Arguments on the other side of the question may be based on:

(1) Presence of large sand deposits in ^{valleys} underlain by sandstone. (see p. 97)

plan of (2) Glacial striae and observed rounding *of rocks surface.*

(3) Freshness and local derivation of much of drift material. (see p. 100).

(4) Apparent greater importance and width longitudinal of ~~XXX~~ valleys. So far as the ^{from this area} existing data will show this is fallacious and due to lesser glacial deposition where the flow was stronger.

Barony is not clear (5) The deepest wells are situated in these ~~Wansons~~ valleys.

Needs explanation (6) The estimated depth of the drift is greater than that of the soils of the Driftless Area. (see p. 100).

Reference have been given to the various paragraphs wherein more detailed theoretic consideration of these arguments is taken up. **OVER**

Sand Deposits. We have already considered the distribution ~~XXX~~ of the great sand deposits of the present area which all occur ^{blocking eyes} in valleys underlain by sandstone, and ~~blocked by~~ terminal mor-

Wingra moraine aines and we have also seen that glacial ^{streams and} lakes occurred in all of these localities. Farther north, in the to the southwest of the upper lakes these relations are even better displayed and have ^{generally} always been regarded as ^{being} due to glacial erosion. But these are not all the sand beds, for many are found along all of the ^{that} ~~Wingra~~ Moraine. The writer is inclined to believe

and if those farmers, instead of hee-
ting them, continue to act as they
have done, I shall arrange with
Monsieur Hocquart as to what is to be
done to put an end to disorders
which cannot be tolerated for any
Reason, taking ^{proper} precautions also to
prevent the working of that post being
interrupted.

One P

I remain with very profound respect,
Monsieur,
Your very humble and very obedient servant,
Beauharnois.

Begin
8pt. Quebec, 25th October 1744.

It has been observed in local observers and residents of the
large valleys. It has been observed in the mountains of the
that several acres, although formerly entire
at some points, has not been dismantled for
in the production of the lake or other topographic
features of today.

We can easily imagine the glacial
across the bottom of the Lake Valley at Lake
Wabigoon for under what conditions could
the drainage have extended 300 ft in the middle
to deposit the load? The most that can be
concluded is local observers and residents of the
large valleys. It has been observed in the mountains of the
that several acres, although formerly entire
at some points, has not been dismantled for
in the production of the lake or other topographic
features of today.

that these facts ^{may be} are best explained by the presence of glacial lakes in which the sand was ^{carried by the} washed ~~until~~ and freed ^{and so} of the lighter clay. This would also explain some of the gaps in the moraine and the absence of outwash. It has therefore been concluded that these accumulations of clean sand and gravel are essentially ^{or alluvial fans in localities of exception water action} deltas and that there is nothing to show that they were derived from the erosion of solid rock. Instead, much of the sand may have been part of the pre-glacial alluvium in the stream bottoms. ^{I must admit I have thought the younger moraines of the area are not fully explained for they show remnants of channels of drainage} Terminal moraines. Large parts of the terminal moraines of the area seem to have been fixed in location by the presence of rock hills. In the case of the Lake View Moraine the plateau to the north must have thinned the ice and caused it to deposit much of its load there and hence leave the veenered belt free from ~~much~~ drift. Any other influence of the pre-glacial hills may have been to furnish too great an obstacle for the weakened ice to overcome, ~~or they may have shielded its edge from the sun.~~

It is noted that where most of the moraine is of ^{igneous} forain and hence englacial material, that its mass is very small thus showing the slight amount of ~~that~~ form of drift.

The "ice face" or ice contact face, is the steep slope characteristic of the ~~stoss~~ side of all moraines ^{within this area} and was caused by the accumulation of material against the ice. Minor advances and retreats thus caused

Why not transport on ice?

Is there such an absence?

Why not alluvial fans?

What is the bearing of this?

of the interested parties of whom he
 complains more especially continues
 to give trouble, ~~he is~~ to send him back
 to Montreal when the Canoes return
 from that Place next year, ordering
 the other interested parties to bring
 him back on pain of disobedience.
 With regard to the matter of the com-
 - pact made by those farmers with
 the coureurs des Bois & ~~xxxxxx~~ ^x ~~xxxx~~
 I ordered him to oppose the carrying
 out of such an infringement of
 the King's Ordinances by not per-
 - mitting the delivery of the goods,
 and, on the contrary, giving orders
 to the farmers and the ^{Engagés} Employees
 to seize the coureurs des Bois and hand
 them over to him that he may send
 them home. I shall have the honor,
 Monseigneur, to report to you next
 year all that happens in connection
 with the orders the Sieur de Lusig.
 -van is to give on the receipt of ^{Commande} ~~my~~ ^{your}

overlapping and confused ridges and mounds inclosing the frequent undrained areas. Other pits, including all of those in the same areas, were caused by the melting ~~out~~ of buried ice blocks. These latter deposits often partially bury the moraines proper thus indicating a later origin but the two forms are mixed (inextricably).

Drumlins. A few statements may safely be ~~a~~ made ~~of~~ concerning the drumlins of the present area. They are: composed of local material; accumulated under the ice; often more or less stratified; shaped by the movement of the glacier, not built on rock cores unless by accident; distributed with apparent disregard of the pre-glacial topography, although not found in the paths of freest glacial flow; close to both stoss and lee slopes of the rock hills; conformable in direction to the striae; not related to any tensional strains in the ice which might have caused crevasses; confined to the zone of maximum glacial deposition; become ~~XX~~ smaller as we approach the terminal moraine; and buried by recessional accumulations.

Various causes have been assigned for the formation of these hills; but in view of the wide variations in their form, which is apparently determined solely by the mechanical action of the moving ice. it seems possible that all are not of the same origin. The most that can be said is that they avoid the principal paths of the glacial flow and are concentrated in localities of comparative

those Couriers paid on the Spot, the farmers bind themselves to supply them this fall with goods at the same rate as they sell them to the other French of the post and to give them permission to Trade them at that Place; That, ^{also} as he has no garrison with him, he has been unable, not only to secure the Couriers des Bois, but even to repress the License of the farmers ^{who are} ~~which is~~ all the more ^{blameworthy} reprehensible ^{as} ~~that~~ they are acting in direct contravention to His Majesty's ordinances, ^{supporting} ~~basing~~ themselves in this matter, as in all others contrary to good order, ^{by} ~~at~~ the argument that, as they pay the rent of the Post, they must in no wise be hindered in anything they consider ^{conducive to} ~~suitable for~~ their interests. On learning of this weak argument I wrote to the Sieur de Lusignan to see that order ^{is} ~~be~~ kept at that Post and ~~that~~ if the Sieur Auger, ^{or} one

✓ ~~The same~~ Auger (Augé) was a common ^{name} ~~name~~ in New France; possibly this was Louis, who is listed as a merchant at Lac Beauport - Ed.

stagnation; this agrees with the suggestion that they are analogous to bars in an overloaded stream.

Clay Layer. The omnipresent surface clay and boulder layer is generally regarded as having been laid down from the englacial drift during the retreat of the ice sheet(1). This is the most plausible explanation in most localities but ^{the clay} it also ^{where such an explanation is plainly inapplicable} occurs in the same X areas. Some think that where stoneless, it was dust blown from the englacial drift which had melted out on top of the ice while others agree the work of ice bergs, a theory which requires the presence of larger ~~XXXXXX~~ marginal lakes than seem to have existed. In many localities where this layer is absent it has obviously been removed by post-glacial erosion. ^{Since the ploughing of the fields was commenced} Ground Water Level. As the level of the Yahara was raised about 250 feet as a result of glacial filling the water table has been enormous~~ly~~ raised above its pre-glacial level. Moreover in some localities the water stands higher in the clay and clayey sand that it could have ^{stood?} in porous rock. As a result there is no rock exposed which has been in the belt of cementation longer than since glacial times.

Derivation of the Drift. Although the study of the present area cannot solve the question of the derivation of the drift the figures expressing its amount are far more accurate than those at the disposal of Chambelin and Salisbury who made their investigation before the introduction of drilled wells (see p.). They endeavored to compare the average thickness of soils in the Driftless Area

Post shall give every protection to the farmers to facilitate their Trade, he shall likewise exert his authority to drive ^{from all the Territory} ~~away throughout the whole extent~~ of the said Post all Coureurs des Bois and deserters, whom he shall cause to be arrested. when necessary, And their goods shall be seized at the ^{suit} diligence of the said farmers and sequestrated after an Inventory has been made of the same, Until Monsieur the General and Monsieur The Intendant have given orders regarding them.

Article 7th.

The farmers shall be obliged to provide the Commandant with Fuel and lodgings, and ^{to} supply ^{him with} the presents it may be advisable to give the savage nations of the post, but always in moderation, And solely to keep them well disposed toward the French, And Prevent them from taking their furs to Strangers, such presents ^{to be} being Independent of

with the average thickness of drift necessary to cover the ridges of that region and with the mean depth actually present in the glaciated ~~regions~~ ^{country}.

Now assuming ^{that the same ratio of foreign to local material} 75% of the ~~XXXX~~ 57 feet of drift ^{as determined by Alden from analyses of the pebbles,} to be pebbles, which alone were considered by Alden ^{which then 87% or 49.6 ft out of 57 ft (6-1)} and of then 87% or 51.5 feet was derived within the limits

^{we find that} of the state, Chamberlin and Salisbury (1) found that

the average thickness of the residual soil of the Driftless Area was 7 feet to which should be added from two to six feet of more or less disintegrated

rock. If we deduct ^{9.6} 11.5 feet for this it is still found that 40 feet remains to be accounted for by

importation. This may have been derived from (a)

(glacial) restricted local erosion, (b) planation farther north,

^{or} (c) thicker pre-glacial soils, ~~or XXXXXX or XXXXX~~ of ~~erratics~~ Wear of erratics and of local material

must have also furnished much of the finer material.

All sand is seen to be much rounded and mixed with minerals from the crystalline rocks. We know that

all of these factors had their influence but their discussion is not here attempted.

As the main conclusions of the present work the writer finds that:

(1) Pre-glacial valleys have a greater depth than was formerly supposed.

(2) The lakes and other features are not due to glacial erosion but to inequalities in deposition.

(3) The pre-glacial topography has left its mark on most of the drift features, fixing the position of the hills and controlling deposition.

(1) Chamberlin & Salisbury, 6th Ann Rep U S G S p 254

shall not under any pretext whatsoever carry on any trade; or The previous farmer may make arrangements with the new farmers with reference to such debts, or the new farmers shall recover the same at their cost, And in such case one half of the debts collected shall belong to the said farmers who shall have the alternative or choice, And who shall be bound to deliver the other half of the said debts at Missilimakinac to the order of the previous farmer.

Article 5th.

The Officer who shall be appointed commandant of the said Post shall not carry on any Trade directly or indirectly under any pretext whatsoever; he may only have a small quantity of goods for purchasing the food required for his subsistence.

Article 6th.

The officer commanding the said

(4) The thickness of the drift, 57 feet, is greater than the old estimates from shallow wells but less than the theoretical conclusions of Chamberlin and Salisbury.

(5) The drift is largely of local origin, often composed of weathered materials, and sandstone is an important constituent.

(6) Rock exposures are more common than was supposed.

(7) Greater depth of the drift decreases the area formerly supposed to be underlain by the higher rock formations.

(8) Rocks are slightly folded and possibly faulted; the chief structures ^{have an east-west or a north-south} trend, ~~east and west, and north and south.~~

(9) Main pre-glacial valleys follow synclinal depressions and lesser ones are joint-controlled.

(10) There is much pre-glacial soil left in situ.

(11) The position of the terminal moraine was controlled by a range of pre-glacial hills.

(12) There are several recessional moraines which have heretofore escaped notice.

(13) Ice action has modified all the shore features of the lakes.

(14) Wave erosion and stream downcutting has nearly ceased, the bodies of water having ~~become~~ adapted their shores to them.

(15) Both lakes have been lowered about a foot

and their area decreased by cutting off bays (see following section)

Article 4th

The previous farmer shall not carry on any trade ^{from the moment of the arrival of} ~~as soon as~~ the New farmers ^{Begin} arrive at the said Post. And the former shall be obliged to send away and remove without the limits of the post all the goods he may have on hand; a Statement of the goods so remaining to him shall be drawn up as well as of the Bales that may be made of the same for conveyance to Missilimakinac, where the farmers of the other posts shall be permitted to purchase them; The whole with the knowledge of the Commandant of Missilimakinac aforesaid, and not otherwise; unless he should prefer to dispose of the same by ^{private} ~~mutual~~ agreement ^{with} to the new farmers. The previous farmer shall leave one ^{Engagé} ~~Engagé~~ ^{only} at the post to collect the debts due him, which ^{Engagé} ~~Employee~~ shall be fed by the new farmers, and

(16) The settlement of the country has increased the runoff, erosion and growth of weeds in the lakes.

(17) Ground water drawn upon by the present wells is of very local origin.

(18) The largest springs are fed from the catchment area of the terminal moraine which is both pitted and forested.

those the said farmers themselves may
 give to Induce the savages to hunt,
 And to trade with them. In all such
 Cases the presents of furs that may be
 given by the savages to the com-
 manding officer shall revert to the
 farmers, without the said Officer being
 able to ^{have no} claim ^{Thereon.} Any.

Article 8th.

The commanding Officer shall be
 obliged to provide his food at his own
 expense in consideration whereof the
 farmers shall be bound to convey to
 him in their canoes, every year,
 the quantity of fifteen hundred pounds
 weight, in Food, provisions and goods
 suitable for the purchase of the Food
 necessary for his subsistence at that
 Place; they shall likewise convey
 free of charge his person, his Trunk,
 his money-Box, And utensils required
 for the Journey both going to the said
 Post and returning Therefrom.

V-~~THE~~ TOPOGRAPHY OF THE LAKE SHORES.

omit { The origin of the several lakes, the topography of their shores, and the final extinction of some of them, are the last matters ^{that will be treated.} ~~worthy of our attention.~~ These lakes ^{names of lakes} within the area under consideration are now called "Wau-besa" and "Kegonsa," or commonly "Second" and "First," ^{larger} respectively. These Indian names ^{together with those of the other lakes} were not used by the aborigines themselves, having been applied by Dr. Lyman C. Draper, the founder of the Wisconsin State Historical Society, about 1858. Dr. Draper was requested by Governor Farwell, who was then "booming" Madison, to give Indian names to the lakes, ^{for use} in an advertising pamphlet that the ^{(as being euphonious,} former was writing. The names were selected from the ^A language of the Chippewas, who never dwelt in this neighborhood, their habitat being in northern Wisconsin. The name "Wingra," meaning "dead" in the language of the resident Winnebagoes, ^{is an exception having been} ~~was~~ actually applied to that sheet of water, the ^{common} name of today being therefore a translation; that tribe called the entire region "Taychoperah", or "Four Lakes," but do not appear to have used individual names for the principal lakes. In this connection the writer wishes to say that the Indians did not apply names in the way that we do; they were generally descriptive or derived from some trivial incident and used for identification; contrary to the popular notion, they really have no poetic significance.

next Page!

Correct a recent bulletin by Gannett; - the meaning of geographic names in the U.S.

Lake Waubesa (Second Lake).

Size and Shape. Lake Waubesa is the smaller ^{at} of the ~~four~~ two lakes within the area, possessing an approximate extent of 3.2 square miles with a maximum depth of 36 feet.

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The names of the smaller lakes now extinct, "Hook," "Grass," and "Island," ~~a~~ descriptive, having been applied by the first settlers.

The common names of the lakes, "First," ^{and} "Second," ~~"Third" and "Fourth"~~ were applied by the U. S. Land Surveyors, denoting the order in which they found the lakes in ascending the river. These names are nearly universally used outside of the ^{Madison} city and many ^{persons} do not know ~~all of the others names.~~

A belief is current that there is a still deeper spot, but the writer has not searched for it. As will be seen from the accompanying hydrographic map, the lake is a somewhat regularly shaped, elliptical basin, with its longer axis ^{bearing} a little east of the ^{north} meridian; the southern part deflects more to the west. Under water the basin is very regular being (only broken) by a shoal ^{extending outward from} the west shore.

~~Shores.~~ The shores are broken on the west by Hog "Island". ~~Bram's Point~~, and Bram's Bay; while on the south-east a series of drumlins ^{with axes trending} bearing west or south, break the shore into a series of northward opening scallops.

Surrounding Topography. The topography of the surroundings is in general of the marshy ^{type with many drumlins} drumlin type, but there is also considerable high ground moraine. At a few points veneered hills extend to the shore, while on the west is a buried rock plateau not far above the water level. All of the country to the northwest is of a marshy character. (see plate - ~~see~~)

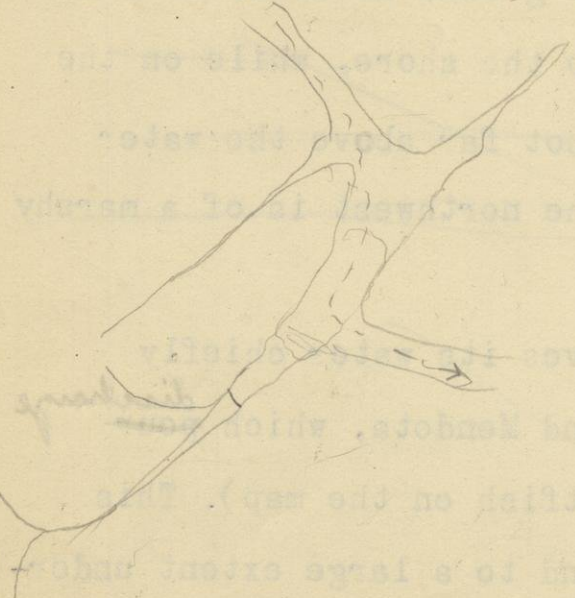
Tributaries. The lake derives its water chiefly from the upper lakes, Monona and Mendota, which ^{discharge} pour into it through the Yahara (Catfish on the map). This stream is choked with weeds and to a large extent underlain by deep ^{muck} beds. In the upper portion however,

A belt of ... that there is a still deeper spot.
... not ... to ... the lake is a
... elongated ... basin, with the
... of ... the southern
part ... to the west. Under water, the basin
is very ... being only ... by a small ...
shore.

The shores are ... by the
"Island" ... and ... on the south.
... of ... of south. ...
... into a series of ... opening ...
The ... of the ...
... is in general of the ... type, but
there is also considerable high ground ... At a few

points ... hills extend to the ... on the
... is a ... rock ... the water.
level. All of the country to the ... is of a ...
character (see plate - 101)

... The lake ...
from the upper ... and ...
into it ... (Gallies on the map).
... is ... with ... and to a large extent ...
lain by ... in the upper portion however.



It contains boulders and ^{farther} ~~lower~~ down ^{the stream} sand shows in the bottom.

The normal fall as determined by the writer for the construction of the proposed canal, is 0.8 ft. ^{in two miles} between the two lakes. The portion of the river forming the outlet of Lake Waubesa will be later treated. Two creeks enter the lake through marsh from the vicinity of Lake

View, and another from north of Macfarland. ^{From the presence of springs in the marsh to the north it is popularly supposed that there are many in the lake bottom but the writer has not sought them.} ^{as suggested above} Origin. The problem of the origin of Lake Waubesa

is relatively simple and the data ^a bearing on it are ample.

~~Although previously explained, it will be reviewed in more detail.~~ The course of the ^{pre-glacial} ~~Tertiary~~ Yahara was approximately ^{that it now follows} ~~its modern one~~ but it was then about 250 feet

lower and possessed several large tributaries. One of these, the Uphoff Valley, ^{joined the main stream} ~~reached from the north~~ of the present lake, ^{flowing from the} ~~from the~~ ^{joining the principal valley opposite} ~~southwesterly direction.~~ On the north there may have been another ~~forming a continuation~~

~~of the main valley similar to the Waubesa valley on the south, in which~~ ^{most of} ~~the lake now lies.~~ Besides these principal valleys were others of less importance. The surrounding plateaus were chiefly of the Madison sandstone and reached an elevation of about 875 feet ~~but~~ ^{upon} the east ~~zone was~~ capped by the Lower Magnesian limestone.

The Glacier, moving southwesterly, encountered these several channels. Favored by ^{that the} the portion of the main valley ^{which,} ~~and its tributaries in the same direction,~~ ^{with lying between two tributaries in the same direction} it followed

~~this course~~ and left ~~it~~ ^{it} comparatively unfilled, while it ~~chock-~~^{for chocking}ed with drift all other valleys not so situated. The writer has already expressed his opinion^(p-) that Glacial erosion was not ^{therefore} a factor in the origin of any of the lakes and that the sand hills at Lake View and elsewhere were probably derived from the pre-glacial soils of the deeper valleys. Prof. Irving correctly conjectured that this lake lay in part in such a northeast---south-west valley (1).

Former Levels and Extent. No trace of any higher ^{more than} 1 foot higher than the present normal stage level than that of the spring of 1905, ^{can} could be found.

~~The indications of such higher stages are often deceptive for ancient ice-pushes may have raised boulders high above the shore so that subsequent filling in front gives the impression of a raised beach. Terraces made by the same agency are also a source of confusion. The area from which ^{has retreated} former extent of the lake ^{may} therefore be considered as simply the ~~that~~ ^{that} along the shore ^{what is} ~~what is~~ now marsh. A careful account of the size of trees ^{The} ~~growing~~ on the various shore features ^{was noted} ~~was kept~~ but merely with the conclusion that all ^{these structures} ~~are~~ several hundred years old at the very least. Indian mounds are found on a tree-grown hill (037, Dunn 18) south of the lake. They must have been built before the formation of the marsh in that end of the lake, but no trees upon them are much over a century in age.~~

Mounds are never found except along watercourses and cannot be less than 300 years ~~XX~~ old.

~~Present State.~~ ^{Stage in Cycle} Lake Waubesa ~~has~~ now in a condition of old age. It ~~has~~ ^{is nearly perfectly} adapted ^{to itself} to its shores, cutting being very slight even at the highest water; few sharp bays or points exist, while ~~the~~ weeds ~~have~~ covered all the shallowest parts. Artificial intervention will soon be needed to prevent the degeneration of this body of water into the condition of Lake Wingra. If the rushes were once removed the waves would retard their growth.

A prominent factor in the suspension of cutting is the formation of a boulder line. Whereever this has been removed as at ~~the Battle Creek Sanitarium on Lake Monona,~~ ^{several points on Lake Kegonsa} the result has been a renewal of erosion. It should never be tampered with. The writer would like to urge the necessity of enforcing the law against filling ^{along the shores} of lakes; ~~these~~ ^{thus caused} obstructions catch a large ammount of shore drift and weeds and help in the extinction of the body of water.

Shore features.

In describing the topographic features of the shores of Lake Waubesa, let us start at the outlet and go around the lake ~~counterclockwise.~~ ^{to the north, that is against the hands of a clock.}

which is in the middle of the east shore of the lake
106.
~~a section of water and southward extending~~

~~Outlet.~~ The outlet has at present two channels;
both are rocky, shallow, and ~~quick-flowing~~ ^{contain swift flowing streams}. The southern one curves rapidly northward, under a steep bank that it has cut; ^{upon its right} the northern and straighter channel is artificial and joins the original below a marshy island which is faced with an ice rampart, ~~which also~~ ^{along the lake} This rampart runs north ^{of the outlet} until it merges into a cutting cliff. It has been dug into in several places showing that it is composed of the usual beach materials: boulders with white to black gravel.

Just to the north ^{of the outlet just mentioned,} a cliff is cutting slowly into a drumlin of sandy clay and boulders; ~~there are noticeable~~ ^{fragments} several of sandstone which seem to have come from the outcrop to the north. A large part of the hill has been removed by the waves,

Passing on, we gradually find the shore changing from a cutting cliff to ~~a non-cutting one~~ ^{are not now protected by boulders}, and then by slow degrees to an ice rampart. ~~More boulders are found at the south end of the latter than at its middle; the explanation of this fact will be given later.~~ To the rear is a peat marsh, three or four feet above the lake level, thus obliterating all traces of the former shorelines. ~~Its age is denoted by an elm tree two feet in diameter which grows upon it.~~

At Edward's Park the shore is a cliff in calcareous

to quartzitic Madison sandstone, being the only rock shore on the lake. As the rock is friable there is no trail of pebbles along the beach. To the north there is a low cliff in till on top ^(from feet above the water) of which ~~at the~~ gulley by the ~~old ice house~~ there is a small ridge, which is obviously the result of ice work, ~~although four feet above high water.~~ Many bull-rushes are found off the shore here, but ^{as usual} ~~not extending to it, as is usual.~~ At the north end of the Park, the cutting shore ceases rather abruptly and there appear ^{instead} two or more ice ramparts containing no boulders.

North shore Directly at the mouth of the little creek, bull-rushes again begin, here growing quite up to the shore, the outer edges forming scallops. The actual shore is a high sandy ice ridge upon which grow huge cottonwoods.

ch? { Trees of their size, however, are known which are not over 40 years in age. In ancient times, although possibly only a few hundred years ago, the lake covered the entire marsh north of the railway track, but doubtless it was extremely shallow. The prevailing southwinds of summer, blowing with a full sweep up the lake, ~~apparently often~~ tried to throw a bar across this bay, ^{several times} ~~which~~ ^{whose shore} the wind-driven currents could not follow. Thereupon the ice, always active, especially in small and shallow lakes,

up
 doubtless pushed these successive bars until they formed
 the ridges--composed chiefly of ^A ~~small~~ ^{fine} gravel and sand---
 now seen behind and in front of the track. A large number
 of these, all trending in the same direction, seem to
 die out in the marsh; one alone, larger than the others,
 continues to the edge of the Widespread, from whence
 it is ^{thought} ~~said~~ to continue under water to near the railway
 bridge, ~~for the cattle can only wade in that direction.~~
 The largest ridge on the present shore runs under the
 track as the latter follows it across the bay. Just east
 of the bridge it reappears as a sandy hook pointing
 against the current showing the preponderance of lake
 action. Outside of the track are large accumulations
 of muck and some incipient ice ramparts.

Old inhabitants aver that the Widespread has not
 been materially affected by the construction of the
 railway in 1858, save that ~~thereto~~ the outlet into the
 lake was wider.

The ridges along the shore to the west ~~seem to fit~~
~~in with the theory advanced for the origin of those~~
~~on the east; and they must obviously antedate the latter,~~ ^{se on the east}
 for no ice push could have made such ramparts since
 the formation of the bar upon which the embankment was
 constructed for the railway. These ridges run nearly

north and south, and are composed of fine material; they are from two to three or more in number, and gradually die out some hundred yards north of the last of the trees. In places a boulder line is present behind these ridges, ^{along the original shore.} ~~Similar features farther west, prove the former existence of a lake in the Nine Spring Marsh.~~

~~An northward opening bay once was entered by this lake just to the west; it first received an ice ridge at the inside and was then cut off by a bar straight across its mouth. Boulder lines are found all around this marsh even up into ^{the town of} Fitchburg. These latter are some 10 feet above the lake and may be ^{indicate another lake or simply} due simply to stream action. Where the railway leaves the low land ^{to the west} the peat is found to be five feet above the lake.~~

~~South of the track, are to be found ramparts continuous with the above. Behind is the usual filling of several feet of peat and wash from the fields. Considerable filling, mostly of organic origin, has accumulated in the reentrant between the track and the shore. All of the latter from this point south to Hog Island is lined with weed patches; they are especially dense north of the red cottage ^{in the bay} and there even some cat-tails have crept in.~~

Wet shore Leaving the ice ramparts, we pass a cutting shore

and come to a terraced cliff like that at Bram's Point. It is ascribed to the especially violent action of ice on a steep bank; that is, it is an ice rampart on an old cut cliff. No cutting is now going on.

no II ~~At the red cottage~~ ^{to the south} The bay is spanned by a long ridge, composed mostly of black sand and gravel. At the south end near the public road there are found many boulders.

Location
Following this ~~near the windmill~~, is a grass-grown cliff. A neighboring fence, projecting into the lake, has caught a large amount of weeds thus forming a point; such as are often important though often only secondary on a previous obstruction, ~~They permit~~ the growth of rushes and then willows. ~~The shore is here erroneous on the published map; I have made the correction on mine.~~

Hog Island Here we arrive at the so-called Hog Island, which breaks the smoothness of the outline of the lake. It is not now, and apparently never was, a true island. Its ultimate origin ^{might have been} ~~was possibly a pre-glacial hill.~~ At all events, ~~There was here~~ a shoal in the lake, for no part seems to ever have showed above water. The ^{waves} lake then cut to its present shape the drumlin to the rear. On account of the slight depth the lake then sought to readjust the shore line. The first step probably was the throwing

up of a ridge by the action of the waves and ice near that which now forms the end of the point. Shore currents from the north then built a bar ---now but faintly seen and in places very peaty --- out to this ridge. At least one attempt failed, as is shown by a bar to the south of the present one, while the beginnings of a later one are ^{seen} outside of it. These northern bars show little ^{effect} ~~trace~~ of ice action. On the south a bar started out in a similar manner, but its traces are barely discernable. However, a ridge, profoundly modified by the ice, reaches out from the south. Traces of it in the shape of boulders extend along all of that side of the point; but the high gravel ^{portion} ~~ridge~~, whose materials may have been wave-born in part, ends suddenly. A small bay, ~~not shown on the map~~, extends inside the boulder line on this side of the point. All of these ^{outer} ridges have been much altered by the ice, leaving traces of recent pushes and angles in the shore line. This has in connection with the waves prolonged the outer ridge to its present shape thus enclosing the little bay at the north. It is said that during the seasons of high water when the country was first settled that these bays sometimes joined thus giving rise to the term "Island." (cf. p. 63, 138, 138)

Succeeding the ridge on the south, there comes a small cut cliff with a beach at its foot. As all of the lake shore from here southward is choked with bull rushes, reeds, and sometimes water-lilies, no extensive cutting is in progress except at exceptionally high water. A large bay formerly existed to the south, ~~leaving the hill on the McConnel farm almost an island.~~ Its shorelines are now as usual obscured by peat and wash from the fields. This marsh is cut off from the lake by the usual rampart, with boulders at each end -- doubtless pushed up from the lake bottom--- and in the center composed only of gravel and black sand. In several places it is massive and shows traces of ^{successive} several pushes the last having raised the highest part which is on the outside. After its formation the waves attempted to demolish it but now all that has ceased and the formation of a beach and the accumulations of muck show it to be a building shore. ~~While currents are often the original cause of such ridges they owe their present height and shape solely to the agency of ice.~~ The overlapping of two ridges is here well shown. Through the opening in the middle of this rampart there flows the drainage of a large area of ploughed land. The resulting sediment has formed a delta (covered at high water) which extends some 100 feet into the lake. ~~On the~~ XXXXXXXX

On the south of the bay, an old point with the remnant of an ^{ancient} ~~old~~ ridge is seen at the end of the woods. Part of the present rampart on the shore here may be original, but the small ridge on top, which is certainly due to ice action, runs almost to the cut cliff under the hill. The prominence of boulders at the ends of ice ramparts has been alluded to; it is regarded as caused by this gradation of the ramparts into cutting shores. There are moreover, many boulders ^{lying} off all this side of the lake in some six feet of water. Just here the bottom is the usual soft sand but many places ^{near} ~~off~~ the cliff are covered with coarse gravel.

Following the cliff, which is in sandy boulder clay and was cut considerably during the spring of 1905, come a simalar bay and rampart. ^{in which but few boulders are original} Most of the boulders seen here have been brought from the neighboring fields, but a few small ones are original. The ridge is largely clean gravel; ^{and few of the boulders are original} through the break is ^{flows another} again a run with its delta which is here gravely. An attempt to drain this marsh has been abandoned but while it was inclosed it was raised considerably by the wash ^{from the neighboring fields}. To the south is an old point ^{surrounded by} with a boulder line around it; as the marsh is somewhat above the lake this might indicate a higher level but it seems unlikely.

Location
 II Immediately to the south of the ~~line fence~~, the rampart joins ~~the~~^{at} cut shore, masking an old ~~cut~~ bank continuous of the shore with the point just referred to. This portion is lined is nearly continuously lined with bull rushes, but nowhere do they come quite to the bank. The cause of this phenomenon is thought to be due to the influence of the stoney bottom, the greater activity of the waves near shore, former low water, and the wading of the cattle. ~~The presence of these rushes seriously impares the value of this shore for cottages.~~

Just beyond Bram's Point is a terrace structure resembling that mentioned at the head of the lake. At first sight it seems like the remnant of a level five feet higher than the present; but the absence of corresponding boulder lines there and elsewhere shows that it is simply the work of the ice.

Bram's Bay As we approach Bram's Bay the rushes cease, and some recent cutting is evident, ~~although upon the bank there are oak trees 8 inches in diameter.~~ This bay is one of the marked features of the west^{*} side of the lake. It is extremely shallow and always choked with seaweeds, although with few rushes, ~~thus making it a favorite autumn resort of the water-fowl.~~ The lake formerly extended much farther into the land, and then actively

~~cut its shores, this leaving a sharp point on the north.~~
 On the south a cliff was ^{then} cut in the ^{Madison} sandstone (034).

Finally by the combined work of currents and ice, several ridges, some of which contain boulders, were formed thus reducing the curvature of the shore-line. As these do not point in the direction that one would expect currents to go, it is probably that they have been moved bodily by the ice. ~~The action of ice in forming ridges on low shore without the intervention of bars, is in the writers opinion, underestimated in importance. From the fact that no shore features have escaped the action of the ice, it is impossible to give any definite opinion.~~

The present ridge along the shore at first sight is a gentle curve but closer inspection shows it to be full of angles. The cross section is ^{like} that of a railway embankment but ^{the flat top} is probably due to ^{trampling by the} cattle walking on top, for it is composed of sand with but few stones. ~~The filling of the upper part of the marsh by an alluvial fan from the fields is well shown.~~

On the south side of the opening the ridge comes close to the old shore and contains boulders. Former ramparts parallel to it together with boulder lines

are also seen. The ancient rock shore then turns south thus leaving another marsh enclosed ~~which is artificially drained~~.

Just off this bay there is a shoal reaching to within some two or three feet of the surface at the normal stage of water. It is of considerable extent, dropping suddenly into deeper water on the east. w ∇

The sandy bottom is covered with boulders which hardly seem to be sufficient to have kept it from being cut to wave base which ~~is~~ (here about 10 feet). From its prominent position and relation to the rock ridge on shore it is thought to be composed of the Madison Sandstone, but there seemed to be no way of proving ~~this~~. ^{Several persons} ~~Fisher-~~ ^amen of unquestioned reliability say that there are other such shoals in the lake; but the writer had no opportunity to search for them. They also say that there are many lines of submerged boulders in a depth of from six to ~~XXXX~~ ten feet of water. Some of these are thought from their angularity, to have been derived from bed-rock.

¶ An unusually large number of old ridges parallel to the present shore is seen X on the south shore of Bram's Bay. Here the beach makes a sharp turn into a large ridge along the main shore of the lake. From this jut

out five old bars which soon die ^{away} out in the marsh ~~XXXXX~~
 for it is higher than the ^{water} lake. The sharp turn made
 by them shows the result of ice ^{action} pushes.

The main ridge along the shore passes into a hill
 of sandy drift and then begins again, two stages being
 seen to the south. First a ridge now very broad and
 containing many boulders at the north end, was thrown
 across the bay to the high land beyond. These older
 features like this often grade so ^{slowly} into the original
 drift that their origin is ~~sometimes~~ obscure. ^{This part} hardly
 seems to indicate a higher stage of the lake. After this
 the entire southern end of the lake filled with weeds.
 Several ridges which overlap at the north, were thrown
 up along the marshy shore forming the present rampart,
 which ~~This~~ ends rather suddenly in the marsh when pointing ^{in the direction}
^{of} the end of the high land at ^{on the east shore,} Water Cress Park. At
 the outer end ^{minor} ridges ^{bearing} pointing more to the south are seen;
 all are composed of fine gravel. Outside much of this
 shore there is a filling of muck.

The lake once ^{covered} ~~extended over~~ all of the marsh up
 to the west line of ^{The Township} Dunn where some of the peat is now
~~some~~ 10 to 15 feet above the water ^{There} covering the ancient
 shore-lines. Strong evidences of this ^{extension} stage are to be
 seen in the numerous cliffs and boulder lines ^{nearer the lake} elsewhere.

~~No special study was made of these except as they were passed in the course of other work. Large parts of this shore were in rock but it is~~ ^{now concealed by landslides from above.} ~~but seldom exposed. Descriptions of the large springs at the head of the marsh were given in Section II. On the east side a steep slope thought to be underlain by rock simulates the cliff of a higher level. Well preserved boulder lines are seen below under a low bank. The weeds alone form the shore of this end of the lake. The water is very shallow for a long way out and no bar was discovered.~~

East shore At Water Cross Park on the east shore, the cottages stand on a very sandy ice rampart which is higher at the outer edge as usual. Behind are springs along the old shore; they may rise from the Madison sandstone. There is a suggestion of a level of two or three feet higher where the old bank joins the present one but it is probably merely due to filling.

Passing a grass-grown cut bank we come to Sherlock's Bay which is one of the prominent features of the east side of the lake. It is blocked by a massive ridge which is mostly of fine material, although where it is thicker in the middle there ~~XX~~ are many boulders. ^{as well as} ~~There~~ ~~are also~~ traces of two or three older ramparts. Inside,

the marsh is much covered with wash which has also formed a delta outside of the natural opening. ~~There are only a few rushes on this side of the lake.~~ North of the bay is Sherlock's Spring, a feeble flow from sand for the a well (W54, Dunn 9) shows the rock to be some 25 feet below the lake level. A cut on top of the hill ^{exhibits} sand overlain by till. The cliff shows only clay and is not now being cut. It must be understood that the high stage of water ~~during~~ the survey covered the beaches which normally line most of the shore. The level was then, as determined by gauge readings throughout the summer, some 1.2 ft. above normal.

Passing on, the shore is high and some is being slightly cut until we pass the 860 ft. ^{a small} drumlin north of which the ancient shoreline turns sharply back upon itself. The marsh nearest the lake is very wet but over most of ^{the} ~~the~~ marsh and especially behind the island all traces of the ancient beaches ~~are~~ obliterated. Here is shown a common phenomenon: the belt of water around the edge of a marsh; it is ascribed to fires which could only penetrate as far as the peat had dried. ^{and also to heaving of the plants} It is also well seen in the marsh north of the railway in Sec. 30, Blooming Grove.

The cottages stand on original land connected by

the edge in clay was there

ice ridges ~~XX~~ of gravel and boulders to the high land on either side. An old bar and boulder lines are here noted especially on the west of the island in the marsh.

East Bay 880 ft. drumlin, the next high shore is the most exposed spot on the lake, ^{is formed by a drumlin} and is being cut away rather rapidly, while ~~to the east~~ is the most prominent bay on this side ^(see plate - fig. 1 -) of the lake. ^a A strong boulder line ^{along the} on either side ^{edge of the high land behind its extension of the lake} shows the former activity of the waves. The ridge along the shore is peculiar; that ^{portion} running east and west is nearly all boulders which continue some distance into the marsh ^{to the east}. The shore, however, turns north with a ridge of the ordinary type. Many boulders are found also all over the marsh while farther back are dry places which suggest old bars. The explanation offered by the writer is that the former rampart was the first formed as is shown by its length and the course of the creek to the far east. Traces of recent pushes, which have considerably modified all the features, are to be seen.

Leaving the bay the shore is a high grass-grown cliff showing considerable recent cutting. A small marsh with a boulder line around it is seen just south of the outlet, our point of beginning.

Lower Yahara River

Lake Waubesa discharges its waters through the Yahara River; a stream which at its maximum probably never discharges more than 150 cu. ft. per second, and has a depth of but two or three feet with a width of some 150 feet. At all points on the outside of curves it has cut its banks and prevented the growth of rushes, but nowhere does it seem to have eroded the bottom to any considerable extent. Boulders are found at the outlet from Lake Waubesa, above what is incorrectly called "Black Bridge Crossing" on the map, and above the iron bridge (Red Bridge Crossing) ^{named} and at the last, there is some evidence of down cutting. However, the river has become so filled with cat-tails and other weeds that the tendency to lower the level of the lakes above has been largely checked. Just at the edge of the high land near the last mentioned boulders, the bottom of the stream is covered with angular fragments of limestone, forming an undoubted outcrop of the Lower Magnesian, and indicating a wide divergence from the pre-glacial course. A mill dam, remnants of which form islands, was formerly maintained just above the bridge but no evidence of the work of the waters in the pond is visible. It is possible, however that the high stage of water thus caused in Lake Waubesa explains the ^{apparent} evidences of higher levels. The dam at Stoughton

having raised the water for a longer period of time has probably considerably affected the beach formations of

Kegonsa; the popular idea that it affects Lake Monona

is fallacious. *The fallacy is that the water between the two lakes is about two feet in depth.*

Lake Kegonsa (First Lake.)

Size and Shape

Lake Kegonsa is larger in size than Waubesa having an approximate area of 5.3 square miles, but has the slightly less depth of 31 ft. As judged from its shore-line the lake is nearly circular in shape being only broken by three points and one bay. An inspection of the hydrographic map shows, however, that this symmetry is broken by a long submerged ridge which extends out from the west shore.

Shores. The shores of Kegonsa are broken on the west by Colladay's point which is composed *principally* ~~primarily~~ of the bed-rock, by a point of till on the south shore, and on the northeast by another rock cliff. The bay between the two first named promontories is the only prominent one ~~upon the lake~~ and is nearly free from the rushes

which fill those on the upper lake. Except for the Door Marsh on the north ~~shore~~ and the small marsh on the southwest

Surrounding Topography. The topography of the surroundings of the lake is upon the north a great marsh, upon the northeast and west veneered hills, and upon the south a sandy terminal moraine.

(all of the shores are high)

Tributaries. Aside from the water furnished from the upper lakes, Kegonsa derives a considerable amount from smaller streams. Of these Door Creek is the largest while a small channel to its west also supplies some water. Farther east is another little creek and on the southwest shore is Hook Lake creek which derives its supply chiefly from springs as was described in Section III under the head of "Water". *As with first Lake Waubesa, the presence of springs in the lake bottom was not ascertained.*

Qigwa The data bearing on the origin of Lake Kegonsa are not so full as those for Waubesa. It is certain, however, from the isolated sandstone ridges at Colladay's point and beneath ^{a portion of the} the shoal nearby that we do not have to deal with a basin ~~exc~~ excavated by the glacier. To be sure there is much sand in the terminal moraine to the south but it is not as well marked as that south of the upper lakes, while there is some evidence of erosion at ~~most~~ ^{at the neighboring rock outcrops} all at 0-17, Dunn 26. ^{fact} The most striking thing is that the lake is wholly in the main valley of the ancient Yahara and that it is in the ^a belt of veneered topography-- a region of minimum glacial deposition. Precisely where the former course of the stream was is not clear; it seems most probable that it here turned from a ~~southerly~~ ^{southerly} direction in the ^{Don valley} ~~narrow valley~~ ^{to} the ^{north} ~~west~~ to an easterly ~~course~~ ^{course} which it followed to near the present turn

to the south about a mile east of the area. The large tributary valley now buried beneath ^{the upper part of} Door Marsh is believed to have had some influence on the formation of the basin by allowing the glacier ^{easy} ~~easy~~ access to the main valley & like a similar one is thought to have in all the other

lakes. *Well records show that the course of the main valley was approximately the modern one.*

Former Levels and Extent. Only slight suggestions of a much higher level of water ^{than the present maximum stage} are found upon the lake under consideration. Its former extent must have been more than twice the modern for it once covered all of the great Door Marsh to the north; ~~no data were obtained as to when this retreat was accomplished but the~~ trees growing on the beach across that end of the lake show *this retreat took place very* that ~~it was~~ long ago.

Stage in Cycle Lake Kegonsa is not as far advanced towards extinction as is Waubesa although all its shores are now practically adapted to it. The regular outline has undoubtedly had its effect in this. The monotonous uniformity of grass-grown cliffs with boulders and a narrow beach at their base is broken only by the two rocky points just mentioned. Nevertheless, at several points where ignorant persons have removed the boulders erosion has recommenced necessitating artificial measures to prevent its encroachments.

Shore Features.

In ~~treating~~ of the present lake we will start at the inlet and go around ^{the shore} in the direction of the hands of a watch.

Inlet ^{Yohara} The River enters through marshy ground ~~especially on~~ its south bank and has been so much turned to the north by a bar coming from the south that the willows on the latter hide the lake until one is almost upon it. There is a concentration of current at the end of this bar producing the unusual depth of five to seven feet according to the stage of water. Just outside, however, the bar continues across under water and is covered with rushes. A small creek ~~before mentioned~~, enters to the north and east of it we find the beginning of the great sand ridge which forms the north shore of the lake. At this point the number of shells upon the beach is noticable but elsewhere the waves seem to destroy them. A ^{minor} ~~little~~ bar turns up the creek thus showing the preponderance of wave over current action.

With Shore Passing on to the mouth of Door Creek we find the ridge higher and grass-grown. The mouth of the creek has been turned considerably to the west and when visited by the writer had been recently nearly blocked by a bar grown out from the east. From the shape of the beach ridge it is evident that the wind has driven it into the mouth

at former times ^{thus showing the preponderance of wave} as it ^{over current action.} has done at the other locality just mentioned.

New wave built deposits are well observed on this sandy beach; they are highest on the outside sloping back to a puddle within. Wherever there is any obstruction like a fragment of drift wood it catches the shore drift ^{thus} forming a point.

"Lone Tree Point", as the writer will call it, having been ^{obtain} unable to ^{count} secure the proper names ^{but few?} of most of the places on this lake, forms the only break in the smooth contour of the north shore. It is undoubtedly original land, as is shown by the boulders, but ^{has} seems to have been raised along the front by ice pushes. The coarse material extends some distance along the beach in both directions but ^{if anything farther} possibly more to the west. Trees farther back in the marsh suggest a former bar connecting this island to the east shore but the peat and the high water hid most traces ^{there} of it. In front of these trees is a smaller channel showing that this connection was not always complete.

Leaving the point we find a long gracefull curve of beach running up to the high land of the east shore. A few, but not many, bull-rushes are found along this side of the lake and at other shallow points, but nowhere are they so numerous or dense as on Lake Waubesa. The great

age of this ridge is evincee by a ~~two~~^{three} and a half foot bass wood growing upon it, at an elevation of some two or three feet above the water level. As we approach the east end of the beach the material becomes gradually coarse~~r~~, containing many boulders, and the evidences of ice-action become more marked. Two ~~older~~ ridges of which the northern seems to be that mentio~~ned~~^{ed} at Lone Tree Point may be here seen. All of these are very massive ant the iⁿnermost is heavil^y wooded; none however, require any higher stage of water for their formation, and seem to have been raised to their present ^{elevation} height by the action of the ice. The ultimate origin is undoubtedly the action of the wind-driven currents in cutting off this shallow portion of the lake.

At the old quarry in the first high land the waste and stripping were thrown into the lake forming an artificial obstruction which has caught a little beach of sand on its south side. North of the quarry is seen an old lake cliff which was cut in the rock. The comparative absence of weathered rock at the quarry shows the existence of some glacial erosion. A marked southeasterly dip ^{of the strata} is a prominent feature.

Passing on we find a cliff in clay now being but slightly cut ^{and} ~~although~~ considerably gullied. The beach material is chiefly limestone which is derived from an outcrop farther south. In a little bay where the drift is more sandy, there is a filling in front of the cliff which must primarily have been caused by the currents which brought the limestone pebbles; it owes the present shape to the ice, and does not require a higher stage of water for its formation. This part of the shore of the lake is low but dry and is one of the most pleasant spots on either of the two lower lakes.

East Point or William's Point Just south of the bay there is shown ^{in a cliff being} ~~is a~~ rapidly eroding ^{ed} ~~cliff~~ some five feet of concretionary, thinbedded limestone corresponding to the upper layers at the quarry. The greater depth of water ~~was~~ close to the shore and the exposed position of this point are the causes of this exception to the general rule that the shores of this lake are not being actively cut by the waves.

Leaving this spot we rapidly pass to an ice rampart which is now being somewhat eroded by the water. The limestone fragments of which it is composed rapidly become smaller in size as we recede from their source. It runs out past a little eastward opening bay which it has cut off but becomes smaller and of very recent date where it crosses the actual mouth of this reentrant, in turning to the north.

Along the cliff to the east, cutting is more active ~~and~~ and overthrown trees are common. A bar has been built out to the east forcing the mouth of the little creek in that direction and several older ones are seen inside that on the present ridge. Just north of the outlet of the lake there is a gravelly bottom which must formerly have been part of a shoal now nearly covered by marsh.

East Bay South of the ~~XXXXX~~ river the railway skirts the shore which is a beach of fine gravel, ~~covered by small~~ wilows. As we approach the high shore near Lake Kegonsa station boulders and coarse material begin to appear and the shore is a cutting ice rampart in front of a marsh. Farther south at the end of this marsh two ridges with a beach in front are noticable; behind is a boulderline along the edge of the high land together with an old rampart of boulders which runs a little way into the marsh just north of the walk to the station. In front of this last is a little point composed almost entirely of boulders, a fact which makes one suspicious of its natural origin.

The cliff, which begins a few yards beyond, is in coarse stratified gravel and is being rather rapidly eroded. ~~A little further on is an old cove blocked by an ice rampart which nearly buries the~~ boulder line behind.

Cottage South Shore — All the south shore of the lake which is a high tree-

grown cliff has been more or less tampered with by the cottagers in constructing boat houses and piers. In several places, as was mentioned before, walls have had to be built or stone dumped to prevent the encroachment of the waves where the boulders had been thoughtlessly removed. The materials of the cliffs is usually boulder clay with locally stratified clay and gravel; it is though however, that ~~but~~ the almost universal surficial stratum of boulder clay may often obscure the true nature of the material by sliding down the slope. Normally ~~no~~ ^{little} cutting is going on but the high water of 1905 renewed it in several places. On the top of the bank, where it is low enough, is an ice rampart often at an elevation of some six or seven feet above the low water of the spring when such pushes generally occur. At the far west end of this high shore the rock shows beneath a concrete cottage.

After leaving this section of the shore which is almost continuously lined with cottages, we come to the outlet of the ~~Hook Lake Valley~~ ^{a valley small creek} with its small marsh. The public road, which here follows the shore, is probably built upon an old bar or ice rampart which spanned this ancient bay. No very marked sign of the activity of the lake when it entered here are to be seen; the ~~rock~~ ^{embankment} scarps sometimes resemble cliffs but are distinguished by the rounding of their lower slopes for ~~the~~ cliffs run sharply down to the flat below. Behind the embankment is seen a portion

of an older ridge while in front the shore line has been readjusted by a comparatively recent ~~ridge~~ sandy beach, which was "quick" when visited by the writer; a phenomenon which is characteristically developed in newly laid sands.

Barber's Point

North of the quarry at Barber's point where the shore is a filling of waste and stripping, there is a low cut bank in marshy earth which is protected by willows. ^{followed} Farther north ~~by~~ the meadow back of Colladay's Point, ^{by} there is a low ice rampart; the photograph of this locality was taken later in the season when the water was two feet lower exposing a beach lined by deposits of wedds and muck.

Colladay's Point

Colladay's Point, the most striking feature of the west shore of the lake, lies on the ~~XXXXXX~~ westward portion of the ridge of rock which forms the shoal to the east. The accompanying photograph shows its structure very well; ^{which lines the shore enclosing a lagoon} the materials of the ice rampart are limestone pebbles, often very ^{large} coarse and derived either from the outcrop to the north or from the lake bottom. The argument applied to the Bram shoal in Lake Waubesa is much better here, for this spot is more exposed ^{being ~} in the larger lake. Of course all the depths given on the hydrographic map are too small for they were measured in the winter, when the water is ^{usually} always low. Although the picture does not show it, there is an opening to the enclosed lagoon at high

stages of the lake which suggest that the beach material was largely transported from the north. The coarseness and angularity of the pebbles in the foreground shows ^{southward of the opening to the lagoon suggests} the possible source from the lake bottom. The pond is of considerable depth as is shown by the singular freedom from weeds although several large oaks on the rampart show its great age. The primary origin of this point is the shallowness of the lake at this point as it was with Hog Island in the upper lake. Drift from the outcrop to the north was probably the first factor but the ice and waves also tended to steepen the shore line.

The Mendota limestone in the hill behind is overlain by more or less calcareous Madison sandstone and shows ^{together with} a little glacial erosion and a lee side deposit of till on the south. On the ^{north} other side the Mendota has been cut and is being cut into a cliff; several large trees are, however, found upon its top. ^{showing the slowness of recession} This rock, although not forming a cliff underlies the beach with but few pebbles upon it, as far north as the spring beyond the cottages. Leaving this we find a low gravelly beach with decreasing amounts of limestone. A huge elm overthrown inward from the shore bears witness to the force of the ice.

This type of low shore with no well marked ice rampart passes to a cliff in boulder clay which is heavily

grown with trees and bushes. This is one of the few spots where there is any resemblance to the original state of the country before the ^{coming} ~~appearance~~ of the settlers.

A comparison ~~XXXX~~ of this thick luxuriant vegetation with the sparse dry and bare oak groves of today, shows the devastating result of civilization. It seems probable that this radical change in the face of the country cannot ~~have~~ failed to have its effect on the climate; we know how it has accelerated erosion, made streams intermittent, destroyed springs, ~~and~~ exterminated certain plants and animals, and dried and filled ^{lakes and} marshes:

The remainder of the shore line of the lake is a more or less high, boulder covered^e bank which, near the inlet, our point of beginning, grades into the bar of coarse gravel with occasional boulders ^{that} ~~which~~ nearly crosses the mouth of the river.

The Extinct Lakes.

While no special survey of the extinct lakes within the present area was made certain features of so striking a character were noted in the course of the work that they demand treatment. It is of course impossible, and would be of little value, to describe all the basins which once contained water; by no means all of the present marshes were persistent lakes, while the shore features of many others have been concealed by peat and wash from the fields. Merely the lakes which have vanished in the last few years since the country has been settled and which are depicted upon all but the latest maps of the U. S. G. S. will be mentioned. ~~It seems strange that Mr. Alden should have allowed them to appear upon his map when he did his field work at least four years after the disappearance of the last!~~ *omit*

Hook Lake.

The marsh, which was until 1898, Hook Lake, is nearly a square mile in extent and contains an island of ~~gravel~~ in the center. From the time of the settlement of the prairies to the north about 1843 to the later '90s the lake was steadily diminishing in size and often went almost dry killing the fish long ago if indeed there ever were any (1)

(1) Madison, Dane, Co, and surrounding towns, Wm. J. Park & Co, 1877
Wm. E. Colladay, p 489

The prolonged drougths which afflicted this portion of the United States in the years from 1887 to 1901 ^(cf p 63, 111, 138) gave the final blow to what ^{must have} ~~had~~ once been a very picturesque body of water. ^{On the west, tamarachs and willows have} ~~already covered a considerable part.~~

^{Surroundings} The lake was situated just south of a break in the northernmost ice face of the Lake View moraine and hence must have been the scene of much glacial deposition. ^{from the waters there meeting} Upon the east, the high hills are known to contain rock cores at the north end at least, while the moraine on top ^{shows a second and in some} ~~grades into~~ kame gravels ^{a second and possibly} ~~on the south; the amount of sandstone is~~ ^{noticeable.} At an old point, beneath a cliff in clay and gravel, is a spot where according to popular traditions the waters of this lake, which had no visable outlet ^{low,} were supposed to seek a subterranean outlet. A pit now but three or four feet deep has been sunk, according to report, to ten feet in weathered, sandy limestone. It is now dry although there is water in the marsh a few feet away and would certainly ^{allow all into it} ~~flow~~ until filled! On the west ^{Two older} ~~smoother~~ ^{ridges of the} moraine and ^{now} ~~kames~~ separate the lake from the basin of the western Grass Lake. ^{most} ~~All~~ these hills contain rock at about the level of the marsh.

The most striking feature of the outline of this interesting lake bed is the "hook" ^{or bay} at the south end among the kames. From it the ancient outlet is tracable to the Oregon Branch although sixty years of ploughing have

(See plate - fig - p -)

136.

nearly obliterated it. The outlet is now blocked by a ridge of boulders but its exact relations to the cessation of flow and to the lowering of the lake level ^{as yet} are ~~unknown as~~ cannot be determined with certainty ~~as yet~~ yet.

Higher Levels

Most interesting ^{or} of the shore features are the traces of two higher stages of water than that in the present

marsh. ~~At the outcrop mentioned in a little eye is~~ ^{stage is generally not usually accompanied with much cliff cutting (see fig - p -)} a boulder line eight feet above the water while five feet below ^{this nearly continuous sandy} is an ice rampart, and ~~pabbly beach blocking the~~ reentrant. Farther north, in the woods, the upper boulder

~~line is well seen while below is the sandy ice rampart~~ which nearly surrounds the lake. ^{Where the shore is steep,} This latter and the little ^{of the lower stage often} beaches look as fresh as those on living lakes although

abandoned by the waves for at least seven years. Such

^{as have just been described} features are tracable along nearly all of the shore of the lake ^(see fig - p -) except where it has been ploughed ^{or the work of the lower stage has obliterated} but were only ^{of the higher} noted where particularly striking.

On the north shore which ^{above} ~~with portions of the east~~ was systematically surveyed, slight interruptions occur in the rampart one of which is shown in the accompanying photograph ^(plate fig - p -). The higher stage cut out the boulders among the trees ten feet above the marsh after which a lowering of the waters caused the formation of the lower cliff. The other picture ^(top) shows the normal succession of boulder line and later rampart while farther west a cut terrace of the higher level was noted. (Generally)

Chore of the high level, which was thirty feet above the road in the valley to the north, 137. ~~XXXXXX~~ the upper features give the impression of slight development and of great age; it is certain from the size of the trees and from the accounts of the inhabitants (1)

that they originated long before the settlement of the country. The areas behind the lower ice rampart are

~~not naturally drained~~ Their showing that little water entered the lake in ~~run~~ after ~~the~~ formation.

cause of Extinction The causes of the first step in the extinction of this

lake, the lowering of the water level, was doubtless due to the down cutting of the outlet which was in the soft

clays and sands of the outwash plain. ~~No levels were run~~ show that the road ^{to the south} is ~~10 ft~~ above the present marsh and ~~to determine the exact relations.~~ There was never any the channel may have been 5 ft deeper.

serious attempt to drain the lake although it was much discussed; as it is, it is useless; too dry for a lake;

too wet for pasture or hay. On the west, however, tamaracks and willows have covered a considerable area.

Other causes of extinction are not far to seek; it was never a very deep basin for according to ^{the best} accounts the maximum depth cannot have been over 20 feet. It must have been filled with outwash from the ~~XXXX~~ glacier; the drainage area is small and contrary to some statements there were never any large feeding springs for the underground water sought a lower outlet to the east. The blocking of the ^{lake} outlet by an ice rampart may possibly have delayed the end until ~~E~~ vegetation was aided by the prolonged droughh.

Origin Data bearing on the origin of Hook Lake are scanty.

In part at least it occupies a col and is held in by

(1) Wm. E. Colladay, cited, p. 489.

the ice face of the moraine at the north and by the kames at the south. ~~The higher level was thirty-five feet higher than the road in the valley to the north, and possibly higher than the outwash plain to the south.~~ ^{Twenty thirty about}

Island Lake.

Island Lake is situated, for it still contains some open water, in Section 3, of the town of Rutland. As may be judged from the name, the chief feature was a high island near the upper end. Its origin was simply an irregularity in the kames. North of the island only the peaty soil shows that the lake once extended there. The cut cliffs in the sandy kames to the east are very prominent as are those around the island and at first sight strongly resemble those scarps caused by the bed-rock. ~~Mr. Alden has shown the island as a drumlin but it bears no resemblance to the proper shape and from its composition of coarse gravel and its association, the writer regards it as a kame.~~ ^{is a kame}

Size of outlet? ^{Raised Beaches} Well marked raised beaches occur on the south of the island at elevations of four and seven feet above the present water level. Spits project in either direction but seem to have been turned back to the north by the ice. The cause of the lowering of the water level was not determined ^{as the outlet was not visited} but is not thought to be artificial although both stages may have occurred after the settlement of the country during the decrease of rainfall which then occurred (cf H³, H¹, B⁵)

The Two Grass Lakes.

Two other lakes still maintain an existence on paper under the common name of "Grass Lake". That shown on the old Evansville sheet of the U. S. G. S. is less often seen but ~~Mr.~~ Alden retains the one in Sec. 2, Rutland. As the name indicates, they were never seen as open sheets of water and neither exhibits any marked shore features.

There are also several other very wet marshes upon the area but the land surveyors, who as is well known were never very conscientious in their work, did not report them. Several show raised beaches and well marked ~~in~~ rapports. As has been explained, Indian mounds are important to the geologist in that they ~~are found only near~~ ^{were only built near} watercourses; The presence of these relics shows that formerly all of the marshes in Blooming Grove were navigable for the canoes of the aborigines.

which is a very wet marsh