Correspondence re: Physical geography of Wisconsin, 1932 revision of Wisconsin Geological and Natural History Survey bulletin, 36. 1932

7-6-32.

LIBRARY OF CONGRESS
DIVISION OF MAPS
WASHINGTON

June 24, 1932.

Mailed from
South Bristol
Maine on July 2

Mr. F. T. Thwaites,
Science Hall,
Madison, Wisconsin.

Dear Fred:

You have never told me whether the plan which Mendenhall, and Twenhofel, and I worked out for the conversion of the Sparta-Tomah folio into a bulletin is agreeable to you, and hence I have not taken any steps to begin the revision of the portions of the text which deal with physiography. I shall be glad to learn your views about the matter, at your convenience.

With warm regards,

Very sincerely yours,

Lawrence Martin

~~Chief, Division of Maps.~~

P. S. I wish you would build a fire under Bean so that he will eventually write me whether Bulletin 36 is dead or only sleeping.

Quaker Bridge, N. Y.,
July 11, 1932

Col. Lawrence Martin,
Library of Congress,
Washington, D. C.

Dear Col. Martin:

Yours of June 24 mailed from South Bristol, Maine on July 2 was just forwarded to me where I am located for the summer.

If you will recall you did not write me about the Sparta-Tomah manuscript but simply mailed me a copy of a letter to someone else. Shortly afterward Twenhofel returned to Madison for a few days and took the matter up with me. I forwarded my agreement to the new arrangement via him by word of mouth. Not long after that I recieved a copy of a letter to him from Mendenhall.

As I will be unable to work on the manuscript to any extent before the early part of 1933 I would be most pleased to have you work on it in the meantime.

No plans have been made for any more field work. Judging from memory only, I feel that the map boundary between the Eau Claire and Dresbach needs revision to a much higher position. Several drawings need revision from new data. The paleontology of adjacent areas has been studied in great detail by Edwards and Raasch who succeeded me because I found myself unable to agree with a certain well known authority although they have since (without any suggestion on my part) come to my point of view. Possibly we could photograph some of the fossils collected before and certainly will revise the section to fit more colsely with theirs, although probably not exactly. Many points which certain authorities regarded as important neither Twenhofel or I can see that way. Some field work will be needed to look at cuts on highways made since 1917. I feel that this should not take long and might be done next summer when no funds will be available for any other work. There is a little left from the old fund, you recall.

When the manuscript was handed in I was senior author and I do not desire to surrender this position.

My text of glacial geology is now at a standstill since I am here for the summer. Expect to do some work on the outwash terraces to throw light on the cause of the reentrant angle in the drift margin.

LIBRARY OF CONGRESS
DIVISION OF MAPS

MEMORANDUM

To South Bristol
Maine

July 23, 1932

Dear Fred:

Your letter of July 11 is at hand & I am delighted to learn that you are working in the east this summer. I think it is very healthy to have some one (who knows Middle Western glacial deposits as well as you do) working on the Pleistocene of the east. Salisbury is essentially your only predecessor (who knew the key deposits of Wis-Ill-Iowa) & his New Jersey work was not particularly enlightening as to correlation.

I am glad to know that you agree to the plan of making the Sparta-Towah folio into a bulletin of U.S.G.S. I'll make a start on the revision of the physiography, &c. as soon as I can.

There is no question that you must continue to be senior author of the publication. I made that clear to Mendenhall after I did built the fire under Twenty which led to the U.S.G.S. agreement to return the MS to the authors for revision & change of form of publication.

I hope you will join me in opposition to Twenty's idea of adding an author or two. Two colleagues is my limit. If Twenty is under obligations to these young guys he can say so in the preface or in a footnote to the appropriate chapter. You & I got up this publication, & the original funds for it, so our wishes should be paramount. Mendenhall will uphold us in this view if you agree with me.

With warm regards
Lawrence Martin

Oct. 14, 1932

Col. Lawrence Martin,
Division of Maps, Library of Congress,
Washington, D. C.

Dear Col. Martin:

Twenhofel and I are planning a field conference in re the disinterred Sparta-Tomah as early next month. It is to include Trowbridge, Tester, Ransch, and Shrock. Doubtless I will have a chance to take over again some phtographs needed for illustrations. With this fact in view could you please send to me the text of the manuscript on bed rocks, such of the diagrams you do not need, and the proposed photographs. In the years which have elapsed since we worked there I have made a special study of landscape photography and can now turn out pictures which are vastly superior to the 1916-17 brand. I have two camerasand can guarantee satisfactory results. The sooner we get this material the sooner we can get to work. Please remember that Twenhofel will not be here during the second semester.

While in New York I visited the Finger Lakes in company with Professors Ploger and Holmes of Syracuse. I returned much more favorable to glacial erosion than I was before I went. However, it seemed to me that undercutting of spurs by glacial and interglacial streams probably accounts for some of the abnormal cliffs. In the Cattaraugus quadrangle I sold the idea to Ploger that his oversteepened valleys are glaciated interglacial valleys as they have no relation to direction of ice movement.

The glacial text is moving again as the New York report is held up awaiting analyses. Illustrations, all line drawings and block diagrams, are now almost done and all the text is in rough draft at least and much of it is in final form. Where and how to publish, if publication is possible in view of the well-known Depression, remains to be settled. Some of the people here are simply submerged in gloom. I try to make fun of them and carry on cheerfully.

Tommy is now walking, has since his first birthday in August, in fact.

I have looked over the single copy of the "revised" Bull. 36 with which I was entrusted but fail to find much change. Have had my students still read the old one. I infer that dictates of cost are the reason. Hope we can had Trowbridge a better case in the Sparta-Tomah report.

It is certainly interesting that both Ransch and Edwards who displaced me in western Wisconsin now hold the views which led to my dismissal!

Sincerely,

Dear Fred:

If you & Bean agree, write Twenny & jazz him up.

Warm regards.

W.H.T.

P.S. Have I forgotten, or was there something said about a new edition of Bulletin 36?

April 18, 1932.

Dr. W. H. Twenhofel, Chairman,
Division of Geology and Geography,
National Research Council,
2101 Constitution Avenue,
Washington, D. C.

Dear ~~Mr.~~ Twenhofel:

Thank you for your letter of April 11. I shall be glad to exhibit parts of The George Washington Atlas before the Division of Geology and Geography anyway, and will come if my quarantine permits.

After you get through your annual meeting and its aftermath, I wish you would take a whirl at the U. S. Geological Survey and see if you can get them to dust off the text and illustrations of our Sparta-Tomah folio and progress a little towards its publication. My own idea is that their criticisms of a few years ago can easily be met by the aurhors. Secondly, that the thing is never likely to be published as a folio but could easily be put in form for publication as a professional paper or a bulletin. Third, that they have no money to publish anything and have enough things on hand to use all printing funds for the rest of the life times of Mendenhall and his grandson. If you and Thwaites and I handle things right, however, we can get all the departments of geology and geography in the middle west to acquire and express an appetite for this publication as a piece of teaching apparatus, since nothing else which is available tells so much about stratigraphy and physiography in a ~~particular~~ characteristic part of the Driftless Area

and in relation to reliable topographic maps. Accordingly, if college professors weep on the shoulders of sympathetic Congressmen, the U. S. Geological Survey might have funds to publish this text pretty soon after its three authors have remodeled it slightly.

You have my permission to take any steps you like along these lines if this meets your own inclination, and if Thwaites will give you similar carte blanche. I wonder if you might not like to take a whirl at the thing while you are here this year or next.

With warm regards,

Very sincerely yours,

Chief, Division of Maps.

LM:CG

Washington, D.C., November 29, 1929.

Mr. Fred T. Thwaites,
Wisconsin Geological and Natural History Society,
Madison, Wisconsin.

Dear Fred:

Thank you for sending me your paper entitled "Glacial Geology of Part of Vilas County, Wisconsin". I shall read it with great interest.

I wish Mrs. Thwaites and you would come to the Columbus meeting of the Association of American Geographers on December 29-January 1. The preliminary program will be available in Madison before long and you will observe that I am going to give a paper as President of the Association on the Michigan-Wisconsin Boundary Suit of 1923-26.

I wonder if you or your mother or the State Historical Society have an extra copy of your father's excellent paper of many years ago regarding the Wisconsin boundaries. I should like very much to have one for my own library.

With warm regards,

Very sincerely yours,

Lawrence Martin

Feb. 14, 1931

Col. Lawrence Martin,
Library of Congress,
Washington, D. C.

Dear Col. Martin:

Bean at last showed me your letters in re revision of Bull. 36. I am sorry about the misprint on p. 6 of the comments. My M slipped up because of haste in typing. You see that since I was married I have to do all my own typing! The sentence should have read" Many recessional moraines---". Please do not judge me too harshly in thinking that I disagree with Alden on all points. His was a wonderful bit of work for the day in which it was done with poor transportation, wretched cuts, no shovel, no brush few striae, no adequate funds, in fact no nothing! However, I do disagree on separation of true morainal kames from pitted outwash. Besides teaching Glacial Geology since 1921 I had three years intensive work in northeastern Wisconsin. Support of latter work has now been withdrawn for reasons not clear to me but it was formerly paid for out of road material funds as long as Bean was a highway commissioner. Real kames are formed below moulins, in pools between ice blocks, and as fans between ice blocks. They grade into till moraine, deltas in large lakes, pitted outwash (flat toppped, well sorted), normal outwash, eskers (different in form), and Flint's crevasse fillings. Many eskers are undoubtedly the latter. If you have not read my Outline please inform me and the lack of it will be taken care of gratis. Now as to Alden: his moraine around Cambridge on U. S. 12 is certainly pitted outwash and I strongly suggest that the long strip south of there which does not run as a moraine should is all the same, although I have not followed it through to near Lake Koshkonong. The area east of Lake Geneva is the same and Bean agrees with me on both, I think. This does not mean that there is no Lake Mills morainic system and certainly does not apply to the moraines farther north around Waupun. These are probably my Mountain morainic series (Thornton of earlier reports). I may add that there is a gap most of the way of 18 miles between my work and Alden's. I could never get authority to do this area so may finish it at personal expense someday when I have no summer job. My maps were the first in Wisconsin where a rigorous separation of moraines and pitted plain was made. I am indebted to you for the inspiration which led to my paper on the subject which preceeded my field work (unfortunately). I would now add some details and am having a student work this winter on average screen tests of outwash gravels as compared to kame and esker gravels. The fact that Alden did not teach me anything about this matter shows definitely that he mapped almost anything with kettles as terminal. If we had not got new ideas since we would not be scientists!

Would you care to read my field reports with maps and then turn them over to Alden for inspection?

With best regards,

Formerly in charge of Pleistocene, now of well records

Feb. 6, 1931

Major Lawrence Martin,
Library of Congress,
Washington, D. C.

Dear Major Martin:

Maybe I should say Colonel, but have forgotten!

In reply to yours of the 2nd I am glad to hear that we are not far apart in interpretations.

Bean has not shown me the letter but I am moved to ask a question: HAVE YOU A COPY OF MY OUTLINE OF GLACIAL GEOLOGY, EDITION OF 1927??? If you have not I will mail you one. It takes up all these matters of glacial deposits although I have learned a lot since the spring of '27 and will make changes when I am able to revise the outline which is getting a bigger and (let's hope) a better task every time it is done. I might add a thankless task for nobody seems to regard a mimeographed outline equal to a printed book!

I have just finished reading Davis's paper on caves. It took a week of spare time and could have been condensed to two pages so far as concrete ideas were concerned. However, if I can find time I will attempt the task you desire.

I never got any suggestion of peneplanation in eastern Wisconsin but ~~seeing that~~, barring a few places where the break in slope is above the "clinkstone" I never did in the west either.

I was sure the new theory of the Baraboo upland would shock you as it did Trowbridge. But there really is nothing radical in it. I also think there are marine cliffs at lower levels each capped with conglomerate. But the Denzer quadrangle is so rotten that one can do little at present. Besides, the argument with Ulrich resulted in my retirement from the field of Paleozoic stratigraphy. The Baraboo Range is within an hour's ride of Madison but nobody is working there now.

In regard to the name Weidman Falls, I know it is bad form to name geographic features after living persons. However, the falls were described by Weidman and are located near his birthplace. Of course, they are half a mile off in location on his map but that is the fault of the map. I think the name is justified. The owners just call it "The Waterfall."

Laid more comments on Bean's desk today.

With best regards form both of us,

Sincerely,

P. S. Would you care to see the annual field rep~~orts of the Highway Commission~~? northern Wisconsin, the work discontinued when

State of Wisconsin
GEOLOGICAL AND NATURAL HISTORY SURVEY
~~MADISON, WISCONSIN~~

Washington, D.C.
Feb. 2, 1931

Dear Fred: Comments

Thank you for the helpful suggestions in your ~~letter~~ of Jan. 28. I find myself in thorough agreement with many of your points and not far from you on any.

In a letter to Bean, and also meant for you, I am raising an inquiry or two about your present views of KAMES, pitted outwash, the Delavan Lobe, &c.

Have you ever read carefully W.M. Davis's "Handbook of Northern France", Cambridge, 1918, and especially his discussion of the Upland Belts northeast of Paris? Do it, if you have not, that's a good fellow, and tell me if you see any essential differences between these French cuestas and the Western Upland of Wisconsin.

Do you see any evidence of peneplanation in the French cuestas? For that matter, do you in the upland belts of eastern Wisconsin?

I'll be tremendously in your debt.

Very sincerely yours,

Lawrence Martin

Your new contributions on hanging valleys sounds appetising. I'll want to read your complete story about the marine upland at Baraboo. Sounds fishy to me, & all fish are not marine.

Now, Fred, this Weidman Falls; have a heart.

Please give my compliments to your mother and to your wife.

LM.

Bull 36 in light of the information available in Jan. 1931

p. 1 p. 1 The statement that the climate and soil of Wisconsin is everywhere favorable to a successful agricultural and dairying industry is open to serious question

p. 10 See my annual reports for tabulation of soil series, also Outline of Glacial Geology.

P. 12 Quanity of water power probably exaggerated. Steam now cheaper.

p. 24 Delete Ulrich's uncompleted report

p. 26 Delete Miller's uncompleted report

p. 28 Delete William's uncompleted report

p. 44 The existence of a large area of Franconia-capped hills in southern Barron County appears to have been unknown at time this was written. Much of this country is quite rough and should not be included in the Central Lowland for farther south the same kind of hills have been put in the Western Upland. The discussion on p. 46 should be modified radically. See ms. of Sparta-Tomah report.

SUGGESTIONS FOR REVISION OF BULL.36

by

F.T.Thwaites

1 Position of Wisconsin in relation to lake and river really a disadvantage.

4 Revise geological column.

6 Shale is not materials given-revise. Use of sometimes?

16 Map of rainfall is not average but of only one year.

32 Revise map of buried pre-Cambrian.

33 Et seq revise statements to include Franconia cuesta, etc.

34 Make new drawing.

38 Make new figure.

48 Revise legend.

50 Do

51 Omit Fig. 19 as misleading.

52 Legend of Fig. 20 is incorrect.

63 Et seq revise to answer Trowbridge as in Sparta-Tomah manuscript.

82 Crags are no evidence of non-glaciation-mention Monument Rock, etc.

93 ~~Plate IX cliff is probably mainly~~ sandstone.

87 Revise statements on caves. If it is desired to shorten the book omit Chapter V.

99 For 1885 read 1855.

125 Correct some statements as to origin of loess.

127 Revise to state condition - these statements incorrect in regions of crystalline rocks.

143 The 100' terrace at Onalaska is really dunes.

153 Mimimize hypothesis of uplift as cause of terracing - a good suggestion if the hinge line were not parallel to river!

159 Omit Fig. 53 - this was a millpond and is now gone.

178 Omit discussion of pre-glacial diversion of Wisconsin as there is no evidence and this has misled many people.

179 Omit Fig. 62 as misleading.

184 Might add discussion of Kickapoo meanders and a figure of them.

223 Conclusions as glacial erosion need some revision. There are caves in eastern Wisconsin. State relative frequency of caves in unglaciated regions in same formations. Sections and maps of Lake Michigan and Green Bay are very misleading. Buell used figures on Waterloo quartzite to show little erosion.

248 Revise figures to modern knowledge.

271 No evidence of deep channel at Sturgeon Bay but there was one east of Kaukauna which should be mentioned. Revise map.

Chapter XIII revise to mention new formations.

319 New figure.

357 Do

359 Do

410 Omit Fig. 176.

423 Omit reference to pirates - all bunk as nothing to steal there.

~~432 Omit Fig. 189.~~

Revise maps showing quadrangles, lists and prices of maps, etc. etc.

Revision of Bull 36.
1-11-31.

THE FRANCONIA CUESTA IN WESTERN WISCONSIN

The recognition of the Franconia Cuesta in western Wisconsin is one of the outstanding discoveries in physiography of the Driftless Area which has been made since the publication of Bull. 36. The upland of this cuesta can be traced from the vicinity of Kilbourn northwest along the face of the higher true Magnesian escarpment through Juneau, Monroe, Jackson, Trempealeau, Eau Claire, and Dunn Counties until it is lost beneath glacial drift in Barron County. The width of this upland ranges from a mile or two up to more than 25 miles. It is just as distinct as the uplands which are underlain by dolomite. Trowbridge recognized it in the Sparta quadrangle and called it the Sparta Plain. It is separated from the true Magnesian Upland by an escarpment which exposes the Jordan, Madison, Trempealeau, and Mazomanie formations. Outliers of this escarpments where small have conical shapes distinct from the smooth rolling uplands on the Franconia thin-bedded or shaly sandstone. The outer edge of the Franconia Cuesta is bounded by the Dresbach escarpment which is preeminently the most striking line of cliffs and steep slopes in the entire Driftless Area. It contains the famous Camp Douglas Bluffs as well as scores of other similar scenic features. Some of these bluffs, where the sandstone is well case-hardened have cliff sides; others where the rock is softer are conical. A feature of such prominence as the Franconia Cuesta should be described if it is intended to bring Bull. 36 up to date. Some of the block diagrams prepared for the Sparta-Tomah report and sections of the new topographic maps would make excellent illustrations.

THE EAU CLAIRE BENCH

The Dresbach sandstone, the most striking cliff-maker of the Cambrian section, is probably nowhere much over 100 feet thick. At the foot of many of the cliffs, for instance west of Kilbourn, there is a broad bench which is underlain by the Eau Claire shaly sandstone. Traces of this bench are also found in the Sparta-Tomah region although not mentioned (?) in the report written in 1922. The Eau Claire bench is much better marked in regions farther

north and is well shown in many of the new topographic quadrangles clear up to the type locality of the Eau Claire formation at Eau Claire. This feature can hardly be called a cuesta and is by no means as important as the Franconia Cuesta but as brought out by Guy-Harold Smith in his thesis of 1921 it cannot be ignored in a fair description of the topography of the Driftless Area. It demonstrates a principle ignored by many physiographers, namely the protection afforded to soft sandstone by a shale which acts as a roof does to a house. In regions like Adams County where there is no shale in the Eau Claire the Dresbach cliffs extend down into or possibly through the Eau Claire without any important break.

CAVES IN EASTERN WISCONSIN

Caves are not unknown in the Niagara dolomite of eastern Wisconsin. One occurs on the Murphy Farms in Sec. 3, T. 29 N., R. 26 E., Door County. At the entrance it is about 5 feet wide and 5 feet high. A very well-known cave is at Maribel in Sec. 13, T. 21 N., R. 22 E., Manitowoc County. In commenting on the paucity of caves in the glaciated region of eastern Wisconsin it is well to recall the following facts: (a) caves are less common in dolomite than in limestone, (b) caves are rare in the unglaciated area of Niagara dolomite in northwestern Illinois, (c) discovery of caves in glaciated regions is difficult for it is hard for a well driller to tell if his drill passed through a crevice or a solutional opening, (d) caves are not very abundant in the Galena dolomite of the Driftless Area, and (e) residual soil and decomposed dolomite are found in many parts of Door County. Caves seem to be most abundant in the Lower Magnesian.

Survey Photos

Suggestions:

1929 Falls of Montreal River Vertical
2008 Dresbach Cliff, Franconia Bench, Magnesian Upland
2241 Natural Bridge Vertical
2677 The Monument--a postglacial crag Vertical
4304 Terminal moraine topography
4436 Pitted plain with kettle, moraine in distance
199 Personal-Hamilton Mounds

Substitutions:

Either
2764 Falls of Amnicon River or
3419 Same
For Plate XXXVIII, B

Page 370 Revision of table

	Depth	Elevation
Nekoosa	0	925
Necedah	310	595
Kilbourn	450	478
Madison	730	120
	Descent	Grade in feet per mile
Shawano to Green Bay	945	29
City Point to Richland Cen.	900	13 change to 880 - 12
Green Bay to Casco Jct.	682	38
Richland Cen. to Plattev.	385	22

p. 50 Change legend to "The Dresbach escarpment near Camp Douglas, etc."

Miscellaneous comments

p. 1 Is the climate of Wisconsin everywhere favorable to agriculture?
p. 10 See my report of 1927 for tabulation of soil series, also Outline of Glacial Geology appended
p. 12 Is not total amount of waterpower exaggerated?
p. 44 The existence of a large area of Franconia capped hills in southern Barron County was unknown at time of writing. Much of this area is rough and should not be included in the Central Lowland for farther south the same kind of hills were put in the western Upland. See ms. of Sparta-Tomah report
p. 353 Longitudinal and transverse should be stated to be in reference to the strike-text not now clear.

Comments on Bull 36, Jan. 28, 1931

In reference to Trowbridge I can find no single illustration which seems suitable for reproduction. Fig. 16, p. 70, might be used pointing out the elementary fact that weathering since uncovering would unquestionably tend to lower the crests of the cuestas producing what T. calls "beveling". Fig. 17. p. 72 is too inaccurate to reproduce. A profile of this ridge was prepared for the Sparta-Tomah report but might need revision in light of the new maps. It shows that the question is confused by local thick Magnesian near Viroqua. It seems strange that a ridge bridging the gap between two cuestas should have survived only in the interval between two of the largest streams!! Fig. 24, p. 93 is highly misleading in that no geology is shown; could add it from Mineral Point Folio. In Fig. 28, p. 99 et seq. no recognition is given either to (a) other formations younger than Niagara, i.e. Devonian, or (b) changes in thickness. I suggest, as Martin did, that the Mississippi is a subsequent stream formed in a vale determined by retreat of the Devonian limestone. Certainly no such complex history of stream capture is demanded.

p. 49 Is term "late youth" justified where no remnant of an original sea bottom is preserved?

p. 50 In connection with the Franconia-Dresbach escarpment at Camp Douglas the entire Franconia bench and the double valleys within the cuesta should be mentioned. Here (?) also add a paragraph on the bends of the Kickapoo Valley with figure taking same from my paper on Pre-Wisconsin terraces of Driftless Area.

Fig. 19 Suggest statement to effect that west end of range is not represented correctly.

p. 53 Correct figures on elevation

p. 54 A part of Devils Lake Gap is certainly pre-Cambrian. Present idea is that Messengers valley hangs over preglacial gorge and discharged north where lake is now the west wall having been altered by superposition of Wisconsin River. South Bluff is a huge meander scar of the later river. Hanging valleys east of the station show later overdeepening of the old col by the later through

stream. Potholes are now known in a hanging valley 70 feet below the summit on the East Bluff trail. Ideas on hanging valleys derived from work while with mapping classes. I may want to publish on them someday but meantime have no objection to a brief statement by Martin.

p. 55 The valley probably extended north of Messengers

p. 59 top. Thick and thin or rather broad and narrow are reversed in text.

p. 60 I recall a racetrack which was laid out about 1900 but there may have been a still older one as ruins of an old tower were there when I visited the Mound before that.

p. 63 See the Sparta-Tomah report. I would stress (a) original irruegularity of thickness of the Magnesian, (b) bevel by weathering and longer uncovering, (c) same kind of upland on crests as on back slopes and in vales, (d) strange that the Viroqua ridge connecting two cuestas is so near to such large streams, (e) lack of a definite topographic unconformity between uplands and valley walls, (f) no flat uplands save on part of Baraboo Range, (g) the Francoian cuesta does not fit into the Dodgeville Plain at all and poorly into the Lancaster, (h) the Eau Claire Bench does not fit at all, (i) the double valleys inside the cuestas should be mentioned, (j) in any case the Dodgeville Plain would not account for more than 1 percent of the area and so is really unimportant.

p. 68. In my paper read at Toronto I suggest the marine origin of the upland plain at Baraboo also occurence of sea cliffs and rock benches at lower elevations. Will want to publish on this someday but have no objection to brief statement.

p. 77 Fig. 27 is misleading as this area was not glaciated all at same time. Suggest revision of legend. The discussion of origin of the Driftless Area fails to take into full consideration the shifts in glacial centers. Why was area not covered by Keewatin ice during the Kansan? Was there a Patrician lobe in Lake Superior then? Stock explanation written when only Labradorian center was known.

p. 81 There seems never to have been any joining of ice

south of the Driftless Area. Kansan certainly mainly Kewatin, Illinoian Labradorian; Wisconsin shifted from Labradorian steadily westward. Note recent papers at Toronto. My work in Wisconsin pointed to same facts. Note also that Weidman repudiated unglaciated area near Wausau in conversation before he left. Area is nearly "driftless" but probably not "unglaciated". Note difference in expression.

p. 87 Caves are not absolutely confined to Driftless Area but it is easier to find them there than in glaciated territory as they are nowhere very abundant.

p. 109 Devils Lake gap was about 900 feet deep.

p. 119 Adams County outwash is topset beds of deltas not alluvial fans. The Mississippi Lake is open to serious question. High level erratics may be left by erosion of pre-Wisconsin terraces.

p. 121 Weathering of Wisconsin sandy drift is so common that paragraph on weathering west of Sauk City is really not needed.

p. 123 Some geologists reasoning from the fossils in some loess regard much of the loess as intefglacial. It is now known that several loess deposits were made during the Pleistocene. The latest or Peorian loess seems to have been made during an early retreat of the Wisconsin ice after the Iowan substage (formerly called Iowan stage). See Outline of Glacial Geology. Many geologists, including myself, still think, however, that much loess must have been deposited immediately after glaciation as Martin suggests. This may have been mingled to the west in Nebraska and western Iowa with desert dust. The testimony of the fossils is not final for some think they indicate a cold climate. (Conversation with Baker in 1926)

p. 153. I have always objected to this suggestion of tilting. The older lake beaches far from thick ice show no or little tilt so far as present information goes. Lake Wisconsin and certainly Later Lake Oshkosh show no tilt. The cause

of uplift is important. If isostacy the isobases may curve around the areas of thick ice. Data on which they have been drawn would admit this interpretation See Outline of Glacial Geology.. Explantion of decrese in grade of outwash away from ice front as well as low grades due to lake water drainage is adequate without more than a suggestion that tilting might have occured.

p. 154 Uneroded nature of terraces proves Wisconsin age. Most are either Middle or Late Wisconsin.

p. 158 I have been at Waumandee Lake and it is clear to me that it was nothing but a millpond which is now dry.

p. 173 In connection with statment that there are no rapids in the Driftless Area I suggest that this is not literally true. Martin has visited Tarr and Trout Falls. Can also mention Black River Falls and Weidman Falls. All but the last due indirectly to glaciation. Under discussion of this section all of these should be mentioned. Weidman Falls (name not known either to S. W. or to owners of the falls but in common use at the U. W.) is due to superposition of a stream over a knob of quartzite. Name announced in my paper on Buried pre-Cambrian.

p. 177 Rock terrace at Bridgeport see papers by MacClintock and me. The terrace is so far as I can see due to river erosion for it is not at the top of the Magnesian. Change "sometimes" to " in some places".

p. 178 Suggest omission of entire section and illustration (Fig. 62) on ancient diversion of the Wisconsin. There can be no proof of so ancient a capture and the thickness and distribution of covering strata cannot now be even surmised.

p. 180 the tunnels are not doubletracked and the best trains still follow the older route.

p. 182 Would this be a better place for discussion of the abandoned bends of the Kickapoo?

p. 185 This would be a good place for brief mention of Tarr and Trout Falls.

p. 188 Omit reference to capture of Wisconsin River.

p. 189 Omit cost of St. Croix-Lake Superior Canal as ancient history and an optomistic guess anyhow.

p. 192 Marquette State Park change to Nelson Dewey State Park

p. 202 Bottom Omit statement about mapping of escarpment. I remapped much of it. Found little change but could not discover one of the outliers. Part of the lack of outliers is due to a subsequent valley along the face of the escarpment, the preglacial Wolf valley. One ofthe points Martin did not know was the overridden drumlins. Thosenorthwest of Appleton and those east of Fond du Lac both show this phenomenon. In both cases the later ice did little to older unconsilidated deposits. I admit glacial removal of rock ledges where conditions are favorable but think the Niagara escarpment suffered most since the dolomite rested on slipp ery shale. The outliers at Mosquito Mounds east of New London might be mentioned. Both show a marked roche moutonee form suggesting reality of some glacial erosion. Failed toget a pho to when there as I was working on foot the day we went up them and never got back on a good day.

p. 206 The offset in the escarpments northwest of Appleton and east of New London is caused by a fault. Might be mentioned. Announcement in my last paper, but was first discovered by Chamberlin.

p. 215 gap in Niagara Cuesta northeast of Lake Winnebagonot known to Martin but is followed by two railroads.

p. 221 Division of Wisconsin of eastern part of state into three parts unknown to Martin. Progressive shift to west made known by (a) changes in relative sizes of ice lobes, the Green Bay Lobe progressivbly incresing, (b) overridden drumlins, (c) crossing striae. The older maps confuse the several ~~sta~~ substages. For instance Fig. 79 is decidedly off on ice directions in several places. Needs revision badly.

p. 223 et seq.

On general subject of glacial erosion I like to have the ultra- enthusiastic view stated as well as Martin has. At same time I would like to suggest a few cautions which will strengthen his case by removing some points of attack.

(a) Highly exaggerated cross sections tend to be misleading. for the lake is several hundred times as wide as it is deep. (b) the lake is a rock basin, (c) drift-filled valleys lower than sea level are known in Michigan but one points toward the northwest (d) hanging of Green Bay probably in part due to drift fill, p. 230 (e) data were used by Buell in his unpublished ms to prove little erosion!! (f) there is a "Shale Ledge" east of Appleton at Hollandtown which probably had its cover removed by glacial erosion, a good point for Martin for shale outliers of such size as this should be rare in Driftless Area. (g) Lots of residual soil in Door County in spots; note that ice from northwest was only last phase of glaciation during the Late Wisconsin, (h) caves taken up before, (i) p. 238 would not compare with cuesta of soft sand in Alabama, (j) the backslope is double with an escarpment on the Byron capped by Waukesha or Coral, also entire Coral and Racine areas are really quite hilly. Many hills are due to old coral reefs, (k) influence of shippery shale below dolomite might be stressed, (l) Erosion caused many fresh pebbles in drift.

CONTINUED ON NEXT PAGE

M p. 245 any recessional moraines mapped by Alden are kames and pitted outwash. These deposits may and indeed probably were made by stagmant ice as suggested by by the courses of the eskers. Judging from farther north the Waupun-Rush Lake moraines represent an important readvance, Red drift moraine at Fond du Lac must cover one of these. This red drift or Late Wisconsin is product of a readvance after a time when the recession of the ice drained Lake Michigan to below its present level and allowed of the formation of the Forest Bed at Two Creeks.

p. 248 suggest omission of Fig. 97 as misleading in l ight of recent studies in Illinois. It does not seem to be discussed in text. Could you use instead some of the similar maps from my 1927 field report?

p. 250 Suggest omission of gravel seam at Ripon as not physical geography.

Glacial erosion, continued

(m) the deep hole in bed rock at Black Creek was not known to Martin. Its bottom is about 180 feet above sea level. Erosion or sinking of land?

I think that sinking of the entire Great Lakes district is a tenable suggestion for the great depth of the lakes but it cannot entirely explain the great width of the basins and still less the deep rock basin of Lake Superior. It seems to me that a better case for ice erosion can be made there than with the lower lakes.

Lake Deposits p. 251.

Suggest a short description of Early and Late Glacial Lakes Oshkosh. Early Lake may have been held in by dam of Johnstown and Milton moraines and stood at 875 to 900. Not yet worked out as key is near Portage. Held up by Middle Wisconsin ice. Later lake had levels 830 and later 795. Held by Late Wisconsin ice. no tilt. Outlet through Manitowoc River to Lake Michigan, later destroyed when Sturgeon Bay was opened. Color of Red Till due in part to iron from Menominee and Gwinn districts when ice came from that way. (My idea). For data on lakes see my annual field reports.

p. 253 Have already mentioned that the Forest Bed means low level of Lake Michigan and therefore a great ice recession.

p. 265 The change in public sentiment from demand for drainage of Horicon Marsh to demand for reflooding might be worthy of mention as a sign of the oversupply of agricultural land.

In connection with erosion of glacial lake shores might mention their lack in certain spots due to protection by floating or pack ice.

p. 304 Revise statement on Dresbach cuesta or rather escarpment. The Mt. Simon escarpment has only been found near Eau Claire. If present farther east it is buried by drift. East of Portage no Dresbach escarpment has been mapped. In this area there is no true Franconia, at least no micaceous shale. The Mazomanie formation is so like the Dresbach that the Magnesian escarpment is the only possible boundary. If there is any subordinate escarpment in the Cambrian it is so covered by drift that I cannot find it. Eau Claire shale and bench absent in east.

Fred.

50. Write new legend. ✓

~~83 Look up photo to take place of Plate I K.B.~~

~~87 Revise state + n caves.~~

183 Fred make new photo.

184.— Fred write new par for Kirk. Kirkpo sender

We will make new cut.

319 Read thru.

Hamilton Mds — writeup + 1 photo.

353 Longitudinal & transverse
rough county around mountain
Northern drumlin area

50. ~~The Dresbach escarpment near Camp Douglas etc~~

January 8, 1931

Fred:

Check text and table on p.370. ✓

Plate 38B. Have we a better photograph? ✓

Start Ike on checking the list of elevations. ✓

EFB

Table.

	Depth	Elev.		
~~Wa. Bap~~				
Nehawka	0	925		
Needmore	310	595		
Fulton	450	478		
Madison	730	120		
	Descent	grade ft per mile		
Shawnee to Green Bay	(680 / -265)	945 (33m)	28.6	29
city PT to Richland center	970 / 71	840 / 900 (71)	12.7	~~15~~ 12
green Bay ~~to 2 Riv~~ / Casco Jct	-265 / -947	682 (18)	38	38
Richland center Platteville	71 / -814	885 (41)	21.5	22

Fred:

Martin wants you to pick out the illustration in Trowbridge's EROSIONAL HISTORY OF THE DRIFTLESS AREA that appears to you to be most damaging to the non-peneplain view. He plans to reproduce it, writing in his own legend.

EFB

Fig 129 leave hanging ✓

change names ✓

Fig 16 - p70 point out error.

17 p72 - use instead the section made for Sparta-Tomah
or else a new one based on topog maps.

24 - p93 no geology - add it from M-P Folio

28 p99 - no recognition either of other formations
or of changes in thickness

1/2 hr

✓ p 34 Sketch map of Franconia crestn - new Fig 11
use page bare maps

✓ Bring notes
✓ Arrys map of N. Dewey Park - in pkg file - get it
✓ Tower Hill Pk. no map

Bare map of mis R chunks

p. 306 The Central Plain in nottheastern Wisconsin seems to have been the site of the preglacial Wolf River, at least for a considerable distance. In that part of the State there seems to be no Franconia bench. The Mazomanie is present but I could nowhere see any subordin ate escarpment such as is present around Natural Bridge where there is no Franconia. By the way, the fact that the ~~Franconia~~ mazomanie everywhere weathers into curious forms including the Natural Bridge should be brought out. I can almost everywhere recognize the Mazo by its fantastic weathering. Another point is that it is now recognized that the Upper Greensand and the Yellow Sandstone of the preliminary reports on the Sparta-Tomah region are both Mazomanie. In western Wisconsin the peculiar weathering is not nearly as prominent as in the type locality of the Mazo. An important feature of the Central Plain is the "hole" at Black Creek where the bed rock is below 280 feet above sea level.

p. 307 In discussing the buttes and mesas the fact that they are outliers of the Dresbach escarpment should not be omitted. Where, as in central Adams and Juneau Counties, there is no Eau Claire shale they the cliffs extend down into the Eau Claire and probably the Mt. Simon sandstones although bluffs that low inthe column are not comon. Even Dorro Couche (misnamed Daircuse on Soils Map) Bluff has Franconia i on top. So has Roche a Cris. Friendship, ~~and~~ Mile Bluff, as well as Elephant Back also rise into the Mazo. Many bluffs in eastern Adams have Franconia and Mazo on them. Locally the upper sandstones form cliffs as on Pilot Knob east of Friendship. In this connection the Mazo is the cliff maker, not the Franconia. Dont forget to mention Glover Bluff!

p. 311 Lack of sandstone outliers near Shawano due in large part to deep river channel just west of Magnesian. General discussion is O. K., however.

p. 313 Glacial deposits. In such sandy tills areas discrimination of till from ~~and~~ assorted material is impossible in shallow excavations as weathering is deep and ice-rafted stones common. Such a high sand content led to much outwash

most of which is pitted. Outwash to Lake Wisconsin deltaic plain from Outer and Second Moraines, later on lines of plain leading south into eastern extension of Lake Wisconsin, later Early Glacial Lake Oshkosh. Details not mapped by Alden who habitually confused pitted outwash and till with poor data available in pre-road-building days. Should mention Chain-o-Lakes at Waupaca. Fenneman got right origin. Incidently local granite boulders, different in character from Ontario-Quebec stuff to east, are abundant throughout Waupaca and Waushara Counties. Think there is a lot of concealed granite. Dont forget the granite outcrop east of Plainville, Adams Co. from which I once collected wind-worn marks which I thought were striae. (p. 314).

p. 314 There is little true ground moraine in Central Plain M Young drift. In Middle Wisconsin area most of what Alden mapped as such is either outwash or lake bed. He confined lake areas to those where he found clays and he did not see anywhere near all of those. Early Lake Wisconsin may have reached 900 feet elevation. Red clays not all overridden. In Late Wisconsin area some ground moraine is overridden outwash, rest in large part lake bottom not all of which carries any deposit of Later Glacial Lake Oshkosh. I would be quite willing to recant as to the nunatacks although Martins arguments are sound but "The Monument" and many other crags which are indubitably post-early drift in age have made me waver.

p. 315 Eliminate reference to Amherts Jct as being undoubtedly in Northern Highland. Earlier moraine at St. Croix Falls probably Patrician and MAY be Late Wisconsin. If so the Keewatin drift may be a LATEST Wisconsin, making at least four different Wisconsin advances of which the Middle and Later of eastern Wisconsin are separated by the Forest Bed retreat. (Unpublished).

p. 317 Change "often" to "in many places" as they do not change between visits.

p. 318 Change statement on deltas for the outwash plain outside the Johnstown Moraine (Outer Moraine) is obviously a series of deltas which in many places overlies lake clays. The lake at Grantsburg was due to the Keewatin ice advance

which temporarily blocked St. Croix valley. Not interglacial as thought by Berkey, Wieman, Leverett. Last ~~two~~ unpublished. later erosion of outlet before ice had left area south of Lake Superior led to burial of deposits by outwash taken for till by Berkey et al. Area of Lake Wisconsin exaggerated in so far as much of eastern and northeastern parts filled with deltas before level began to fall. Much of sand on floor of basin reworked by wind as is also case in Glacial Lake Oconto and Glacial Lake Oshkosh basins. Many more beach deposits are now known. Highest are about 980 corresponding to outlet east of City Point (Mineral Land Survey, 1916). Others seem to be lower, probably at level held up until Dells were eroded. Best opened up deposit on Necedah Mound reaches elevation of about 970 and must have been made by northwest winds. Elevation at Mauston can be obtained from new map. Some beach deposits reported by Raasch probably reworked early terrace gravels. See my paper on pre-Wisconsin terraces.

p. 320 Eliminate reference to North Mound, near Babcock as Mineral Land party found no erratics. Remember lots of mosquitoes there during visit with Martin in 1915!! Eliminate paragraph on tilting as new data definitely limits it to less than 20 feet if ~~at all~~ any. I could find no evidence of tilt in beaches of later Glacial Lake Oshkosh and am not at all sure there is any in beaches of Early. L. O. although there data is contradictory.

p. 321 Eliminate reference to lack of weathering in boulders in lake outlet. As I recall we did not stop there in 1915. This is not a depenable criterion for old drift and I would not like to comit myself in writing on such brief examination. Dunes in Adams County made by S. W. winds, therefore postglacial.

p. 322 Many ponds and marshes in Central Plain have marl deposits in them due to hard waters from dolomite pebbles in drift.

p. 325. I wish to register another protest on spelling DALLES when all local people spell it DELLS and the U. S. G. S. does also both on map and in reports.

p. 333 Note caution on crags in OLD drift.

p. 334 Course of Wisconsin River wholly post-Wisconsin age. Omit statement

on slope of outwash, except to make it clear that the Nekoosa plain is a delta whose top is just about 980. Same elevation near Dells. Terraces on river possibly related to cutting of the Dells. Size of terraces near Petenwell not appreciated until new highway was made. They are best developed in face of delta?deposits to east but matter not worked out in detail. Wonder if all the plain between Wisconsin and Yellow at Necedah might be a terrace?? Does not seem likely although country rises higher not far east of Wisconsin.

p. 336 Is grade from Wisconsin to Fox enough to really make any serious danger of a permanent diversion? I think not, for it never happened. Check figures on grade of Fox. I doubt that it is steeper for a long distance as shown by lakes in its course. Slope begins below Lake Puckaway. Levee mostly to protect low parts of Portage and the railroad embankments, although canal is an undeniable point of danger. I could get little new idea of origin of Lake Shawano except to suggest that it is shut in by a fan of Middle Wisconsin outwash brought down by the Wolf and later buried by red late Wisconsin till.

p. 338 Is not Fall Line at Chippewa Falls?

p. 340 Here is good place to mention Tarr and Trout Falls both due to diversion of streams on valley filling.

p. 341 Position of water table not mentioned as cause of swamps. Slope of region important.

p. 343 Mention disastrous efforts at swamp reclamation. Only advantage is that jackpine growns better when water level is low. Fires worse. Big ditches a fraud engineered by realestate speculators and contractors under terms of old drainage district law. For cranberries a large amount of water is needed for flooding so no complete drainage. Swamps now more valuable for water storage than for farms.

p. 345 Lake Duluth drainage and Barrens Lake drainage not mentioned.

Hamilton Mounds are located in the northeastern part of Adams County. They were not ~~visited~~ discovered by the earlier geological surveys of Wisconsin, and Although reported to Mat Martin and Thwaites in 1915 by Mr. Severson of Hancock it was not until 1928 that they were reached by a geologist. Then E. F. Bean, State Geologist visited the mounds in the course of road material surveys. Alden passed by the Mounds without recognizing their character.) Hamilton Mounds consist of Huronian quartzite which is rather closely folded and considerably faulted and brecciated. The strike is approximately west. The individual ridges trend in the same direction. They cover about one square mile and have a maximum elevation of about 110 feet above the adjacent outwash plain. These ridges which are of the hogback type due to steeply inclined sedimentary strata Plate --- is a view of the Mounds along the strike showing the serrated skyline.

p. 350 The region around Marathon may be driftless but is probably not unglaciated It is possibly typical of what the highland was before glaciation but is not typical of what it is today. I would stress the fact that although made of massive rocks the uplands are distinctly level and have a marked topographic unconformity between them and the valleys of a later generation. In my paper on the buried preCambrian I mention several types of topography as follows: (a) rather flat areas on massive rocks, locally dissected since uncovering from the Paleozoic cover, (b)rough areas of diverse kinds of igneous rocks as around Mountain, Oconto County, (c) hogback topography with trellis drainage on alternating hard and soft sediments and interwalated flows and sediments, Martin seems never to have seen the second type. I doubt that all the roughness is due to post-Paleozoic erosion althouth I cannot with present data prove this. The rounded granite hills are glaciated but have no real roche moutonee form. Much of the present level surface is due to glacial outwash as in Vilas County although the scarcity of rock outcrops and the results of scattered test botings does indicate a rock surface of low relief. Aldrich says that the trap country

was far from level when covered by the Upper Cambrian sea. Berkey found this at St. Croix Falls long ago.

p.357 See the proof maps of Penokee-Gogebic district for revision. Note that almost all the gaps are on fault lines possibly if not probably on account of cross shearing.

p. 361 study new map to see about railroad route. Grade much less along the stream. Highway uses other gap.

p. 362 Powers Bluff is locally known as Skunk Hill.

p. 366 Fail to see that disregard of rock structure by the Wisconsin is cited as evidence of superposition nor that depth of outwash in valley bottom has been considered. I also fail to see Wiedman's proof of the pre-Cambrian age of the peneplane, namely the continuation of same slope of exposed and concealed parts.

p. 368 I desire to register a protest against the proposed technical use of term "baraboo". Too many such terms tend to discredit the science of physiography. They areunscientific in that the user is tied down to a given interpretation and so looses freedom of thought. If science did not revise interpretations of facts it would not be science at all.

p. 369 Omit tabulation of old wells at Madison. These old records are mostly bunk. When my paper comes out it will show the facts from the new wells. Range in 10 wells in and near city is from 21 to 139 feet elevation of pre-Cambrian surface.

p. 370 tables might be revised to include other more characteristic slopes. All such data tends to minimize theroughness of the peneplane surface.

Section on buried souls should be revised. I am positive that the exposed clays as at Nekoosa are due to acidulated waters under present conditions for the weathering of marcasite in the overlying sandstone is an adequate cause. Iron in deep waters at Sparta due to same thing. Oxidation and disintegration beneath Paleozoic cover under present conditions not only possible but probable. Weidman presented no evidence to contrary. Better be cautious in repeating his conclusion. note iron ores and altered dikes in Gogebic to 4000 (?) ft

p. 371 Omit section on embayment at Waupaca. Old mapping put pre-Cambrian only where it outcrops. Now know more about local and distant boulders. See maps in 1927 and 1928 field reports and 1928 map of Wisconsin for revised boundary. Now think that is far from accurate in southern Waupaca and Waushara counties. Contact with sandstone from western Waupaca Co. east to New London along a fault. I doubt that the escarpment of Mt. Simon sandstone protected by Eau Claire shale near Chippewa Falls is actually at the concealed sandstone border.

p. 374 Some of ice certainly came from the Patrician center. Note Weidman's repudiation of non-glaciation around Wausau. Dalles of Eau Claire (Marathon Co) due to Wisconsin diversion of former head of Plover R

p. 376 Note that I sustain Wiedman in pre-Wisconsin age of the Arnott Moraine. It is deeply weathered and oxidized. Muscallunge Firetowner Hill reaches an elevation of about 1825 feet. Dolomite pebbles are present throughout the entire area of theGreen Bay Lobe and even in parts of the Antigo outwash plain. Note that pebble counts will not solve the questions of the drift for they fail to take into account the "fines" and the boulders. Character of till important, of outwash less so. Since the character of drift changes slowly with time I would not say it is "usually" anything. This should read "in nearly all places." Nor would I call the till of the north "boulder clay" in most places. The late Wisconsin and the moraine near Winegar are only examples of something which fits that archaic word.

p. 377 I could not find the interlobate in Oconto County for certain. In T. 33, T. 14 E. is a huge ridge but so far as forest cover allows observation it has a flat gently undulating top utterly unlike the southern interlobate. Around Ada Lake Firetower Hill, whose elevation is due to quartzite, the country is quite morainic. The matter of this interlobate will not be settled until glacial work is resumed, if ever.

p. 378 Note that Bean could not find any boulder train near Powers Bluff (Skunk Hill.)

p. 379 The eastern side of the Northern Highland which I studied in 1926-8 is a giant stairway in which the risers are terminal moraines and are measured in tens of feet and the treads are pitted outwash plains whose width is measured in miles. Scattered through the recessional moraines and outwash plains are thousands of drumlins, some of them 200 feet high. The axes of these drumlins indicate a movement toward the northwest in Middle Wisconsin time, that is in the Green Bay Lobe. Drumlins also occur in the Langlade Lobe and to some extent in the other lobes farther west. In this connection I might say that the lobation of the Middle Wisconsin ice in the north has never been worked out. I strongly suspect, southwesterly striae in Douglas County to the contrary notwithstanding, that the lobe in Barron and PolkCounties is Patrician and of Late Wisconsin age. The Bayfield ridge is an interlobate but I have never been able to find any other interlobates which are at all comparable with the one made famous by Chamberlins early studies. The pitted outwash plains of the north are described in my paper on Vilas County and in the several annual field reports written during the time I was employed on glacial work in the north. All of them are more or less terraced and contain boulders in spots, particularly in and around the kettles. Eskers have been found throughout the district.

p. 380 If you go north from Wausau on U. S. 51 you would have no doubt that the Wisconsin drift region of the Northern Highland has been ruined for agriculture by glaciation. But you must realize that climate also has a big part in the failure of agricultural settlement in the north. They say they have "nine months winter and three months poor sleighing" every year. As to boulders, the fact that they are more abundant in such a region (as is also the case in New England) than in regions underlain by sediments is due simply to the fact that hard rocks like granite break into big chunks. One can soon learn to tell the local granite boulders as they are in almost all places a quite different rock than the far-travelled erratics.

p. 387 No railroads in Bois Brue Pass itself, only cross the river.

p. 390 The majority of lakes seem so far as I have seen, ~~to be~~ are in pitted outwash. In northen Vilas County many are in terminal although some of these show outwash terraces along sides too small to show on published map. None, so far as I can recall are in ground moraine although this is not true of other parts of the State. I cannot speak for the lakes of Burnett County which are in bed of Barrens Lake as I have never seen this area.

p. 395 Modern tendency is to return to steam for power. No danger of using up coal. Transmission lines subject to heavy maintainace, interruption by storm, high losses at all times. Steam plants now being built on lake docks.

p. 401 It is too sweeping to say that Lake Superior is in a rift valley if that term means a valley depressed between faults. Anyway the rift portion is confined to the western finger of the basin. Putting the conclusions before the evidence is putting the cart before the horse. Would not the summary look better at end of the chapter?

p. 403 Check highest beach line with Ikes work.

p. 404 The Paleozoics at Limestone Mt., Michigan occur well down in the basin, just how low I dont know. They seem to have been faulted. Wonder if either (a) the basin has been faulted down in post-Paleozoic times or (b) the peneplane was faulted down in pre-Paleozoic times? The relation of the basin to the cuestas of Paleozoics at the east is often forgotten. Of course the whole question of the relation of the Keweenawan to the Cambrian enters here. Many hold that it is non-marine Middle or Early Cambrian.

p. 406 Renewed down faulting in Pleistocene time must be considered but I think the points in favor of glacial erosion apply well, better in L. Superior than with the lower lakes in fact. I used to cite the Apostle Islands of friable sandstone with channels from NW to SE across them as evidence of weak ice erosion but since I have learned of the Patrician advance form the northwest and proable earlier Patrician ice sheets (Kansan) I have somewhat weakened on this. The weathered condition of the cliffs observed in 1910 I now think may be post-Wisconsin.

Martin seems not to know that all ice did not come from Labrador.

p. 410 The figures which had a part in the argument with Leverett do not refer to a Wisconsin problem. The main objection to such conclusions in a region of Young Drift is that glaciation may easily be the cause. The upper Mississippi is certainly in a postglacial course. ~~It~~ Does Martin want us to think that (a) the rivers were not moved from a pre-Wisconsin position due to preglacial or interglacial piracy or (b) piracy occured in post-Wisconsin time?

In connection with the boundary suit Minnesota seemed to have failed to grasp the idea that submergence made a river into a lake and that therefore the boundary should follow straight line in middle.

p. 416 History of glacial lakes should be revised from Leverett's later work. I am not sure that the later history is correct, however, for Ike and Aldrich did not check the highest lake levels or the rate of tilt. On the whole, it seems to be a subject of dispute up to date because (a) Leverett was making a rapid survey of a kind of country he was unfamilar with and (b) the Mineral Land work was merely incidental to magnetic surveys and were not exhaustive.

p. 423 Have already protested about the Pirate yarn. Only pirates I ever saw stole sawlogs!

p. 432 I could never see the tombolo (again a fool technical term) between Sand Island and the land. No good beaches on island and it leads to another bar on shore of mainland at Sand River. Note that peat has been found off this island at depth of 60 feet under some lake sand. Recent note in Science.

General, pp. 24-28

Hotchkiss, W. O., and Bean, E. F., A brief outline of the geology, physical geography, geography, and industries of Wisconsin: Wisconsin Geol. and Nat. Hist. Survey, Bull. 67, 1925

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Omit because reports have been definitely abandoned or postponed to indefinite
Ulrich, p. 24 future

Miller, p. 26

Williams, p. 28

Add

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Western Upland, pp. 70-72

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Drainage of Central Plain, pp.345-346

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Lakes and streams of Northern Highland, 399-400

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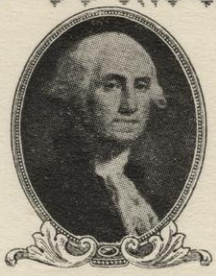
Hobbs, xWxxH.,

United States Commission
for the Celebration of the Two Hundredth Anniversary of the Birth of
George Washington

1732 1932



OFFICE OF THE EDITOR
DIVISION OF MAPS
LIBRARY OF CONGRESS
WASHINGTON, D. C.

March 16, 1931.

Mr. F. T. Thwaites,
University of Wisconsin,
Science Hall,
Madison, Wisconsin.

Dear Fred:

Thank you for your letter of March 9 and the publications. If I read thoroughly all that I ought, I will never get my Bulletin 36 revised but I shall have to glance through these publications and some of the literature to which they refer, and to talk to Dr. Alden about the field reports you have sent him.

With warm regards,

Very sincerely yours,

Lawrence Martin

~~Editor of the Atlas.~~

March 9, 1931

Major Lawrence Martin,

Library of Congress,

Division of Maps,

Washington, D. C.

Dear Major Martin:

In reply to yours of the 3rd I am sending under separate cover copies of my outline of glacial geology, edition of 1927 and Glacial geology of part Vilas County, Wisconsin.

In regard to your postscript I am positive that the names of glacial lakes mentioned have never been used. I suppose I have made it clear that the name Glacial Lake Oshkosh has been substituted for Glacial Lake Jean Nicollet. This was published by Trainer and is discussed in the field reports which you have not mentioned. I am sending these to Alden as he wished to look them over. If you desire to peruse these documents which cover several counties you can get them from him.

With regard to points on which we do not agree I have found that if I waited long enough others generally have come to my point of view, so please do not worry about laying in asbestos paper!

Sincerely,

LIBRARY OF CONGRESS
DIVISION OF MAPS
WASHINGTON

March 3, 1931.

Mr. F. T. Thwaites,
Department of Geology,
University of Wisconsin,
Madison, Wisconsin.

Dear Fred:

Thank you for your several helpful letters. I agree with you about so many of the matters you discuss that it is not worth while saying yes, yes.

I disagree with you so violently about a point here and there that it would use more paper than there is to explain my position; and besides, I have no asbestos paper. It would hurt you so to be disagreed with that I should also have to send you olive oil and vaseline; and I have none of these. The group of agreements is very large; the group of disagreements tiny. Between these lies a moderate-sized group of points about which you and I agree but in these few cases the State Geologist would not let me change the Bulletin 36, text or illustrations, as much as would be necessary to explain our views, since he is printing a slightly revised and not a thoroughly rewritten Bulletin 36.

The most miraculous things have happened to me. The latest is a long letter from William Morris Davis in which he says that he once read and is now rereading Bulletin 36 and he thinks it is hot stuff. He ~~never~~ once suggests that I should adopt Trowbridge's views about peneplanation in southeastern Wisconsin. Of course, these things please me. Professor Davis presents the hypothesis that there are two peneplanes rather than one on the preCambrian, one visible the other buried. This is really a revival of the hypothesis of Wilson regarding facets on the preCambrian peneplane of the Canadian shield; but as far as its extension into Wisconsin is concerned, I thought 15 years ago and I still think that warping is the simpler and more desirable explanation.

I have no copy of the 1927 edition of your Outline of Glacial Geology and shall be obliged if you will send me one. I cannot find the copy of your dis-

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cussion of glacial geology near Winger and Winchester. Do you want to send me another?

Do not let me discourage you about distinguishing pitted outwash from moraines. You were doing grand work along lines which ought to have been followed out before.

With warm regards,

Very sincerely yours,

Lawrence Martin

P. S. Do you know definitely whether any one has ever used either the name Glacial Lake Ashland or Glacial Lake Milwaukee for a glacial lake adjacent to the State of Wisconsin or elsewhere?