Correspondence - Published papers [unfiled]. 1916-1960

30 July, 1958

Dr. M. M. Leighton,
61 West Pennsylvania Ave.,
Urbana, Illinois

Dear Dr. Leighton:

Yours of the 23rd is at hand and I wish to thank you very much for the copy of the paper on x-ray examination of loess minerals. It had not appeared when I revised the last edition of the "Outline" By the way I mailed you a copy at once. Please read the pages in the back. It was no longer possible to make additions to the old text in different places so I had to put new material at the end and did not note that in the table of contents.

I realize that I will not be able to change your mind on the origin of loess but would like to make some remarks. The fossils do not seem to agree with nearby glacial ice for the snails had to have vegetation to live on. I feel that the broken forest ground along waterways are important elements in causing still air and settlement of dust. Were they there in that condition when ice was not far away, I wonder? I do not deny that dust was blown from outwash plains for there is more loess on and near them than there is elsewhere. I remember, however, that you did not think the silt cover of outwash plains is loess back in '33. I do not agree.

With regard to Iowan till I recall your saying in '33 that the limits of the till are not the limits of glacial ice. The peculiar borders given by Calvin and others always aroused my skepticism and I long argued the problem on that basis alone. I feel now that the Iowa prairies were uneroded parts of the Kansan drift plain on which Iowan till now survives. We have an even more peculiar situation with the distribution of the Valders till in northeastern Wisconsin. My map was ruined because the engraver used pink where I asked for red. No second proof ever came to either Bertrand or me or we would have raised the roof complaining. But you can see it with a glass or on the soils maps of Brown and Manitowoc counties. The problem is simplified by the distinctive color of the Valders till but there are many outlies and areas of rough topography where nobody can find any red till. It must have lost its color through soil formation. We could easily have had similar conditions in Iowan time. Those hills of loess we visited north of Iowa City are fossiliferous. I feel that there could not have been any ice on the adjacent prairie when they were formed. I saw a lot of Iowa road cuts in this area in '34 when they were fresh and decided that there is a thin loess on the prairies above the pebble band.

I am still disputing with Aldrich over a rank heresy of mine, the support of the Martin theory of the topography of the Driftless Area. If they let my paper through over the fits of the older geomorphologists, I intend to deliver it at St. Louis. Campbell once refused Martins manuscript on this in the Sparta-Tomah folio manuscrips, you see. But I feel that I should present the alternative interpretations which I feel make more sense then the "special pleading" used for peneplains.

About going to Chicago I could go down for the day easily at almost any time but prefer not to stay over night. I have no appointments for September at present.

Sincerely yours,

STATE GEOLOGICAL SURVEY DIVISION
LOCATED ON THE CAMPUS OF THE UNIVERSITY OF ILLINOIS

JOHN C. FRYE, CHIEF
NATURAL RESOURCES BUILDING
URBANA

July 23, 1958

Dr. Fred T. Thwaites
41 Roby Road
Madison 5, Wisconsin

Dear Fred:

Thank you for your letter of July 17 stating that you expect to go to St. Louis, and for your comments regarding my paper. Please find enclosed a check for $3.00. I should like very much to have a copy of your last edition of "Outline of Glacial Geology." The last one that our library has is 1946. That may be the latest but I want one of my own anyway.

I read your summary, "The Development of the Theory of Multiple Glaciation in North America", 1928, and I regard it as an excellent comprehensive summary, but I found it necessary for my purposes to review the originals. I am sorry that I did not repeat what I said in my 1957 paper, "The Cary-Mankato-Valders Problem", about why you came to propose the name Valders, but I of course plan to treat such matters fully in my book.

The men who did the x-ray work here conferred with me at the time in regard to the clay mineral fraction, and the evidence is strong that the clay fraction came largely from the west. However that is not the case with the silt and fine sand fractions. They are definitely from the valley trains. Mechanical analyses of the Farmdale loess and of the Peorian loess are surprisingly similar. As to "warm" and "cold" loesses there may be both where the climate is dry enough and windy enough to carry the dust. I had to leave the elaboration of these things to my book. With regard to the boundaries of the Iowan ice I am sure that you wouldn't make the statement that you do after field study. I thought that I would revise them but couldn't.

By the way, your own writings report red drift at considerable depth in northeastern Wisconsin which makes it clear that there have been sources of red drift at different times. There is red drift in what is probably Tazewell drift in central Michigan, lower peninsula.

I do want you to know that I much appreciate receiving your comments.

Sincerely yours,

M. M. Leighton
Chief Emeritus

P.S. It may be wise to hold a September meeting of midwest men at a central place like Chicago. Could you attend? I will let you know definitely later.
Mrs. Leighton and I are leaving next Saturday for ten days in northern Minnesota. MML

17 July, 1958

Dr. M. M. Leighton,
611 West Pennsylvania Ave.,
Urbana, Illinois

Dear Dr. Leighton:

I wish to thank you for your note of the 13th with attached copies of letters and the reprint of your paper "Important elements in the classification of the Wisconsin glacial stage."

I fully agree with you about the qualifications of the members of the committee.

If Wold War iii does not break out I expect to go to St. Louis.

With regard to your paper I would like to register some differences of opinion. You do not mention in your work either my long summary of 1928 in the Wisconsin Academy transactions or the "Outline of Glacial Geology. The latter is still being sold. As I went into this as a commercial venture I am not giving copies away except to those who order more for class use. I think you musthave a copy of the other paper for I was in Urbana in 1929.

With respect to the age of loess the matter is discussed in the first edition of the "Outline" which has an appendix. I could not mention one vital item because it is not yet published. X-ray examination of the Illinois loess has convinced some soils men that the fines or clay fraction could not have come from drift but from the west. The silt fraction they said may have come either from drift or from the west. I do not advocate that all loess came from the western alluvial fans of Tertiary age but think that some must have come during interglacial times. The Russians have both warm and cold loesses that is both interglacial and glacial in age. I think that the thickness relation to valley trains may be explained by vegetation adn broken topography rahter than just distance . Of course valley trains were an excellent source but all I urge is that there is another source in the west. The relation of loess to the impossible boundaries of Iowan ice still carried on many maps w as long ago explained by Shimek on the basis of vegetation and topography.

In you discussion of Valders drift you do not mention when or why the name Valders was introduced. I recall that Antevs first suggested that your original correlation of Aldens red till as Mankato was not proved. By the way I found a red till also below the Forest Bed at Neenah in two test borings made last year. Red till is also reported below peat of more than 12000 years age in Waushara County. I followed Antevs suggestion and picked the name Valders because of the wonderful crossed striae which I think you have seen.
I cannot now find my copies of several old editions of the "Outline" but since I used the name in the 1943 report on northeastern Wisconsin I must have first used it previously. I hear that Black has found a forest bed south of Ashlandbut of vourse has no date on it as yet.

I share your cautious attitude on "radiocarbon years". Maybe Antevs is right even if some varve experts did comitt serious sins against science. See my 1957 report on the Door Peninsula.

Possibly you skipped some events about the Valders nomenclature to save space but I thin from my books that you never ordered very many copies of the "Outline" which has been revised every few years ever since 1934. The last came out just a year ago. Cant your library order a copy. It is only $3.00 postpaid.

Sincerely yours,

IN REPLY REFER TO:

G-Gen

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geologic Division
Denver Federal Center
Denver, Colorado

September 12, 1958

Air Mail

Dr. F. T. Thwaites
41 N. Roby Road
Madison 5, Wisconsin

Dear Dr. Thwaites:

The enclosed draft of a report by the Pleistocene Committee of the American Commission on Stratigraphic Nomenclature is sent to you at the request of M. M. Leighton. I regret that I failed to send you a copy originally, when over fifty were mailed to members of the Profession for criticism. Over half of those on Dr. Leighton's list did receive copies, however, and many excellent comments and suggestions have been received, both from them and from others. We hope that you will add yours.

This year the annual meeting of the Committee, during the GSA meetings at St. Louis, will be open to all interested parties with the expressed purpose of discussing the content of this report. If there is sufficient criticism we will be glad to add an additional member or two to the committee to help with the revision. We hope that you will be able to be there.

Sincerely yours,

Gerald M Richmond

Gerald M. Richmond, Chairman
Committee on Pleistocene
American Commission on
Stratigraphic Nomenclature

Enclosure

Present at Chicago, 20 Sept 58

Bretz, J H

Bupby, J A

Brown C W

Hough, J L

Leighton M M

Martin, Helen M

Mellhom, W N

Ray L L

Trowbridge F W

Thwaites, F T

Trowbridge A C

13 April, 1959

Dr. M. M. Leighton,
611 W. Pennsylvania A ve.,
Urbana, Illinois

Dear Dr. Leighton:

I noted when checking up after a visit to my son Tom at Pennsylvania University over Easter that I had not thanked you for the copy of " Peinciples " and viewpoints in formulating the stratigraphic classifications of the Pleistocene. I am sending enclosed my latest paper on The Baraboo District. I hope its new ideas do not shock you too much. They may not be so new for the paper is a reworking of one prepared for the Kansas Geological Society trip of 1935. I think some of the horror expressed by some of the critics of the paper I presented at St. Louis last fall are due to conflict with the ideas they learned in school. Possibly this is in part due to the conflict of faith in ones instructors, with true science as reasoned out from other lines of evidence. Anyhow the paper on peneplains will as Martin found in 1922 have rough sledding from critics of the Davis gospel. I have lived long enough to see the air camera prove that old topographic maps were most misleading and to see the application of physics to geological problems. How many old-timers knew what log-log plotting is? I know positively that many old reports confused constructional or depositional surfaces ~~are with~~ peneplains. I have myself seen from the rsults of drilling that much of "valley widening" is in fact valley filling. Well, these projects and the resultant criticism are enough to prevent life from becoming dull.

We spent Easter holidays at State College, Pennsylvania where my son Tom is teaching physics. He had to be away for the vacation so wanted us to stay with his family. I made frequent walks over a vally flat of the Harrisburg peneposin(I suppose) and found it underlain not by gravel but by a clay-stone rubble. I have long thought that a new explanation of these levels is in order and Hack has offered one in a recent U. S. G. S. Professional Paper.

I hope to get on Black's Pleistocene trip to northwestern Wisconsinthis spring but nothing is certain as yet. I may also get to Cincinnati next fall.

The paper on the St. Peter base I left in Chicago last fall when I was at the meeting has not yet been heard from except a statement that they have it. I wonder if it will receive rough treatment too. Some people do not accept subsurface evidence or well samples. I endorse Flint for what he called the base of the St. Peter but not for what I consider as that horizon. The strata I include with the St. Peter cut down as low as the Franconia sandstone of Cambrian age but this is known almost wholly from cable tool samples which some people were trained to ignore or reject. I once had this belief and was surprised to find that it is not correct.

With best regards,

Sincerely yours,

F. T. Thwaites

STATE OF ILLINOIS
WILLIAM G. STRATTON, GOVERNOR
DEPARTMENT OF
REGISTRATION AND EDUCATION
VERA M. BINKS, DIRECTOR
SPRINGFIELD
BOARD OF NATURAL RESOURCES
AND CONSERVATION
VERA M. BINKS, CHAIRMAN
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BIOLOGY - - ALFRED E. EMERSON
FORESTRY - - LEWIS H. TIFFANY
UNIVERSITY OF ILLINOIS
DEAN WILLIAM L. EVERITT
SOUTHERN ILLINOIS UNIVERSITY
PRESIDENT DELYTE W. MORRIS

STATE GEOLOGICAL SURVEY DIVISION
LOCATED ON THE CAMPUS OF THE UNIVERSITY OF ILLINOIS
JOHN C. FRYE, CHIEF
NATURAL RESOURCES BUILDING
URBANA

April 21, 1959

Dr. Fred T. Thwaites
41 North Roby Road
Madison 5, Wisconsin

Dear Fred:

I have received your letter of April 13. I think that you are a bit hard on the "old-timers." Don't you think that the inference might be made from what you say that they were all wrong and geologic science was in an awful state? Geology has had to grow, but it wasn't all bad at one time. Even now there are outlandish interpretations made.

I am interested in what you say about the clay-stone rubble on a remnant of the Harrisburg peneplain. You don't describe it and I shall be looking up in Hack's recent professional paper. I would expect a highly weathered product of any former gravel that today would not be gravel.

As for subsurface evidence from well samples, the integrity of it depends in some measure on who is studying the samples, on the reputation of the driller, and on what part of the section is being studied. By that I have reference to the Pleistocene. In my early experience in collecting well logs personally from drillers I found a great difference in drillers. The logs of some were obviously being given as a favor or as a guess, others bore a mark of integrity. I refused to file the former for some other geologists who did not know the circumstances to make mistakes on.

Kind regards to you and Mrs. Thwaites.

Cordially yours,

Morris Leighton

M. M. Leighton
Chief, Emeritus

General Geology Branch
Geologic Division
Denver Federal Center
Denver, Colorado

October 7, 1958

Memorandum

To: All interested parties

From: Chairman, Committee on Problems of the Quaternary
American Commission on Stratigraphic Nomenclature

The S.E.P.M. is in the process of organizing a symposium under the title "Concepts of Stratigraphic Classification and Correlation", to be held at their next annual meeting in conjunction with the A.A.P.G., Dallas, Texas, March 16-19, 1959.

The Chairman is Dr. Grover Murray, School of Geology, Louisiana State University, University Station, Baton Rouge 3, Louisiana.

The express purpose of the symposium is to discuss differences of opinion on all stratigraphic classification problems before the tasks of the various committees working on the stratigraphic code get too far along.

This is an invitation to you to take part in an organized discussion of stratigraphic classification problems of the Quaternary. I have written Dr. Murray to reserve time for this subject and a prepared paper representing your philosophy is in order if you so desire. Titles and brief abstracts should be in Dr. Murray's hands by November 1.

Cordially yours,

Gerald M. Richmond

Gerald M. Richmond

From M. M. Leighton 2-10-59

To those who attended the Chicago meeting or sent regrets:

SOME COMMENTS ON MY PUBLISHED PAPER, "PRINCIPLES AND VIEWPOINTS IN FORMULATING THE STRATIGRAPHIC CLASSIFICATIONS OF THE PLEISTOCENE"

Dallas, Texas: "Your discussion of weathered zones is particularly effective in support of your contention that the proposed classification is 'unnatural'. . . I believe. . .that a classification system loses much of its value when it is constructed as an end in itself rather than as a means to clear thought."

A former president of AAPG writes: "I am glad you speak out for the retention of established values, rather than accepting suggested revisions just because they are new. Scientists shouldn't be sheep!"

Ottawa, Ontario: "Although I have not had the opportunity to see as yet the preliminary report of the Pleistocene committee of the American Commission on Stratigraphic Nomenclature, whose recommendations your paper criticizes, I find myself wholly in agreement with your views. From the little work I have done with Pleistocene deposits during the past half dozen summers I find no reasonable merit for the adoption of the multiple classification of glacial deposits, such as is applicable for bedded rocks. I sincerely hope your criticisms will result in strong afterthoughts on the part of the committee."

Chicago, Illinois: "I enjoyed reading your recent article on Pleistocene classification. Some persons forget that classification is a means to an end rather than an end in itself."

Washington, D. C.: "This is on a subject in which I have a great deal of interest and your article is very thought provoking."

Tulsa, Oklahoma: "I, as well as all of the other geologists who had their training in areas of glaciation, am still very much interested in the glacial processes and the stratigraphy of glacial deposits regardless of the fact that we are considerably removed from glacial areas and are concentrating on other branches of geology. I am fully in accord with your ideas on the natural system of classification of Pleistocene stratigraphy. I think also that it is very fitting that the men who will be charged with the responsibility of setting up this nomenclature come from the glaciated area where the glacial deposits are best known by the concentrated efforts of many people."

Ithaca, New York: "I am following with much interest the rapid developments in regard to this problem. Your paper should stimulate additional lively discussion --which is very healthy!"

Columbus, Ohio: "The debates among the Friends of the Pleistocene on stratigraphic classification are very interesting to us whose principle topics of study lie in other time zones; not only because 'everybody loves a good fight', but because it is through such engagements that every shred of evidence is re-examined and re-evaluated and new facets of the basic philosophy of our science are developed. Your point of view seems to be right and reasonable."

Toronto, Ontario: "I have just finished reading the paper and found it most interesting. I particularly endorse your views on the use of soils as stratigraphic units."

Evanston, Illinois: "I had not been following the deliberations of the Pleistocene committee very closely but your article brought home to me that perhaps my negligence is an abdication of responsibility in this matter. It might behoove many of us to speak up and be heard before we are saddled with a classification that is both unrealistic and unworkable.

From the author of the comprehensive volumes on "The Quaternary Era": "Thank you for your reprint on Pleistocene classifications. How right you are."

New Hampshire: "I am glad to have your summary at hand, and I think I need not tell you that I am completely in harmony with you in the views you express. Certainly we all recognize that the stratigraphy of the deposits made by the Pleistocene ice sheets must be different in almost every way from the stratigraphy of older rocks. And anyone who has had any familiarity with the mid-West certainly can't fail to see your point of view with respect to that area being the starting point for any classification.

"Thank you for stating the case so clearly."

FTT

Resolutions of

Glacial Geologists from Illinois, Indiana, Iowa, Michigan, and Wisconsin

Chicago, September 20, 1958

Those present and their fields of research in the Middle West are as follows:

Name	Fields
Bretz, J Harlen	Chicago region Northern Illinois Glacial Great Lakes
Brophy, John A.	Illinois
Brown, Charles N.	Iowa
Hough, Jack L.	Glacial Great Lakes
Leighton, M. M.	Iowan drift Drifts and loesses of Illinois Classification of Wisconsin substages
Martin, Helen M.	Michigan
Melhorn, Wilton N.	Michigan Indiana
Ray, Louis L.	Ohio Valley
Terwilliger, F. Wells	Michigan
Thwaites, Fred T.	Wisconsin Southern Illinois
Trowbridge, A.C.	Iowa Southern Wisconsin Mississippi River Valley

FINDINGS

We have carefully reviewed the preliminary report of the Pleistocene Committee of the American Commission on Stratigraphic Nomenclature and the conditions and circumstances leading up to it. As a result we have certain observations and findings.

1. The American Commission is composed of stratigraphers of the older rocks who are delegates from geological societies to study and set up a stratigraphic classification and nomenclature of the older rocks. Versed in that field, they have made admirable contributions.

2. When their deliberations reached the Quaternary they faced a different situation. Recognizing that they were not in position to consider and act upon this subject, they had two choices as to procedure: 1) to refer the matter back to the parent societies with the request that a sub-commission, or the like, be formed by the appointment of delegates experienced in Quaternary stratigraphy; or 2) to take upon

themselves the responsibility of appointing a representative Pleistocene Committee. They chose the latter, and in so doing gave the Pleistocene Committee responsibilities that the Commission largely was not prepared to assume.

3. It is a matter of record (1954, A.A.P.G. Bull., v. 38, p. 1334-1335) that a committee on Pleistocene classification was established and then reorganized in 1955 (1957, A.A.P.G. Bull., v. 41, p. 131), with the expressed objective of collecting opinion on problems of classification and nomenclature in the Quaternary and submitting reports thereon (see p. 1, Preliminary Report).

4. At the 1955 meeting of the Commission (1956, A.A.P.G., v. 40, p. 1419), when the Chairman of the Pleistocene Committee made his first report, he requested and the Commission approved, that the multiple classification system--designed for the older rocks--be applied to the Quaternary. The promptness of this action makes it appear that it was

taken before the Committee had completed its exploratory study. It suggests, as does the present preliminary report of the Pleistocene Committee and the articles in the current August issue of the Bulletin of A.A.P.G., the adoption of a new philosophy of Pleistocene stratigraphic classification.

5. It appears further that the Committee's exploratory analysis of the philosophies involved has been incidental since 1955, and that the Committee has bent its efforts on an attempt at adaptation of only one philosophy, hence the character of the preliminary report.

6. In 1955 the Pleistocene Committee was composed of geomorphologists, glacial geologists, and glaciologists, from New England, Ohio, the southwest border area of the continental drift in Kansas, the Gulf Coast, the Rocky Mountains, the Great Basin, and the Pacific Coast. It is a matter of some note that no career workers from the classic area of the Midwest glacial Pleistocene have been included.

7. The observation should also be made here that in the preliminary report and recent articles, insistence is placed on the desirability of having the same stratigraphic classification and nomenclature throughout the geologic column. There is little evidence of the naturalistic approach. Note is not taken of the fact that the subdivisions of the glacial Pleistocene are based differently from the subdivisions of the older rocks--the former on climatic changes, the latter largely on marine invasions and retreats. These fundamental differences require two different philosophies of stratigraphic classification.

8. The Committee has obtained opinions [of its preliminary report] by personal inquiry. However, in this case where the stratigraphic classification of the glacial Pleistocene is involved as well as the stratigraphic classification of the nonglacial, there is need for an organized program of discussion.

CONCLUSIONS

1. We take exception to a fundamental premise of the Pleistocene Committee, that it is desirable to fit the glacial Pleistocene into the system of classification and nomenclature which has been devised for the older rocks and the nonglacial Pleistocene.

2. We feel that any revisions involving the glacial Pleistocene should be made within the framework of the present system by reason of its singular nature.

Therefore, <u>be it Resolved</u>, by this group that insofar as it applies to the glacial Pleistocene we express our disapproval of the preliminary report of the Pleistocene Committee.

PROPOSAL

Be it also Resolved, that in the interests of achieving a more scientific stratigraphic classification and nomenclature of the glacial Pleistocene, we urge the adoption of a measure designed to resolve this basic conflict in philosophy, by holding a symposium of papers and organized discussions to precede the formulation of the final Committee report.

Signed: J Harlen Bretz
John A. Brophy
Charles N. Brown
Jack L. Hough
M. M. Leighton
Helen M. Martin
Wilton N. Melhorn
Louis L. Ray
F. Wells Terwilliger
F. T. Thwaites
A. C. Trowbridge, Chm.

MORRIS M. LEIGHTON
611 WEST PENNSYLVANIA AVENUE
URBANA, ILLINOIS

September 15, 1958

Dr. Fred T. Thwaites
41 North Roby Road
Madison 5, Wisconsin

Dear Fred:

Enclosed is a copy of my letter to Black, inviting him to the conference.

Herewith is also a rough draft of a statement that I have prepared for the conference. You can return it to me at Chicago. I suggest that if you have the chance you show it to Black.

Cordially yours,

Morris M. Leighton

cc: Dr. Robert F. Black

MORRIS M. LEIGHTON
611 WEST PENNSYLVANIA AVENUE
URBANA, ILLINOIS

September 15, 1958

Dr. Robert F. Black
Department of Geology
University of Wisconsin
Madison 6, Wisconsin

My dear Black:

Since you are succeeding Fred Thwaites in the study of the Pleistocene of Wisconsin, I would be delighted to have you attend our Chicago conference with Fred next Saturday, Rosenwald Hall, Department of Geology, University of Chicago, 10:00 a.m. The University of Chicago will be host to us at luncheon at the Quadrangle Club, southeast corner of 57th Street and University Avenue.

Yours Sincerely,

Morris M. Leighton

cc: Dr. Fred T. Thwaites

12 Sept., 1958

Dr. M. M. Leighton,
611 W. Pennsylvania Ave.,
Urbana, Illinois

Dear Dr. Leighton:

Yours of the 3rd is at hand. I saw Black yesterday afternoon and he thinks that after two field seasons, much of it in areas of the State which I never worked in, he might be able to join in the discussion. If you feel the same way you might write him. He said he might be able to drive to Chicago and so get us there in time. However, I advocated flying if at the last moment Truax Field is not fogged in. It took us an hour once to go from Midway to O'Hare in a bus. I think that the new toll road ends for the present at O'Hare Airport.

Sincerely yours,

27 August, 1956

Dr. M. M. Leighton,
611 West Pennsulvania Ave.,
Urbana, Illinois

Dear Dr. Leighton:

I was delayed in answering yours of the 22nd until I found out some things about coming to Chicago on the 30th of the coming month. I find that unless I left about 5:20 A. M. I cannot be sure of getting there by 10 A. M. This is true on both train and bus. The air service is most uncertain because Truax Field is in low ground and is so frequently fogged in that early morning departures are greatly delayed. My best bet is the 7:10 Milwaukee Road train which does not arrive until after10:00 I would then be a little late but not much too early. I have stayed up all night recently on trains but getting started at such an early or too early hour is another matter. Mrs. Thwaites is to have a cataract operation on the 8th or thereabouts and should return from the hospital just about the day before I would leave. Bob will be home and can look after her that day.

With the known uncertainties of dating glacial drifts as well as in correlating them I can see why the "experts" would like to turn to another type field for a general calssification!

Sincerely yours,

MORRIS M. LEIGHTON
611 WEST PENNSYLVANIA AVENUE
URBANA, ILLINOIS

August 22, 1958

Dr. Fred H. Thwaites
41 North Roby Road
Madison 5, Wisconsin

Dear Fred:

Nearly all of those to whom I wrote on August 11 favor holding a meeting in Chicago in September and a substantial number have indicated a date near or after the middle of the month. I have contacted Prof. C. E. Olson, Chairman, Department of Geology, University of Chicago, and he says that our group will be heartily welcomed to Rosenwald Hall.

The arrangements then are as follows. We will meet on Saturday, September 20, 1958, at 10:00 a.m. in Room 41 (4th floor), Rosenwald Hall, University of Chicago, Chicago, and we will take lunch at the Quadrangle Club, University Avenue and 57th Street (two blocks north and slightly east of Rosenwald Hall).

My thought is that the holding of this meeting is in itself taking cognizance of the fact that the classic area is inadequately represented on the Pleistocene Committee, and that we will take this opportunity for constructive action by discussion and by outlining, at least tentatively for further study, what the nature of the Pleistocene in the classic area requires in classification and standards of nomenclature.

Kindly acknowledge this letter and let me know whether or not you probably can attend. I also urge that you study Gerry Richmond's preliminary report and that you let me have your suggestions for the agenda.

Cordially yours,

Morris M. Leighton

14 Aug., 1938

Dr. M. M. Leighton,
611 West Pennsylvania Ave.,
Urbana, Illinois

Dear Dr. Leighton:

In reply to yours of the 11th I have no appointments for any date in September so far as I now know. We were planning at one time to go to California to see our son who is now there but this is very uncertain. Hence I could go to Chicago at any time you desire so far as I now know.

Incidently, I do not deserve the title you give me for I was never allowed to take the PhD. Indeed I was tagged as unfit to teach and some always hold to this view although not my students.

Sincerely yours,

6 December, 1957

Monroe Water Dept.,
Box 200,
Monroe, Wis.

Dear Mr. Mayer:

Yours of the 3rd is at hand and I am sorry to learn of learn of your troubles. It is very likely that the tools were followed down by some broken rock which has jammed them and made it very difficult to remove. Besides the fact that they were left stuck in the first place suggests that trouble might be experienced again.

Now as to the loss of capacity the entire lower part of the hole showed rather hard drilling although some of the samples looked good. Of course, hard drilling is not always due to hard rock for the cuttings settle in some layers and make drilling slow in spite of attempts to put in clay and keep them up. At Madison we had the same condition, hard rock although the sand is coarse. Whenever they got the hole cleaned out the capacity increase showing that there is water in this harder formation.

On the other had it is a financial problem. If you have to pay by the hour fishing it could prove more economical to leave tools and sand in the hole below them As I see it only a pumping test can show . They made several tests at Madison to show just what had been accomplished and you would have only the test before any work was done

I wonder if you have had hold of the tools or if they are prehaps only buried in caved sand

MONROE WATER DEPARTMENT

KENNETH L. MAYER
SUPERINTENDENT

P. O. BOX 200
MONROE, WISCONSIN

PHONE 413

Dec. 3, 1957.

F.T. Thwaites,
41 North Roby Road,
Madison 5, Wis.

Dear Mr. Thwaites:

We are having some trouble at our #4 well.

So far we shot 500 lbs. of explosives and in doing this we jarred an old set of tools loose in the well at that old fishing location 1050' or 1060'.

Our first shot of 250 lbs was at 1575' and this knocked in 72' of material above this location and the second shot at 1460' knocked in 46' above or a total of 118' of material from the two.

After some drilling and bailing we were running in with the tools and they set up at 1050' which knocked the old set of tools down the well to 1510'. We have been fishing for them for over a week and haven't had too much luck.

We were wondering if you thought it would be necessary to retrieve the old tools and clean the well out to the original depth of 1688' or if that 178' left in the well would cut down the capacity of the well.

Any suggestions that you may have will be greatly appreciated.

Yours truly,

MONROE WATER DEPARTMENT,
Kenneth L Mayer.
Kenneth L. Mayer, Supt.,

klm/cst

1688
178
1510

$25.00 cancelled
esp 18c + 6 =
24¢ postage

MONROE WATER DEPARTMENT

KENNETH L. MAYER
SUPERINTENDENT

P. O. BOX 200
MONROE, WISCONSIN

PHONE 413

Sept. 21, 1957.

Prof. F.T. Thwaites,
Science Hall,
Madison, Wis.

Dear Mr. Thwaites:

The Monroe Water Department are going to take bids on their #4 well for the purpose of rehabilitation.

We are not sure just what happened to cause the capacity to drop from over 850 GPM to around 500 GPM. But, we do know it is the well and not the pump. The static level dropped from 193' to 295' about a year ago and at that time the pump was throttled to hold 5' to 10' of water over the boles.

The log #105880 - 106223 that you prepared in 1939, on this well shows a fishing job at 1063' so maybe the well is caved in at this point and not allowing any deeper water to rise.

The Water Board would like to know where to shoot the well in case it is necessary as it was on the two previous wells #1 and #5.

Our #1 well $20,000.00 shooting job was cheaper yet than #5 by $20,000.00, because at #5 after each shot so much material was knocked down and it took so long to drill it up and bail out. We probably should have lightened our loads after experiencing the great amount of material being knocked down each time at #5. At #1 well, each shot seemed to be about right and only a couple of truck loads of sand were drilled up and bailed out, but we did have to test pump it much longer to clear up the sand flow.

Both wells that were shot now produce as much as they did originally and are holding up good.

If you should want any additional information such as pumpages, water levels, etc., we can furnish it.

Thank you very much for your help on these jobs.

Yours truly,

MONROE WATER DEPARTMENT,

Kenneth L. Mayer

klm/cst.

Kenneth L. Mayer, Supt.

25 Sept., 1957

Mr. Kenneth L. Mayer, Supt.,
Water Department,
Monroe, Wisconsin

Dear Mr. Mayer:

Yours of the 21st was delayed in reaching me for I was retired on 1 July of this year and hence do not get mail at Science Hall every day.

Since I am on my own now I cannot furnish any advice except on a consulting basis. If you desire to have me do this I am at your disposal. Otherwise please write Mr. George Hanson, State Geologist, Madison 6, Wis.

Sincerely yours,

MONROE WATER DEPARTMENT

KENNETH L. MAYER
SUPERINTENDENT

P. O. BOX 200
MONROE, WISCONSIN

PHONE 413

Oct. 12, 1957.

Mr. F.T. Thwaites, Geologist,
41 North Roby Road,
MADISON, 5, Wis.

Dear Mr. Thwaites:

The Board of Water Commissioners had a meeting Oct. 8th and they would like to know how much your services would be to spot the shot locations and sizes to use on our #4 well.

The firm of Egerer & Galloway will be doing the work, the same firm that shot #1 and #5 wells here at Monroe.

Carl A. Bayes & Associates of Urbana, Illinois made a Geophysical log of #4 well in 1948 and this probably will be of help at this time.

Please let me know as soon as possible the amount you would charge for doing the required work at #4 Well.

Yours truly,

klm/cst

Monroe Water Department,
Kenneth L. Mayer
Kenneth L. Mayer, Supt.

14 Oct., 1957

Mr. Kenneth L. Mayer, Superintendent,
Monroe Water Department,
Monroe, Wisconsin

Dear Mr. Mayer:

In reply to yours of the 12th my charge for picking shot points in No. 4 well would be twentyfive ($25.00) if the work can all be done here but if I have to come to to Monroe would add expenses, milaege at 7 cents a mile plus meals meals, etc.

To do this in the way I have employed usually requires the drillers daily reports showing number of feet drilled. One can also use the geophysical log which gives essentially the same results. If you have these reports a copy showing number of hours worked and feet of progress is all that is needed. If you do not have this information I can secure it from the drillers of the well.

Sincerely yours,

MONROE WATER DEPARTMENT

KENNETH L. MAYER
SUPERINTENDENT

P. O. BOX 200
MONROE, WISCONSIN

PHONE 413

Oct. 21, 1957.

Mr. F.T. Thwaites, Geologist
41 North Roby Road,
Madison , 5, Wis.

Dear Mr. Thwaites:

We are inclosing the geophysical report along with the log of #4 well.

The drilling time etc., is on another sheet and if you want to insert the size of shot and depth on that sheet, you may.

If there should be any additional information you might need for this job, just phone 413 and I will send it to you.

We plan on starting this job next week so we will need this information quite soon.

Yours truly,

MONROE WATER DEPARTMENT,

Kenneth L Mayer

Kenneth L. Mayer, Supt.

klm/cst.
Enc.3

MONROE WATER DEPARTMENT

KENNETH L. MAYER
SUPERINTENDENT

P. O. BOX 200
MONROE, WISCONSIN

PHONE 413

Oct. 23, 1957.

F.T. Thwaites, Geologist
41 North Roby Road,
Madison, 5, Wis.

Dear Mr. Thwaites:

Enclosed herewith is a hydrograph made by William Drescher of the U.S. G.S.

The graph shows fluctuations of the water table during pumping tests made Nov. 7th to the 9th, 1951. Measurements were either made by steel tapes or reliable air lines and are also shown on the graph.

This information will at least be interesting if not helpful in determining the locations for shooting our #4 well.

Yours truly,

MONROE WATER DEPARTMENT,

Kenneth L. Mayer

Kenneth L. Mayer, Supt.

enc. 1.

24 Oct., 1957

Mr. Kenneth L. Mayer, Supt.,
Monroe Water Department,
Box 200, Monroe, Wisconsin

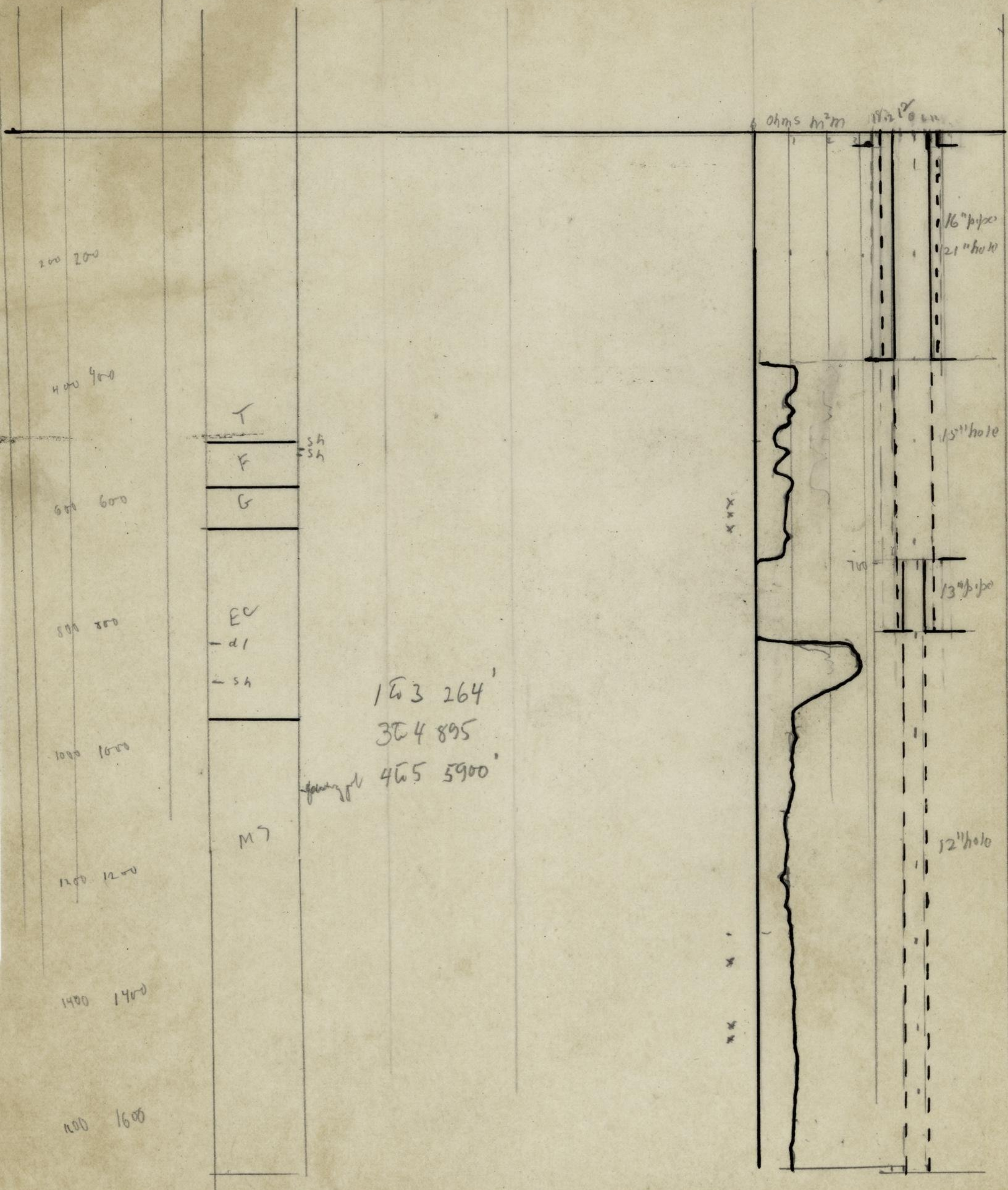
Dear Mr. Mayer:

I have looked over all the available data on your well No. 4 and made several suggestions on shot points. The amounts are subject to revision in light of your experience plus Mr. Galloway's. He recently shot No. 13 here and one shot filled up half the well. The final result however was very good. I depended largely on the drilling speed for there is little in the resistivity log in the lower part which helps much. Your suggestion of a block in the well is good. In all probability the lower part of the well is filled up for some distance. In spite of the evidence for much water in the lower part of No. 5 this well is not very encouraging. Nevertheless I suggest several shots in this section.

The data sheets you sent are returned herewith along with my bill.

Sincerely yours,

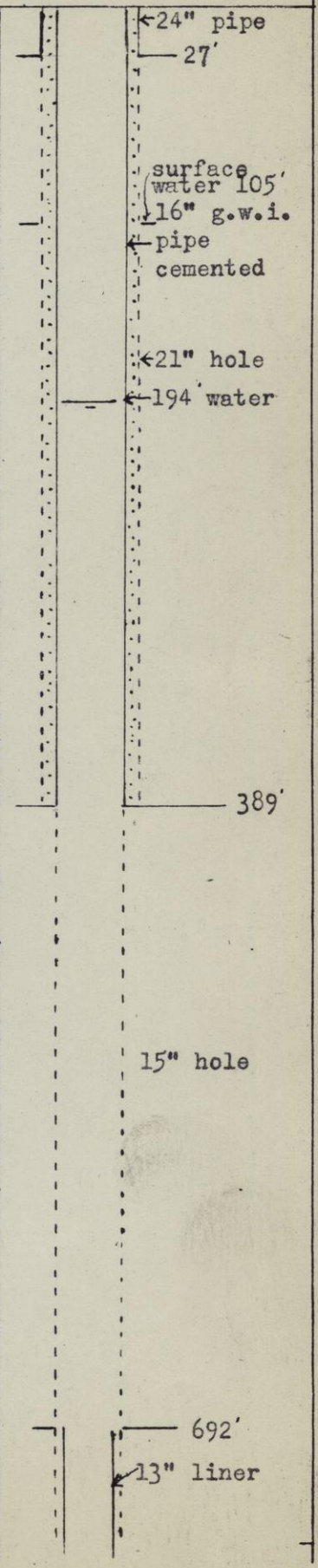
No 4 Monrovia



CITY WELL NO. 4, MONROE, WIS.

Mead, Ward, and Hunt, Engineers P. W. A. Project Wis. 1666 S.
Jos Egerer, Contractor, 1939 Center S½ sec. 34, T. 2 N., R. 7 E.
Elevation about 1005 Samples examined by F. T. Thwaites, Nos. 105880-106223

D	20	0-20	20		Glacial till, dark gray
GAL-PLATT	120	20-55	35		Dolomite, light gray and brown-gray
		55-115	60		Dolomite, gray, blue-gray spots
		115-140	25		Sandstone, coarse to fine, gray, very dolomitic
STP	60	140-180	40		Sandstone, medium to fine, light gray, some yellow-gray
		180-200	20		Shale, red; chert, white; sandstone, coarse, gray
LOWER MAGNE	155	200-235	35		Dolomite, light gray, some pink; chert, pink, some glauconite and sand
		235-280	45		Sandstone, coarse to medium, dolomitic, light gray; chert, white
		280-290	10		Dolomite, light gray
		290-345	55		Dolomite, light gray; some shale, green; chert, white
		345-355	10		Dol, lt.gy; chert, wh, oolitic; ss, fne, wh
TREMPEALEAU	145	355-385	30		Sandstone, medium to fine, light yellow-gray, very dolomitic (Madison)
		385-425	40		Sandstone, medium to fine, light gray, dolomitic (Jordan)
		425-455	30		Siltstone, very dolomitic, gray, some pink, glauconitic
		455-500	45		Siltstone, very dolomitic, red, glauconitic
FRANC	75	500-515	15		Sandstone, fine, pink, dolomitic, glauc.
		515-525	10		Shale, red, dolomitic, glauconitic
		525-535	10		Ss, fine, pink, gray, dol, glauconitic
		535-540	5		Shale, gray, silty, dol, glauconitic
		540-560	20		Sandstone, fine, light gray, glauc., dol.
		560-575	15		Ss, fine to coarse, lt. gray, dol, glauc.
DRESB	65	575-640	65		Sandstone, medium, white, soft
		640-660	20		Sandstone, medium to silty, lt.gray, dol.
		660-680	20		Sandstone, medium to fine, white, lt.gray
		680-700	20		Sandstone, fine to medium, gray to white, part dolomitic
		700-708	8		Sandstone, fine to medium, gray, dolomitic
		708-745	37		Shale, gray, dolomitic, caving



EAU CLAIRE	745-755	10		Dolomite, gray, sandy, caving?
	755-765	10		Shale, gray, dolomitic, caving
	765-790	25		Sandstone, fine, gray, dolomitic, caving?
	790-805	15		Sandstone, medium to fine, light gray, dol.
	805-825	20		Sandstone, medium to fine, white to lt.gray
	825-830	5		Dolomite, sandy, light gray
	830-845	15		Sandstone, medium to fine, gray, dolomitic
	845-850	5		Dolomite, light gray
	850-880	30		Sandstone, fine, gray, dolomitic
	880-885	5		Shale, gray, dolomitic
	885-920	35		Sandstone, fine, gray, very dolomitic
	920-930	10		Sandstone, fine, white
310	930-950	20		Sandstone, fine, gray, dolomitic
MT SIMON	950-995	45		Sandstone, , coarse to fine, white to light gray; no sample 970-975
	995-1000	5		Sandstone, fine to medium, light gray, dol.
	1000-1010	10		Sandstone, silty to medium, gray
	1010-1025	15		Sandstone, silty to fine, gray
	1025-1035	10		Sandstone, medium to coarse, white
	1035-1040	5		Sandstone, silty to fine, light gray
	1040-1095	55		Sandstone, coarse to silty, light gray
	1095-1115	20		Sandstone, coarse to fine, light gray
	1115-1200	85		Sandstone, coarse to medium, light gray to gray
	1200-1205	5		Sandstone, fine, dark red
	1205-1220	15		Sandstone, silty to coarse, gray to lt.gray
	1220-1230	10		Sandstone, coarse to fine, light gray
	1230-1240	10		Sandstone, medium to fine, pink
	1240-1250	10		Sandstone, fine, light pink
	1250-1255	5		Sandstone, medium to fine, light gray
	1255-1260	5		No sample
	1260-1280	20		Sandstone, fine, light pink
	1280-1320	40		Sandstone, fine to coarse, light gray
	1320-1325	5		Sandstone, fine to coarse, dark pink
	1325-1335	10		Sandstone, fine to coarse, light pink
	1335-1340	5		Sandstone, fine to coarse, lt.gray, hard
	1340-1350	10		Sandstone, fine to coarse, pink, gray
	1350-1390	40		Sandstone, fine to coarse, pink and gray
	1390-1425	35		Sandstone, coarse to fine, light gray, hard
	1425-1465	40		Sandstone, fine to medium, light gray, some coarse at bottom
	1465-1495	30		Sandstone, fine to medium, light gray
	1495-1505	10		Sandstone, fine to medium, light pink
	1505-1520	15		Sandstone, fine to medium, light gray
	1520-1525	5		Sandstone, very fine to medium, light pink
	1525-1545	20		Sandstone, fine to coarse, light gray
	1545-1565	20		Sandstone, medium to coarse, light gray
	1565-1585	20		Sandstone, medium to fine, light gray
	1585-1595	10		Sandstone, medium to coarse, light gray

815

12" hole

	1595-1600	5		Sandstone, medium to fine, light gray
	1600-1620	20		Sandstone, medium to coarse, light gray
	1620-1670	50		Sandstone, medium to fine, light gray
738	1670-1680	10		Sandst one, fine to medium, light gray
	1680-1688	8		Sandstone, fine to coarse, light gray

Formations: Drift (Illinoian); Galena-Platteville (includes Decorah); St. Peter; Lower Magnesiann (Prairie du Chien); Trempealeau (includes Jordan); Franconia (formerly Mazomanie); Dresbach (Galesville); Eau Claire; Mt. Simon

Tested at 884 g.p.m. specific capacity = 7.0 g.p.m. Water temperature 55 F.

Fishing job at 1063

Phil: please read & return

6 copies

¶ In reply to the suggestion of G. O. Raasch that the base of the Upper Cambrian is at the ~~base~~ bottom of the Bayfield group instead of at its top a number of lines of evidence ~~may~~ must be considered. This problem was the main subject objective of my studies in the years 1910 and 1912. ~~as~~ published in Wisconsin Bulletin 25, ~~1909~~ 1912 The following discussion was read by messers. Cline, Bean, Tyler, ~~and~~ Thompson and Others

¶ The major evidence for the pre-Cambrian age of the Bayfield group is that it ~~shares~~ was affected by in the oregeny which caused the uplift of the Middle Keweenawan flows and the Upper Keweenawan Oronto group. The great Douglas and Keweenaw faults are thrust#, not normal faults. They could only be ~~associated with~~ caused by compression. It is true that the disturbance of Limestone Mountain (Michigan) involves Silurian# (and possibly Devonian) strata but the movements here seem to be primarily subsidence, ~~and~~ not compression. The vertical strata ~~are~~ may be either drag ~~along~~ on a ~~probable~~ normal fault or they ~~may~~ might belong in that non-descript class often called "cryptovolcanic." Certainly they should not be classed with the great faults of the region to the north and west.

It seems almost impossible to place the age of the immense thrusts as younger than pre-Cambrian. The prevailing near-horizontality of the Bayfield group is due to its position in the center of ~~the~~ a syncline, ~~xxx~~ not to age.

¶ Whatever age might be assigned to the thrusts of the western part of the Lake Superior syncline it is evident that their formation was accompanied by ~~a~~ very great uplift of the ~~hanging wall~~ upthrown sides. The uplifted areas were deeply eroded and then buried by recognized Cambrian strata, as long since demonstrated in the St. Croix valley. The upland both north and south of the west end of Lake Superior is at about the same level and is obviously ~~a~~ part of the great pre-Cambrian "peneplain". If there were any subsequent period of thrust faulting there is no known sedimentary record of the ensuing erosion of mountains. An outlier of Cambrian sandstone discovered by E. F. Bean near Irma, Lincoln Co., Wisconsin, further proves the pre-Cambrian age of this erosion surface.

¶ The quartzose composition of the Bayfield group is no evidence of its Cambrian age. It is with the exception of the Devils Island formation, ~~by no means similar to~~ markedly different from the mineral ~~composition~~ assemblage of recognized Cambrian strata to the south. There are, for that matter, many pure quartz formations of Huronian age. Moreover, the Bayfield group is ~~distinctly~~ definitely non-marine, a fluvial formation deposited in an intermontane valley. Many pebbles of Keweenawan porphyry occur throughout. No such pebbles are present in the known Cambrian. It is clear that the mountains ~~of~~ resulting from the late Keweenawan orogeny were still being eroded when the Bayfield group was ~~being~~ laid down. It seems as if the vast ~~qua~~ quantity of quartz sand of the known Cambrian ~~may~~ must have been derived largely from the ~~later~~ erosion of the Bayfield group.

¶ Exposures in the vicinity of Munising, Michigan, show that a conglomerate of ~~rounded~~ quartz and quartzite pebbles ~~which~~ rests on a very even top surface of the red sandstones, probably of Bayfield age. Although ~~well~~ evenly bedded and therefore probably of ~~enough to suggest~~ marine origin, the pebbles display stream ~~abrasion~~ rounding. It is suggested that they are ~~reworked stream~~ river gravels formed on the pre-Cambrian "pediplain" surface reworked by the advancing Cambrian sea. Owing to the indistinct and irregular bedding of the fluvial red sandstones an erosion bevel is difficult to demonstrate.

¶ The pre-Cambrian surface heretofore called a peneplain, or end point of humid land erosion, is ~~possibly~~ very likely a pediplain or arid climate plain of erosion derived from adjacent residual mountains ~~which was~~ covered with gravels in the lower parts. These gravels were largely removed by the ~~Cambrian~~ Paleozoic sea. This area is now being studied in detail by Philip Oetking under my direction.

It may also be remarked that the lower strata on St. Louis River, Minnesota, now largely covered by water behind a dam, are distinctly of Oronto type. The apparent absence of the uppermost Bayfield formation (Chequamegon) in the subsurface of Minnesota ~~appers to~~ may demonstrate a profound erosional bevel below the Mt. Simon.

¶ In conclusion, it appears that the burden of proof rests upon anyone who desires to return to the interpretation of Irving, which he himself questioned, of making the Bayfield group part of the Cambrian.

F. T. Thwaites Jan. 4, 1950

COMMENTS ON "CAMBRIAN SANDSTONES OF NORTHERN MICHIGAN" by W. K. Hamblin,
Pub. 51, Michigan Geological Survey, 1958

In the report listed above Mr. Hamblin gives a very thorough treatment of the lithology and structure of the sandstones which I studied in Wisconsin in 1910-1912. However, he failed to find any definite evidence of the age of the red sandstone there termed Jacobsville which appears to correlate with our Bayfield, for there is no contact with the older sandstone exposed on the northwest side of Keweenaw Point.

Some points occur to me from this preliminary reading plus a review of my report of 1912.

The first big problem is the geologic age of the earth movements which affected the Bayfield sandstones. Hamblin follows Reasch in making these faults post-Silurian. This is because of the age of the youngest affected strata at Limestone Mountain. I do not think this is established. Whatever the disturbance of the strata at Limestone Mountain, it is not the same as the two great thrust faults, the Douglas and Keweenaw. Limestone Mountain might be related to a branch of the Keweenaw fault, but it is possible that it is one of the so-called cryptо-volcanic disturbances . The upthrown sides of these thrusts were eroded away to a level which agrees with the general erosional level of the pre-Cambrian of northern Wisconsin and northern Michigan. It is an open question what became of the basaltic debris from such erosion. Little or none was deposited in the Lake Superior syncline. It seems to me that movements of such magnitude almost certainly belong to the orogeny which disturbed the recognized Upper Keweenawan and hence are Precambrian. If so, the debris was carried away in the long erosion interval which preceded the Upper Cambrian of southern Wisconsin Local disturbed areas in Paleozoic strata are known at Glovers Bluff in Marquette Co., Wisconsin and near Des Plains, Illinois just to mention those fairly near to Limestone Mountain. Other areas are widely distributed in the Mississippi Valley. The nature of the disturbance in Little Limestone which I saw when the road was freshly graded suggests this kind of structure more than does the drag along the Keweenaw Fault.

A second problem is the origin of the basin in which the Jacobsville-Bayfield sediments were deposited. Under the hypothesis that the Jacobsville is Lower or Middle Cambrian we have to assume earth movement along the faults disturbing the pre-sandstone surface to produce this valley. The pebbles of the Jacobsville suggest that the valley was bordered with mountains. Such a conclusion would fit with the demonstrated aridity of Jacobsville time.

A third problem affects my conclusions of 1910-1912. Are the strata at the bottoms of the three sections, St. Louis River, Middle River and Fish Creek, really Oronto (Freida) sediments? Hamblin asigns the conglomerate beds of Wall Ravine on Keweenaw Point to the Jacobsville. Could it be that the conglomerates of St. Louis River and Fish Creek are also ? It must be realized that the strata deposited in intermontane valleys vary laterally and that there is a big gap between the youngest beds on Montreal River and the oldest known Bayfield sandstone. There are no fossils and correlation must rest on lithology plus structure. The fact that we accepted the correlation is strong evidence of lithologic similarity with the Oronto group. The structure on Fish Creek and the presence of vertical Oronto beds a short distance to the southwest also supports the older correlation. The lowest strata on Middle River are shales not unlike the type Oronto (Freda). Despite the unexposed gaps in all sections but four, not ~~pebbles of~~ St. Louis I am far from convinced that I made an error. I found no pebbles of Oronto sandstone in the Bayfield of Wisconsin.

F. T. Thwaites

17 November, 1958

Dec. 9, 1932

Prof. Douglas Johnson,
Department of Geology,
Columbia University,
New York City

Dear Sir:

I wish to thank you for your reply to the copy of the letter to Leverett which I sent you recently. From the fact that I have spent some time in the Kickapoo country I venture to answer some of your questions.

It seems as if it is absolutely impossible to account for any marked variation in flow of the Kickapoo for its headwaters are ringed completely with high ridges as demonstrated by the tunnels on the Northwestern Railway from Elroy to La Crosse. There are no low passes like that north of the LaCrosse valley where they once surveyed for an interurban. This makes it necessary to assume that the meanders were begun when the river flowed much higher than at present and have been eroded downward with some lateral growth by the preglacial Kickapoo. Whether the initiation of the meanders or bends took place on a now eroded peneplain or was a consequence of the irregular top of the Lower Magnesian dolomites can only be conjectured now. It certainly looks as if then the river must have been larger. but I do not like to decide definitely on the cause of drainage changes that are so old.

I would like to add to my former discussion the fact that it seems peculiar to say the least, that the ridge west of the Kickapoo thought by Trowbridge to bridge the vale between two cuestas and demonstrate the reality of the Dodgeville Peneplain should have been preserved so near to two large streams. Such features should normally be far from main drainage lines.

Another matter is the disregard of rock structure shown by the Mississippi on the west side of Wisconsin. There are several angular overlaps in the Paleozoic, especially between the St. Peter and the Magnesian, at the base of the Richmond, at the base of the Niagara, and at the base of the Devonian. If we had restored the top of the Devonian we would unquestionably get a quite different picture of rock structure from that now obtained from far lower horizons. I have often thought that the Mississippi is a subsequent stream developed on the Richmond outcrop at some remote time.

With regard to the outliers of Paleozoics on the Superior Highland their scarcity on maps is not real. Most of the area is so thickly covered with drift that it is only in the pre-Wisconsin and doubtfully Driftless region north of Wisconsin Rapids that they can be found with certainty. Even there, recent grading on Highway 13 this fall demonstrated that Weidman had mistaken old weathered drift for residual soil from pre-Cambrian and that there is so much sandstone north of the accepted boundary that I found it hard to show my class any exhumed peneplain surface. Well drillers find patches of sandstone far to the north and I have seen much sandstone float near Wausau.

I might add that the rock surface of the pre-Cambrian does flatten

north of Merrill. South of there the slope down under the Cambrian which was described by Weidman so long ago seems to be clear. North of there, the approximate border of the Wisconsin Drift, our knowledge of rock topography is very scant but there may be a plain at roughly 1600 feet elevation. If one wants to extend this outh to touch the Baraboo Upland and some of the cuesta tops it would look possible but would be far from proved. For one thing, it would be hard to see why Baraboo quartzite was selected for complete plantion while many hills of weaker rock like the gabbro hills of the Gogebic survived. It has always seemed to me, as it did to Martin, that slight warping would explain the facts in a simpler way. I have always felt that the Paleozoic outliers at Limestone Mountain, Michigan have never been considered adequately when discussing the peneplain question. This also raises the old question of the age of the Lake Superior sandstones on which I started work 22 years ago and then was never allowed to finish in either Minnesota or Michigan.

I was laid off from further work in western Wisconsin because Twenhofel and I did not agree with Ulrich on stratigraphy but now that he has been retired the matter of the old report on the Sparta and Tomah quadrangles is again open. I have the manuscript and illustrations and when (or if, in view of the well-known Depression) field work is resumed for revision in the light of 1933 (or 19??) science the Kickapoo problem will have further attention. Meantime, I am glad that the discussion was started and hope to hear from you again. I regret that the present conditions make it in advisable to go to the Geological Society meetings this year or we might all have a chance to aruge over these and other matters.

Very truly yours,

F. T. Thwaites, Lecturer in Geology

December 2, 1932

To Messrs Leith, Leverett, Thwaites and Trowbridge

Dear colleagues:

Dr. Leverett has sent me a copy of his letter of November 30 and I have in hand copies of the replies from Professors Leith and Thwaites to Dr. Leverett, courteously forwarded for my reading.

The correspondence was precipitated by a casual expression on my part of certain doubts regarding the identity of the surface developed on the crystallines in north-central Wisconsin and the undoubted pre-Potsdam peneplane underlying the sediments in southern Wisconsin. Where the fundamental complex has been peneplaned, buried by sediments, the mass slightly tilted, and the whole bevelled a second time by peneplanation, the discrimination of the ancient and the recent peneplane, intersecting at a slight angle, is necessarily a delicate matter. The problem is essentially this: Are the conditions as represented in Figure I or as represented in Figure 2.

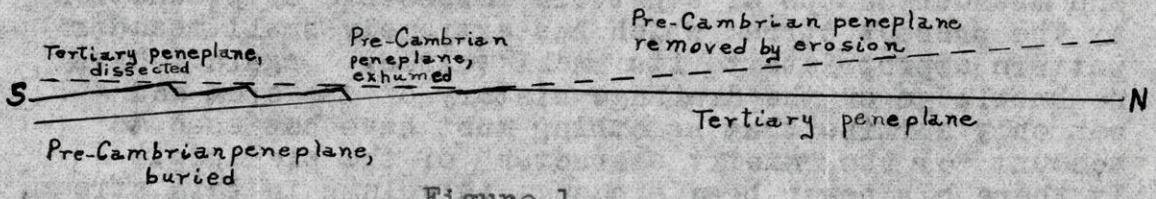


Figure 1.

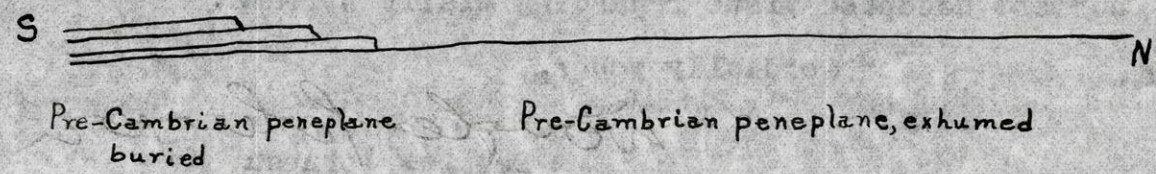


Figure 2.

I have no personal knowledge of the region in question and hence no valid opinion as to what the correct answer may be. I have long hesitated to accept the theory that the peneplane of north-central Wisconsin is a stripped pre-Cambrian surface, the hesitation being based merely on these general considerations: (a) The frequency with which peneplanes of widely different dates, intersecting at a very faint angle, have been mistakenly assigned to the same age in the past. The confusion of the Fall Zone peneplane with the Schooley is an example, but there are many others. (b) The relative scarcity of patches of Cambrian and later sediments over the area believed to represent the stripped pre-Cambrian surface. (c) The suggestion from the geologic maps, which I have never verified in the field or on the topographic maps, that the descent of the pre- Cambrian surface where exposed by stream trenching through the sediments is somewhat steeper than the average inclination of the surface north of the sedimentary areas. It should be understood that these are merely vague questionings. I have no knowledge inconsistent with the theory of a single pre-Cambrian peneplane. I am merely uneasy because the possibility of the alternative interpretation does not seem to me to have been definitely excluded.

With regard to the Kickapoo river:
The pattern of the valley seems to me clearly to indicate that it was carved by a stream of much larger volume than that now occupying the valley floor. The valley curves and curved scarps seem to me to be real meander curves and meander scarps of a pattern impossible of production by the present stream which has extremely small meander pattern appropriate to its small volume. Again I have no knowledge of the drainage history of the area and can only surmise that something must have happened to account for the "misfit character" of the Kickapoo. If there has never been a change in volume in this stream, it certainly deserves intensive study in order to correct current accepted views regarding misfit streams.

Cordially yours,

Douglas Johnson

41 N. Roby Road
Madison 5, Wis.
29th Sept., 1960

Dr. P. F. Oehling,
6946 Forest Lane
Dallas 30, Texas

Dear Phil:

I'm afraid I waited a long time to reply to your telephone call. It was not long before we had to make a two week trip to the Pacific Coast. This prevented my answering for several weeks. Bill had bought a microbus which he hoped would be wonderful. Then he had to fly out to be in time for the school he is teaching at Monterey leaving Carol to go out with us. We had promised to make the trip in a real car, not in this contraption. We found it hard riding. You can't stretch your legs in it . When Carol wears a skirt she has to be pushed in. When you get out you wonder when you will at length touch the ground! But as for speed! Well 300 miles is about tops for a long day. On grades you creep slower than the semis. On level ground you may reach 45. It took 8 days from Milwaukee to Monterey and used almost exactly 100 gallons of gas. Compare this with the use by a Buick and you will soon see that we spent more nights on the road with hence more for room and meals. Which was really more economical? Then you have to shout from back seat to front seat and vice versa, for there is no sound deadening. This matter of enclosed sound help up closed cars for some years, by the way You lose a lot of the interior space by reason of engine, transmission, and gas tank. It is not a large as it looks from the outside. One might mention the danger of a gust of wind tipping it which happened at Arena with fatal results to the driver. Well, we spent six days at Monterey when we got there and flew back by jet. However, I caught cold and was laid up several days. So, that's that. I only got to your letter this morning.

I took the drawing to Randy Sale, the U. W. draftsman for geography and other departments. He did not think mine was so bad counting the proposed reduction in size. If I don't demand a time limit, he will do a bit at a time and not charge for the job. I thought this was better, for he could ask questions of any arise. I will take him the original tracing soon. I sent a copy to Cohee with favorable comment. I also gave a copy to Lee Holt of the Ground Water Section in Science Hall, but he was hunting and hence have no comment. Now school is on I should send the last print to Hamblin at Kansas. The manuscript needs retyping and as my work has deteriorated will have to wait until Amy can do it. She is busy tutoring Bob in Algebra. If we can get a student to do this, then her work should be faster at least I hope so. Time will tell here. Bob got dropped from Platteville because he would not aim higher than a C and a C average is required. He should finish both algebra and trig before reentering but I can't see how he could get both of them by then for he just hates math. He likes geography and history so does well in these. He did not get along well in geology strange to say.

I hope you are better now. And that business is better. With best regards to both of you, I am

Sincerely yours,

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

September 13, 1960

Professor F. T. Thwaites
41 North Roby Road
Madison 5, Wisconsin

Dear Professor Thwaites:

It was indeed a pleasure to hear from you again and to know that you are still active in geologic investigations.

It was a pleasure to get to talk with Philip Oetking of Dallas regarding the stratigraphic problems in the northern peninsula of Michigan. In that connection, I am especially happy to have your very fine cross section from Wisconsin into the northern peninsula showing the correlation of the Cambrian and Ordovician rocks. The conclusions that I arrived at following my subsurface studies in that area are in agreement with the correlations shown on your cross section. It is true that there are facies changes in these rocks, but nevertheless there are certain diagnostic characteristics that carry through from Wisconsin into the northern peninsula by which such correlations can be made.

Thank you very much for the copy of the cross section for my reference files.

With best regards, I am

Sincerely yours,

George V. Cohee

George V. Cohee
Chairman
Geologic Names Committee

22nd August, 1960

Dr. C. V. Cohee,
U. S. Geological Survey,
Washington 25, D. C.

Dear Dr. Cohee:

I lost touch with you when you left Michigan but at the suggestion of one of my former students, P. F. Oetkir; of Dallas, Texas I am sending you here with a print of my section from Sheboygan, Wisconsin to Manistique, Michigan carrying the Wisconsin formations into northern Michigan.

I will be glad to learn of any corrections or comments you may have time to make. You may, of course keep the section if you desire it. I used the base of the Black River as a datum line showing the fossil localities of Oetking on this. It also shows a marked overlap onto the Precambrian including the Jacobsville sandstone but of course one cannot be sure just what was the lapse of time between the two. I find no real St. Peter sandstone in northern Michigan and little trace of the Jordan sandstone. The divisions between the Black River and the Prairie du Chien and at the base of the Prairie du Chien are both hard to make out. I have not been able to see the cores which Hamblin saw. They do not have any of these at Escanaba as yet.

My eyes are so poor that I cannot work as fast or as well as I once could. The section will have to be redrawn if published.

Sincerely yours

STATE OF MICHIGAN

DEPARTMENT OF CONSERVATION

LANSING 26

GERALD E. EDDY, DIRECTOR

GAYLORD A. WALKER, CHIEF DEPUTY DIRECTOR

August 12, 1960

Dr. F. T. Thwaites
41 North Roby Road
Madison 5, Wisconsin

Dear Dr. Thwaites:

Thank you kindly for all the help you have given us on the Cambrian – Lower Ordovician section in the Northern Peninsula. Your recent letter and cross section illustrating the stratigraphic sequence of these rocks is most helpful.

Your viewpoint on the correlation and age of these rock units seems more reasonable than that proposed by Dr. Hamblin. It appears to resolve the correlation of these units as we understand them in the subsurface of the Michigan Basin interior, to the outcrops in Northern Michigan and Wisconsin.

The Committee examined an oil well core which was continuous from Black River through the Glenwood and into the Oneota section of the Prairie du Chien Group. The core was taken from a well drilled in the southern part of the Southern Peninsula. It was compared directly with a core of the same section in the Northern Peninsula. Lithologically and in stratigraphic position, the two cores compare very well.

We suspect that an error has been made in age assignment, but since a question has been raised as to the age of some of the rocks at AuTrain Falls, we will need more paleontological data to help settle the question.

Thank you again for your help and interest in this problem. If there are any favors we can do for you, we will be happy to oblige.

Sincerely yours,

GEOLOGIC NAMES COMMITTEE
Michigan Geological Survey

Garland D. Ells

Garland D. Ells
Chairman

GDE/db

8th Aug., 1960

Dr. Phipip F. Oehking.
6946 Forest Lane
Dallas 30 Texas

Dear Phil:

At long last due to my poor eyesight I have a pale blueprint for you of my revised section from Sheboygan to Miners Castle. I used Hamblins section with modifications for most of the Michigan portion. It does not run in a strai line so distorts drawing considerably.

I have shown the basal Platteville at the top of both Au Train Falls and Miners Castle. I divided the Falls section into two parts, the lower which contains glauconit in the Franconia and the upper in the Trempealeau. This overlap was discovered by Cohee and shown in one of his charts. I also included Grand Island in the section.

Another overlap is that at the bottom of the Upper an Cambrian. This cuts the Jacobsville but how much older the red beds are is uncertain.

What do you think about completing the paper and publishing it? Are you a member of the A. A. P. G./ I have tow papers accepted by the Wisconsin Academy alt one will not appear until 1961.

With best regards to both of you and hope that your is better, I am,

Sincerely yours,

8th Aug., 1960

Dr. G. D. Mlls,
Michigan Geological Survey
Lansing 26, Michigan

Dear Dr. Mlls:

As promised in mine of 27th June I am enclosing a strat graphic correcation section redrawn frlm that prepared by Oeking and myself some years ago.

This shows that there is a major overlap at the top of the St. Peter as was discovered by Cohee about the time of the war. It is fossils from the base of the overlap th t were found at Miners Castle and AnTrain Falls. The latter were just fragments none of them identifiable. I have ventured to divide the rocks at the falls into two formations The lower glauconitic part I put in the Franconia and the upperpart in the Trempealeau. Hence I do not think that the fossils affect the correlation of a gr eat amount of strata. My section makes the abandoned Eben Junction quarry basal Prairie du Chien.

The second major overlap is that at the botton of the Upper Cambrian. The Jacobsville or possibly Bayfield sandstone is clearly older that this overlap but how much older is by no means clear. Allmost all of the section besides our our own work is based on Humblins section with modifications I hope this section answers your question. If you have any questions I will be glad to answer them. Shortcomings in drafting are due to my poor eyesight.

Sincerely yours,

8th Aug., 1960

Dr. A. E. Slaughter,
Michigan Geological Survey
203 State Offide Bldg.,
Escanaba, Michigan

Dear Dr. Slaughter:

Enclosed please find blueprint of a correlation section ion sectionfrom the deep oil test neqr Sheboygan to Miners Castle east of Munising. This is based on our well records plus data from Hamblins recent section. It shows my tentative version of the Gladstone city well. I have divided the An Train Falls section into two parts. The lowe glauconitic part I placed in upper Franconia and the upper part in the Trempealeau. The rock with abundant fossils fragments at the very top I suggest may be part of the Platteville-Black River overlap which was described by Cohee some years ago in his series of charts. I think the fossils from Miners Castle belong in the same horizon. I suggest that the Eben Junction quarry is basal Prairie du Chienalthough there is so little exposed that field data were inconclusive.

I think this section shows no logs whidh are not cleared for publication for most of those in Michigan have been published in abbreviated form or in detail by me. I did not use any of you iron ore tests because they were not located right.

Another major overlap is at the base of the Upper Cambri and is clearly above the Jacobsville How much older that non-marine formation may be is still a problem.

Sincerely yours,

27th June, 1960

Dr. G. B. Ells,
Michigan Geological Survey
Lansing 26, Michigan

Dear Dr. Ells:

Yours of the 23rd is at hand. I fully realize that as I traced the Wisconsin section into Michigan I lost out north of north of Escanaba because data was lacking. My suggestions of the paper published in 1943 need revision.

I got Philip Cotting to work in the vicinity of Manising because of his experience with boats which are necessary to do satisfactory work there. It was he that discovered the fossils above Minors Castle and elsewhere. We sent them to supposedly competent paleontologists who pronounced them Ordovician much to my surprise for I would have thought them Trempealeau.. Later Cotting failed to publish any of his thesis and Kumblin entered the field after reading it in the University library. Much of the work is reported to be very similar. I never was able to find anything which looked like Prairie du Chien anywhere this far north, so it is clear that overlap conditions must occur.

I have a copy of Kumblin's report and had some discussion with him with him at St. Louis.

Presently I am starting to redraw Cotting's convergence diagram which connects the deep oil test at Sheboygan with Au Train Falls. I obtained some logs of drill holes off this line from your Escanaba office but just how to connect them with with this section is yet to be determined. When done I will send you a print.

Sincerely yours,

41 N. Roby Road,
Madison 5, Wis.
25th June, 1960

Dr. Philip Oetking,
6946 Forest Lane,
Dallas 30, Texas

Dear Phil:

No, I realized that you might not be able to reply to my letter very quickly although had no idea of your accident. We are both very sorry to hear of it and of the poor business of 1960. Not having a chance to read the oil papers any more I had no idea of why that is.

My thanks for the section. I want to redraw it for publication possibly changing to true elevations rather than the straight line for the base of the Platteville. I do not think we did try that.
Only one of the well logs sent by the Michigan Survey which now has an office in Escanaba, by the way, will fit into the section. The diamond drill holes are all too far to the west and start in pre-Platteville formations. I may be able to project some of them leaving the locations blank for the records are confidential. None struck iron formation, either. The gap is not as long as I recalled it but the real uncertainty is the position of the base of the Platteville.

No, I never had a set of prints of your drawings.

Where do you think the paper on the Lake Superior sandstone problem could be published. We talked once of the A. A. P. G. Bulletin and if you are a member that would be a good place. I met with nothing but hard luck in either G. S. A. or Journal of Geology. Of course Aldrich's dislike of all the people at Wisconsin could have been the trouble there. They would not take him back as State Geologist to finish his Keweenawan report. At Chicago one is not a member of the elect if not a graduate of Chicago. I turned in both papers to the Wisconsin Academy ~~which was a faster in refusal there~~. The trouble was my typing has deteriorated and Amy had trouble with her eyes and could not type at that time. Two cataract operations since have cured that difficulty.

We are just back from a trip on the turnpikes to a family reunion at Cook Forest, Pennsylvania. The cabin which Tom hired there was a bit crude and uncomfortable so we did not stay long. Carol and Bill stayed only two nights They are now near New York for the summer. Then we will have to drive Carol back at the end of August as Bill will have to fly to get to this new job in Monterey. Tom is at State College, Pa. Bob got dropped from Platteville. We think he just went stale when we thought he was doing better. His grades the past year were rotten. Now he is home and looking for a job. He has never learned to really study hard. As for math and English, well, I always hated the latter but did well in the first. Bob can't stand either.

We had a tubless tire blow out on the way home but got stopped all right. Wasn't it two wheel brake cars tht had trouble when a tire blew?

I still have some papers to finish but the geomorphology book has been abandoned because of the opposition of old-time disciples of Davis and Johnson. Many teachers just can't accept a new idea. "Lake Superior is the deepest lake in the world" because I always taught that it is," one principal told me.

My eyes are bad but the doctor thinks are improving. They tell me that the 15 years of high blood pressure (cause unknown) have left a mark on my heart so I have to avoid steep hills and stairs as far as possible. Otherwise I am not so bad as I might be for going on 77

With best regards to both of you,
Sincerely yours,

STATE OF MICHIGAN

DEPARTMENT OF CONSERVATION

LANSING 26

GERALD E. EDDY, DIRECTOR

GAYLORD A. WALKER, CHIEF DEPUTY DIRECTOR

June 23, 1960

Dr. F. T. Thwaites
41 N. Roby Road
Madison 5, Wisconsin

Dear Dr. Thwaites:

The Geologic Names Committee of the Michigan Geological Survey has been reviewing the Nomenclature and age correlation of the Cambrian and Lower Ordovician rocks of the Northern Peninsula of Michigan. We have run into difficulty regarding the recent (1958) assignment of previously mapped Trempealeau and Prairie du Chien rocks to the basal part of the Black River formation of Middle Ordovician age. Because you have done much work on these rocks in Wisconsin and Michigan, we value your opinion and would like to obtain your present opinion on the age and correlation of the Ordovician strata, especially in the AuTrain Falls region of the Northern Peninsula of Michigan.

Our problem stems from the work done by William Kenneth Hamblin as part of his doctoral dissertation. This work was published by the Michigan Survey as Publication 51, "Cambrian Sandstones of Northern Michigan", 1958. If you do not have this publication or have not read it, I shall be glad to send you a copy.

The difficulty is this: Dr. Hamblin has assigned the rocks previously called Trempealeau and Prairie du Chien in the AuTrain Falls region to lower Black River formation. This was done on basis of fossil evidence which we think, because of the type and preservation, is not sufficient. Further, we cannot reconcile this new age assignment with the subsurface equivalent in the basis proper.

I realize that I have been rather brief in explaining the difficulties arising from the work done by Dr. Hamblin, but we are assuming you are familiar with his work.

The Committee would like to know whether or not you still regard Cambrian Trempealeau and Lower Ordovician Prairie du Chien rocks as being present at the outcrop at AuTrain Falls, Michigan and elsewhere in the Northern Peninsula of Michigan.

We will greatly appreciate your comments and present thoughts regarding the above rock strata.

Sincerely yours,

GEOLOGIC NAMES COMMITTEE
Michigan Geological Survey

Garland D. Ells

Garland D. Ells
Chairman

GDE/db

TELEPHONE EM 8-2155

PHILIP F. OETKING
CONSULTING GEOLOGIST
6946 FOREST LANE
DALLAS 30, TEXAS

June 20 1960

Prof. F. T. Thwaites
Consulting Geologist
41 North Roby Road
Madison 5, Wisconsin

Dear Mr. Thwaites:

I suppose you figured you got the same response from me as you did from the Michigan Geological Survey, but let me assure you it was anything but intentional. When your very welcomed letter arrived I was on tour trying to find some geological work. Before I could answer your letter I found myself in the hospital with a broken leg. I just arrived home from the Fort Worth Hospital yesterday after a ten day spell. It was a combination of errors that caused the accident following and afternoon of sailing. The car which was pulling the boat and trailer out of the water had brake failure ran into the lake and into me at the same time. I was very fortunate and although I could certainly do without my leg in a full cast (for 4 months) it could have been far worse. Clare was unable to locate the section you wanted from my files but now have it and it is enclosed. I

I was under the impression that you had a complete set of plates but if you don't I would be very happy to run off a full set for you. You mentioned in your letter that you had only one consulting job this year. In this part of the oil country you would be considered one of the very very fortunate. Geology in the oil business is at the lowest and most of the consultants are having to take other types of work. I Don't know when it will improve either- many feel it will be a few years. Company men with long standing also have lost jobs.

Your family is well scattered out and I'm sure after knowing Bill and Tom that two excellent teachers are in the making.

Clare and I send our best regards
to you and Mrs. Thwaites

Sincerely yours,

Phil

7th June, 1960

Dr. Arthur E. Slaughter
Geological Survey Division
203 State Office Bldg.,
Escanaba, Michigan

Dear Dr. Slaughter:

Thank you very much for yours of the first ch enclosed with enclosed well logs or rather mainly exploration hole logs. The Gladstone log may be incorporated in our section but the others are too far west to show what becomes of the Prairie du Chien as you approach Lake Superior. The print of the section has not yet come from Dr. Cetking in Texas but I think the Gladstone record can be included in it and the others projected at right angles to the section at proper position even if they do not show the higher formations. and left blank We followed a dip slope from Trenary to the Falls. There is an outcrop of mid le to upper Platteville there. May I leave the logs in the files of the Wisconsin Survey when I finish if you do not want them.

Sincerely yours,

STATE OF MICHIGAN

DEPARTMENT OF CONSERVATION

GERALD E. EDDY, DIRECTOR
GAYLORD A. WALKER, CHIEF DEPUTY DIRECTOR

June 1, 1960

203 State Office Bldg.
Escanaba, Michigan

Dr. F. T. Thwaites, Geologist
41 North Roby Road
Madison 5, Wisconsin

Dear Dr. Thwaites:

I regret the delay in replying to your inquiry of May 19th. I have been out of the office much of the time during the past two weeks, part of which time was spent on the Michigan Basin Geological Society field excursion in Wisconsin.

Enclosed are several well records which are believed to be pertinent to your area of interest. Only the water well log of the City of Gladstone is clear for publication. The other records, those of cores made by the Hanna Company and Inland Steel, in Dickinson and Menominee Counties, although compiled by the Michigan Geological Survey, have not been cleared for publication. Please honor this reservation. If you desire to publish these logs, direct your request to us, and we will contact the companies concerned.

The Cleveland-Cliffs Iron Company did core several holes in northern Delta County in the vicinity of Rock and Osier and also near Trenary in Alger County. Two or three of the cores were chipped for samples, but the logs have not been written.

Of particular interest to you may be the core we have stored here at Escanaba. We have the complete rock record of the Paleozoics from a hole near Cornell and also from a hole near Brampton, both in Delta County. These are good cores from location $3\frac{1}{2}$ to 4 miles apart. Both should start around the base of the Trenton - top of Black River. Unfortunately we have not been able to log either of the cores as yet. They are available for your inspection at any time.

Yours very truly,

Art Slaughter

Arthur E. Slaughter
Geologist
GEOLOGICAL SURVEY DIVISION

AES:gb
Enc.

19th May, 1960

Michigan Geological Survey
Escanaba, Michigan
Attention A. Salughter

Dear Sir:

I have worked on the problem of the age of the Lake Superior red sandstones ever since 1910 and had Dr. Philip Oetking do his PhD thesis on them. At the suggestion of Dr. Hamblin who also worked on the same problem I am writing you to find if you can supply any subsurface data to complete a cross section from Wisconsin north to Aultrain Falls. We had a big gap from Wells, Michigan north to the Falls. Dr. Hamblin tells me that Cleveland Cliffs did some deep diamond drilling on the east extension of some of the minor iron ranges which ought to help on this problem. Could you please send me logs of any of these holes which are deep enough t enough t o help. Since we are not interested in the Precambrian if the kind of rock is confidential that could be omitted. We are interested only in the Paleozoic where some formations appear to pinch out I have done much work on the Paleozoic of the Northern Peninsula for Wisconsin contractors sent me samples from deep wells there which they drilled. I plan to publish a paper on the problem I hope along with Dr. Oetking.

Sincerely yours,

19th May, 1960

Dr. P. H. Oetking,
6946 Forest Lane,
Dallas 30, Texas

Dear Phil:

Enclosed is copy of another letter to the Michigan Geological Survey trying to get information about the diamond drilling through the Paleozoic of northern Michiga to use in fixing up your cross section showing the Paleozoic overlaps. I never got any reply from Lansing.

Could you kindly send me a print of this section which I will work over when or if I get the required data.

Things are now quiet here. Bob is still at Platteville for he just wont work on subjects he does not like. Tom is at State College, Pa., teaching atomic physics. Bill gets a California teachers certificate from San Jose State and h a job for the next year at Monterey, California. Tom has two children, a girl and boy. We hoped to have Bob an us down there soon on the turnpikes but the only time we go is just when they are moving to a new apartment so tha off I feel fairly well but the doctor says that the 15 yea of high blood pressure has left its mark on my heart. I fe no distress except getting out of breat more than I used to. I had one consulting job this spring.

We have had excessive rain this May, and its at it agai . Farmers cant work in the fields or stock use the pastures because it is so wet.

With best regards, sincerely yours,

22nd March, 1960

Dr. W. Kenneth Hamblin
Dept. of Geology
University of Kansas
Lawrence, Kansas

Dear Prof. Hamblin:

I hope you will forgive me for being so slow slow in answering your nice letter of Feb. 19. but, well I first didnt have enough to do to spur me to get at it, and then I got a consulting job which has kept me busy for several weeks. This was followed by a bad cold or flu which has prevented any work at all for over a week.

I will have to communicate with Phil Oetking to get a copy of his cross section to work on. The problem is that we could not find the Prairie du Chien or Hermansville as it is often called. I traced this formation to Gladstone or Escanaba, I dont recall which but we lost it to the north. The sections you sent deal only with older formation so do not help much in this problem. I am inclined to think that this formation is cut out by the overlap at the base of the Platteville. I have no adequate maps at home and hence I have let things slide but as soon as the consulting job on water supply is done I will get at it

Sincerely yours,

THE UNIVERSITY OF KANSAS
DEPARTMENT OF GEOLOGY
LAWRENCE

February 19, 1960

Professor F. T. Thwaits
41 North Roby Road
Madison 5, Wisconsin

Dear Professor Thwaits:

Several of the Iron Companies in Northern Michigan were actively engaged in exploratory drilling east of the Precambrian exposures when I was working on my thesis in 1957, The Michigan Geological Survey obtained several cores that I studied and used in my work. A good number of cores were saved and stored by the companies, but I did not have enough time to examine them. Mr. Robert Riedel of the Cleavland Cliffs in Ishpeming was in charge of the drilling at the time. He would be able to give you drillers logs of all the holes and would probably have a number of cores that you could study if you wanted to make the trip. Mr. A. Slaughter of the Michigan Geological Survey at Escanaba could help you out a great deal also. His address is Michigan Geological Survey, Escanaba Michigan. He is up to date on all of the work in the Northern Penensula.

I found out about the drilling during the later phase of my study and was unable to utilize the vast amount of stratigraphic information that could be gained by detailed studies of the cores. It made me sick. I therefore had to simply pick tops of lithic units and did not have time to make a detailed description of the Paleozoic rocks above the Cambrian. If my data would be of use to you I would be most happy to send it. I have laways regretted that time did not permit detailed logging of the limestones above the Cambrian. I'm sure many stratigraphic problems could have been cleared up by such a study and I am quite confident that the cores, or at least some of them are still available at the Iron Companies.

I will be looking forward to reading your paper. The problems of the Keweenawan-Paleozoics of the Lake Superior area are extreamly facinating. I have extended my work into Wis. and Minn. concentrating on cross-bedding directions and regional paleogeographic evolution of the region. I submitted the paper I presented at the last G.S.A. Meeting for publication sometime last May. It has been through the crities but I haven't any idea when it will be out. Enclosed are two figures of the paper. One is an idealized section showing the relations

of the Munising and the St. Croixan of Wis. and Minn. The other shows data refuting Driscoll's ideas that the Munising is equivalent to both the Franconian and Jordan.

I would like to see the Keweenawan rocks of Canada some day but lack the necessary funds at present.

It was good to hear from you again, I would appreciate a reprint fo any of your work.

Best regards,

WK Hamblin

W. Kenneth Hamblin
Assistant Professor

WH:jz

11th Feb., 1960

Dr. W. K. Hamblin
Dept. of Geology
University of Kansas
Lawrence, Kansas

Dear Dr. Hamblin:

Since seeing you at St. Louis over a year ago I have have been trying to get logs of the diamond drill holes through the Northern Peninsula Paleozoics which you mentioned at St. Louis. I tried the State Geological Survey and no answer. Maybe they were shut down by the financil situation in Michigan. Can you suggest where I can get copies of some of these logs? I want to finish a cross section showing the northward overlap of the Paleozoic with pinching out of some formations. There was a gap between Escanaba and Au Train Falls which we would like to fill if possible.

Our paper is almost done except for this. It will have some alternative views. I could never find any fragments of the Oronto Group in the Bayfield in Wisconsin. But I will admit that the correlation of the lower parts of the three sections which display supposed conformable relations is not entirely satisfactory.

Sincerely yours,

10 March, 1959

Dr. P. F. Ostking
6946 Forest Lane,
Dallas 30, Texas

Dear Phil:

I want to thank you for the copy of your map of Texas which came a few days ago. I don't know when if ever we get to Texas but would use it then.

Amy had her second eye operated on recently but will not get her final glasses until next month. She is able to do more at home now. We were showed up last week by one of the biggest storms since 1923. Melting is slow as it was then. Harry used to say that the climate had changed and that in old days " you could always plow (the garden) on St. Patricks day." Uncle Thomas said after he had gone: " We did once in 60 years." Buster is threatening a squirrel in the window who comes for nuts we put out. Evidently some squirrels know about window glass!

I talked with Stan Tyler about the Michigan report but have no definite conclusion. A suggestion is that you write under your name the section on Michigan for my paper. This is a comedown but in view of the circumstances might be the only way out. Two of my papers are in trouble, one for the Journal not heard of since 20 Sept and that for the G. S. A . getting the expected hostil comments.

With best wishes from both of us,

Sincerely yours,

17 Nov., 1958

Dr. Philip F. Oetking,
6946 Forest Lane
Dallas 30 Texas

Dear Phil:

When at St. Louis to attend the G. S. A. meeting I met Dr. W. K. Hamblin who is now at U. of Kansas, Lawrence Kansas. I had quite a talk with him and he had sent me a copy of his report on the sandstones of northern Michigan I have not read every word yet but have read the essential parts. I had him mail me another copy to me to forward to you; for we did not have your address at that time and place. This came today is is now being forwarded to you along with some remarks herewith enclosed a copy of which is being sent to him. I will be glad to have your comments when you have read this report.

With best regards to Clare and you.

Sincerely yours,

17 Nov., 1953

Dr. W. K. Hamblin,
Dept of Geology,
University of Kansas,
Lawrence, Kansas

Dear Dr. Hamblin:

The copy of your report on sandstones of northern Michigan came today and is being forwarded to Dr. P. F. Oetking, 6946 Forest Lane, Dallas 30, Texas. My copy was awaiting me at the State Survey office when I went down went down there a few days ago. I have read much of it although not all. Enclosed is a carbon of comments which were sent to Phil Oetking. Thank you for sending us these copies which I will value highly. In regard to our work you can realize that the bulk of the field work was based on Munising and visits to other localities were brief.

Sincerely yours,

2 October, 50

Dr. Philip Oetking,
6946 Forest Lane,
Dallas 30, Texas

Dear Phil:

Thank you for your reply of 24 Sept and the best wishes.

I wish I could have had more time to examine the gorge of the Sturgeon but we had no raincoats and had to climb out over slippery red lake clay so that prop retreat was the better part of valor. With Labor Day coming on we had to return to Madison at once. I strongly suspect that as at Presqueisle we have an unconformity complicated by faulting. A detailed survey such as I once made on Fish Creek is indicated.

I did not know you are now on your own which must make it harder to get off on vacation. I may be able to find someone to help but dont want to go up there before the end of the mosquito season.

We had a tough time financially this summer. Tom wanted a car for we talked him out of either a rambler or a Volkswagon. Then we painted the house and last May has had a cataract operation. You see when you price new cars you can see why they do not sell very readily! We just had to get one and so farTom has not been able to pay on the old car because he has no permanent job as yet.

We are going to St. Louis to the G. S. A in November where I am slated to present a paper on peneplains.

Sincerely yours,

TELEPHONE EM 8-2155

PHILIP F. OETKING
CONSULTING GEOLOGIST
6946 FOREST LANE
DALLAS 30, TEXAS

September 24, 1958

Mr. Fred T. Thwaites
41 North Roby Road
Madison 5, Wisconsin

Dear Mr. Thwaites:

It was a pleasure to receive your letter of the ninth, although I feel very discussed with myself for not having my part of the Lake Superior paper ready for publication.

Hamblin's report of the Jacobsville sandstone resting unconformably on the trap should not be too startling. You anticipated this possibility in 1912 (page 84). I don't believe that a single outcrop in the vicinity of Silver Mountain need necessarily alter our views regarding age relations. The outcrop certainly needs examining although along this embayed area (during Jacobsville time) an angular relation between the trap and the sandstone could produce a dangerous regional connotation. If the conditions suggest a regional unconformity, then the question is--- which unconformity shows the greatest time interval. The one at the base of the Jacobsville or the erosional period at the top. I'm not sure the outcrop will have much bearing on the Keweenawan problem.

Attempting to keep the family feed during the first year as a consultant has really kept me hopping. Much of the time spent does not show a profit as you know. I do feel the most difficult road has been crossed and we haven't suffered. To make thing worse I am compiling a geological Highway map for the State of Texas. This map will be published in 16 colors and is to be ready for the Dallas meeting of the A.A.P.G. in March. Progress is being made and the end can be seen for the first time. Until this task is complete (deadline in two months), I'm not going to get a chance to do that which should have been years ago.

As busy as I am, I've never enjoyed geology more. The rewrite is next in line following the Texas Highway-Geological Map. Your kind offer of help will difinitely be needed.

Clare and I send our best to you and to Mrs. Thwaites.

Sincerely yours

9 Sept., 58

Dr. Phillip Oetking,
6946 Forest Lane,
Dallas 30, Texas

Dear Phil:

The matter of your paper on Lake Superior is up again. In '56 I met one Hamblin from the U. of M. at Minneapolis who had been reworking your field. He announced that that he had discovered that the Jacobsville is unconformable on the trap. Later he read a paper at the "Lake Superior Institure", I think in which he announced its Cambrian age. I have not found out if this is in print or if it ever will be but a few days ago we made a reconnaisance to see his locality. It is a short distance southeast of Silver Mountain in a deep valley. Rain cut short our visit so that more detailed work is indicated. I found that in 1912 I said that a locality "might yet be found" of this phenomenon but that it would have no significance on age relations, only of overlap.

What are your intentions about publishing? Can I help you now I am retired and have lots of time. My part of the project is all done so yours is what is holding up any attempt at publication. I have introduced my peneplain paper for St. Louis but it has not yet been accepted and could be rejected again as too heretical!

With best regards, I am,

Sincerely yours,

31 March, 57

Mr. W. K. Hamblin,
Dept of Geology,
University of Michigan,
Ann Arbor, Michigan

Dear Mr. Hamblin:

Than you greatgreatly for yours of the 26th So far as I know you have made an original and highly important discovery. I would like to know how to get to this locality if I can get up there or get Phil Oekking to go. It certainly shows that the Jacobsville is much thinner than some supposed. Of course, if it is a basin filling it should lap unconformably on the higher parts of the adjacent mountains as it does on the Huronian schist at L'Anse. I wonder if the weathering is pre-sandstone or a chemical alteration since? The so called weathered zone on older precambrian poses just this problem.

Thank you again,

Sincerely yours

UNIVERSITY OF MICHIGAN
ANN ARBOR
DEPARTMENT OF GEOLOGY

March 26, 1957

F.T. Thwaites
41 North Roby Road,
Madison 5, Wisconsin

Dear Mr. Thwaites:

I am very sorry for this late reply to your letter of March 3, but I have been out of town quite a bit on job interviews and haven't had much time to do anything.

The unconformable contact of the Jacobsville upon the middle Keweenawan trap rock was found in the Sturgeon River just below Sturgeon Falls which is a few miles south-west of Baraga. There appears to be a highly irregular surface cut into the trap rock together with a zone of weathering about 10 feet thick.

I am happy that Oetking is going to publish. He did some fine work in the Munising area.

Best Regards,

W. K. Hamblin

W.K. Hamblin
Department of Geology
University of Michigan
Ann Arbor, Michigan

3 March, 1957

Mr. Ken Hamblin,
Dept of Geology,
University o Michigan,
Ann Arbor, Michigan

Dear Mr. Hamblin:

I have been meaning to get in touch with you ever since we met briefly that night in Minneapolis. I had had a meeting with Phil. Oetking recently and we were both puzzled about your statment that you had found an unconformable contact of the Jacobsville and the Bran. we could not think of any such contact except along a fault or under heavy drift. I would greatly appreciate it if you could explain further for I never ran across you again in the large crowd present. I had to leave early on the third day. Phil's last word was that he would now just have to get his thesis ready for publication. we wondered if you had done much work inland where Irving concluded there is an unconformity. Later students though his sandstone is in part Lower Keweenawan.

Anything you can tell us will be greatly appreciated. We failed to see any exposures of sandstone near Silver Mountain.

Sincerely yours,

41 N. Roby Road, Madison 5, Wis
14 March, 1958

Dr. H. B. Willman,
State Geological Survey,
Natural Resources Bldg.,
Urbana, Illinois

Dear Dr. Willman:

Today I was able to find both Messers Hanson and Black in their respective offices and go down to see them Now I can reply to yours of the 6th.

The maps arrived safely and I am having the Survey return both to you. They must have the new legend for I cannot find a copy here. All object strongly to including eskers with pitted outwash. They indicate ice direction and occur in ground moraine not in outwash. the esker-like ridges which have fooled many in outwash are crevasse fillings and their origin is different although also due to streams between ice walls. WE OBJECT.

My eyes bothered me so much when I got to drumlins that I am afraid I skimped on number. Anything you do will be all right.

In areas I havemapped I do not think of any moraines below the level of glacial lakes. Your mapping looked all right to us.

We also agree to the wisdom of not trying to correlate the drifts outside the Cary moraine. Some can be determined but others must take the famous "trained eye" approach made famous by Weidman but used earlier by McGee. I think the general tendancy is to think that many of these are not really pre-Wisconsin drifts. The effect of bed rock on erosion is marked. Some are probably not older than Tazewell. I made no committments whatever. Weidman desirved the nickname of Samuel Weisman when he numbered his inferred drifts instead of correlating them!

I agree that Leverett's mapping of northern Michigan will not check with mine. Leverett was a foot geologist and refused to walk through brush because he made such slow progress. He got information from timber cruisers.

But I DO NOT AGREE about the non-pitted outwash along Menominee River. here is a terrace in part mapped by me in 1945 and shown on the new topo maps. We have no air photos here. Someone in Michigan could check it with the photos but the new maps (topographic) were made from such photos. This terraces in not normal outwash but is largely postglacial. Ice meltwater drinage could not go down the river because the course was extended southeast as the glacier melted back into Green Bay. Normal ice drainage was southwest. WE OBJECT.

There is a terrace of non-pitted material along the St. Croix River. See the new topo maps. This river carried the flow from Lake Duluth.

When "Operation State Line reached about 6 miles north of that boundary last May Dr. Black remarked" We havnt time to remap all of Aldens work" and turned homeward. Maybe we might get down there again this summer. He talked of it today.

Two Creeks is the only sure-enough old soil horizon known to any of us. Weidman had one near Woodville in northwestern Wisconsin from which the wood is now in Flints hands but as for making anything out of his field notes neither Black nor I could do it so I left it out.

Sincerly yours,

Illinois

October 14, 1957

Mr. H. B. Willman
Section of Stratigraphy and Areal Geology
Illinois Geological Survey
121 Natural Resources Bldg.
University of Illinois Campus
Urbana Illinois

Dear Mr. Willman:

I am in receipt of the copy of your letter of October 10 to Prof. Thwaites.

I regret that we have no one available who could compile a revised copy of the glacial map and would be grateful if you could make the copy.

Very truly yours,

WISCONSIN GEOLOGICAL SURVEY

State Geologist

GFH:S

STATE GEOLOGICAL SURVEY DIVISION

JOHN C. FRYE, CHIEF
121 NATURAL RESOURCES BUILDING
UNIVERSITY OF ILLINOIS CAMPUS
URBANA

October 10, 1957

Mr. F. T. Thwaites
41 North Roby Road
Madison 5, Wisconsin

Dear Mr. Thwaites:

Thank you very much for the revised mapping along the Wisconsin-Illinois state line. I have passed the copy on to George Ekblaw and he believes that we can make a satisfactory blending of the two maps with this new data.

I am glad that you favor a Wisconsin age for the area previously mapped as Illinoian. As we are not attempting to differentiate Wisconsin substages, but rather to map the terminus of major readvances, the nomenclature problem may not arise. In any case, your reservation as to the specific correlation of the drift will be retained.

I agree that you should not attempt to compile a revised copy. Perhaps Mr. Hanson will wish to delegate someone else to do that. If no one is available, I shall be glad to make the copy and submit it to you for approval.

We will also need some references and bibliography to be used in a pamphlet similar to that which accompanied the Glacial Map of North America, but I shall write you more specifically about that later.

I am glad to have a reprint of your article on pitted outwash. It certainly should be differentiated wherever possible.

I am sorry that the Door peninsula map did not come up to your expectations. It seems effective to me. I was glad that the GSA decided to publish it in color.

Sincerely yours,

H. B. Willman
Geologist and Head
Section of Stratigraphy
and Areal Geology

cc: Mr. George F. Hanson

January 9, 1956

Dr. H. B. Willman
State Geological Survey
Natural Resources Building
University of Illinois
Urbana, Illinois

Dear Dr. Willman:

The maps and sheet of directions arrived and I have made considerable progress on compilation of a map having nearly done Alden's area and mine of 1943. Quite a few problems have arisen on which I will endeavor to meet your requirements.

First: the choice of inks. Your directions call for bright red, blue, and purple. Now purple is a combination of red and blue and is hard to distinguish from both. It is too late to change but I would think green would be farther removed in the spectrum and hence easier to see.

Second: The legend is evidently taken from that for South Dakota and does not fit Wisconsin very well. I have used your color for pitted outwash, although in this state it covers entire counties, for all outwash within a drift sheet and the outwash color for non-pitted outwash outside a margin of a drift sheet or readvance. Is this right?

Third: I have shown areas "submerged by glacial lakes" rather than proved sediments as Alden tried to without boring. Is my usage right? We haven't the data.

Fourth: I have shown all end moraines where the topography is distinct even if covered by a thin later drift. Is this right? I have left out buried outwash.

Fifth: I do not think that "crests of moraines" applies to Wisconsin as it seems to in South Dakota. In my mapping most areas of endmoraine are so narrow that a crest could not be shown. Lack of topographic maps and field notes on this point makes it almost impossible to show crests. None are now on the map.

Sixth: Drumlins in Wisconsin are numbered by the thousand. How many should I show? It is obviously impossible with the large symbols to show all of them. None are yet on.

Seventh: You mention "groups of eskers" but how about large single eskers.? None are yet on.

Eighth: The same remark applies to striae. They are not yet on.

Ninth: Alden (I worked with him in 1907 and so know) mapped everything with kettles as "terminal moraine." I have changed much of his area from personal observations plus general reasoning.

Very truly yours,

WISCONSIN GEOLOGICAL SURVEY

F. T. Thwaites, Geologist

FTT:N

STATE GEOLOGICAL SURVEY DIVISION

JOHN C. FRYE, CHIEF
121 NATURAL RESOURCES BUILDING
UNIVERSITY OF ILLINOIS CAMPUS
URBANA

February 13, 1957

Mr. George F. Hanson
State Geologist and Director
Wisconsin Geological and
Natural History Survey
University of Wisconsin
115 Science Hall
Madison 6, Wisconsin

Dear Mr. Hanson:

I am enclosing a memorandum which explains the status of the U.S. Glacial map. The Wisconsin map received much favorable comment at our meeting and will require much less change than most of the State maps in the final compilation.

However, we do have some problems to solve before the final compilation can be made. Most of the changes in the legend result from the need to obtain uniformity in treatment. A special problem in our case was the use of a stippled pattern for submerged features. It seems best to show submerged end moraines, eskers, drumlins, etc., as if they were above the lake, but to show the position of the lake boundary crossing any of these features by a dashed blue line. No additional lines will need be plotted.

We found a great lack of uniformity in plotting drumlins. Some maps showed 7 or 8 per township. The decision was to spot individual drumlins where widely separated and to show specific locations for as many as 4 per township, the 4 most prominent where there is a choice. This will give better information as to relative abundance.

I shall write you later about specific boundary line problems with Michigan, Minnesota, and Illinois, when I can supply you with copies of the bordering areas. The major problem at the Minnesota boundary is that Wright has mapped unpitted outwash adjacent to areas which you show as pitted outwash. The committee had the impression that perhaps Wright had generally not mapped enough pitted outwash and that perhaps you had shown too much in northwestern Wisconsin. I am not certain that you can do much about it, unless you can differentiate a valley train of relatively unpitted outwash along the St. Croix River.

We have some differences in detail along the Wisconsin-Illinois line. The age of the drift west and south of the Darien and Johnstown moraines may

be a problem. On the basis of Shaffer's recent work (our Report of Investigations #198), this drift in Illinois is all Farmdale, rather than Illinoian as our two Surveys have interpreted it for some years. It seems preferable to show this drift as Wisconsin, which will have a different color from Illinoian on the final compilation. The age of this drift has long been a problem, So far we have no evidence of two drifts in that area, and we have found no place where the degree of weathering of the drift is even close to Sangamon weathering of the Illinoian drift.

I know that the preparation of the first copy of this map was a considerable strain on Mr. Thwaites' eyes, and we all have been very grateful to him for undertaking it. I hope that you will feel free to call on me if I can be of assistance.

Sincerely yours,

H. B. Willman

H. B. Willman
Geologist and Head
Stratigraphy and Areal
Geology Division

Encl.

COMMITTEE ON GLACIAL MAP OF UNITED STATES EAST OF THE ROCKIES

January 28, 1957

Memorandum to collaborators on State maps:

1. The committee met in New Haven on Jan. 4 & 5, 1957, to examine in detail and discuss the First Compilation of State maps. The assembled maps constitute a spectacular whole, and the committee expresses its sincere thanks and appreciation to every collaborator for the time, effort, and skill that are so clearly implicit in most of the maps. Since there is no way in which we can show you the whole assemblage at this stage, we want you to know that we think you will be much pleased with the published result and will feel that your contribution of work has been fully justified. The map will mark a long step forward in our understanding of the areal glacial geology of central and eastern United States.

2. The First Compilation has given us exactly the information needed to assure standardization of the copy for publication. Through study and comparison of the maps themselves, and through questions that many of you have asked during compilation, we have improved, extended, and in places simplified the specifications for the published map. As indicated to you in 1955, the plan is to prepare a Second or Final Compilation which will serve as copy from which draftsmen will prepare the map for engraving. When the Second Compilation has been completed and coordinated, we see no reason why final drafting and publication can not follow shortly.

3. Accordingly we want to ask you now to prepare a final map of your State(s). Although our original plan had been to compile on a specially prepared base with details deleted, this has been found much too expensive and has had to be abandoned. Accordingly we will send you shortly a standard USGS base map, scale 1:1,000,000, similar to the one used in the First Compilation, with the request that you use that. Your final map on that scale will be transferred by us to a blue-line base map of the United States, scale 1:1,500,000, with most of the culture detail omitted. Your "deletion maps," already submitted, will aid us in this operation. No further "deletion maps," however, are needed. For publication, the resulting integrated map will either be kept at 1:1,500,000 or will be photographically reduced to 1:2,000,000 (1 in. = 32 mi.). Even at the smaller scale virtually all the detail appearing in your Second Compilation will be legible.

4. A deadline date of Dec. 31, 1957, has been set for completion of the Second Compilation. We hope that 11 months will give you ample time for the task and earnestly ask that you adhere to the deadline.

5. It is of course essential that the individual State maps of the Second Compilation faithfully follow a common set of colors and symbols, so that draftsmen will have no difficulty in preparing from them the final copy. Accordingly we inclose a Revised List of Conventions and Colors that differs from the Tentative List dated Jan. 14, 1955, and used in the First Compilation. Please follow it precisely. In it we have tried to anticipate your questions, but if you do have questions, please write us. The following comments explain the reasons for most of the changes. We suggest that the map data can be transferred most readily by direct tracing on a light-table.

6. Where areas of drift are discontinuous, show them as continuous, using your best guess as to location of drift border. This is a special problem in pre-Wisconsin drifts in Nebraska, Kansas, and New Jersey.

7. Subdivide pre-Wisconsin drifts as indicated on the Revised List of Conventions.

8. Show each outwash body as continuous. End the color area a short distance beyond the limit of the glaciated region, except that outwash bodies should be mapped continuously along valleys that return to a glaciated area or that are tributary to the Ohio River or Mississippi River.

9. If any outwash is present, show long, major lake-spillway drainage channels as outwash, with a superposed black arrow, where the channel crosses the former divide, to show drainage direction.

10. Generalize the details of an areal color-pattern so as to eliminate equidimensional areas less than 1/10 in. in diameter, and elongate areas (such as eskers) less than 1/16 in. in width. Such small areas will not show on the published map. Long eskers or other areas that are critical to interpretation may be exaggerated in width.

11. Isolated erratic boulders beyond the mapped limits of the glaciated region, eolian deposits, inwash, and Cordilleran outwash are to be omitted.

12. Map deltas as lacustrine sediments, not as outwash.

13. Leave no uncolored areas within glaciated country. Color in from the best available data, no matter how generalized.

14. The ticked-line convention is designed to show major breaks within the Wisconsin sequence (such as Mankato, Port Huron, Valders, and other intra-Wisconsin breaks), because information is inadequate to permit general subdivision by colors. We realize that no ticked line will be continuous across the entire map, and perhaps not even across an entire State. It should be used only in those sectors where adequate direct or indirect evidence of readvance exists. Such sectors should be connected, where possible, by a ticked broken line along the relevant inferred drift border. This convention may appear at the outer margins of areas of either end moraine, or ground moraine where end moraine is not present at the limit of readvance.

15. We believe that names of end moraines, Great Lakes strandlines (examples: Maumee 1, Glenwood, Arkona, Algonquin, Nipissing) and extinct lakes will add greatly to the usefulness of the published map. Only published names in current use should be included. With strandline names fine lead-lines can be used effectively. Names need be used at only a few places in each State. No attempt should be made to identify all segments of discontinuous strandlines.

16. In laying down those conventions for your guidance we have kept in mind the map as a whole, realizing that this may entail omissions or generalizations in some particular State. We believe they are necessary for overall uniformity.

Once more our thanks for your essential help. Without the collaborators there could be no published map.

Committee:
Roger B. Colton
Richard P. Goldthwait
H. B. Willman
Richard Foster Flint

Glacial Map of United States East of the Rockies

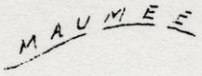
REVISED LIST OF FEATURES TO BE SHOWN ON SECOND COMPILATION, WITH CONVENTIONS

January 27, 1957

Compilation scale 1:1,000,000; expected publication scale 1:2,000,000

Mongol color pencil no.	Symbol	Feature
864		Marine sediments
865	L. OSHKOSH (Black ink)	Lacustrine sediments. (Add name of lake, in slant capitals preceded by "L.," to all named former lakes except glacial Great Lakes.)
867		Outwash (including alluvium where necessary). Extend convention only slightly beyond limit of glaciated region. Leave color area open at distal end & add arrow in scarlet ink to show direction of drainage, thus: ↘
862		Ice-contact stratified drift. (Groups of kames, eskers, kame terraces, pitted outwash, collapsed surfaces.) Include alluvium where necessary.
863	BEMIS	End moraine of Wisconsin age, with name in slant caps approx. 3/32 in. high, spaced out. Place name inside color area where feasible; otherwise along proximal margin. Include only names already published or soon to be published. Show all moraines, whether or not later submerged in lake or sea, in same color.
	(Black ink)	
(Black ink)		Crest of end moraine. (Only within end-moraine color areas & only where two or more crests are present. Use also to show later moraine overriding earlier moraine.)
(Black ink)		"Washboard" end-moraine area (Adjust number of nested lines to what will show at publication scale). Superpose on end moraine- or ground moraine color areas.
848		Wisconsin ground moraine, related till areas, and patchy drift.
(Black ink)		Outer limit of drift sheet, younger Wisconsin maximum, marking each major readvance or other significant break. Ticks 1/8 in. apart and 1/32 in. long, on proximal side of line.

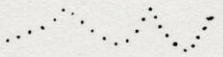
(Black ink) — Inferred outer limit of a major drift sheet (e.g., Kansan or Nebraskan) beneath younger drift of pre-Wisconsin age (Not shown in Wisconsin drift area).
Space dots 1/8 in. apart.

(Indigo Blue ink)
(Black lettering)


Strandlines, lacustrine and marine. (Beaches, shoreline bars & spits, cliffs). Show only where recognizable in field. Name in black slant caps 3/32 in. high, spaced out where possible. Where space is insufficient, place name horizontally over an existing lake or other non-cluttered space and use fine leader line.

(Indigo Blue ink)

Meltwater stream channels & lake spillways (where outwash not mappable). Arrow may be any length. Generalize for groups of closely spaced channels.

(Indigo Blue ink)

Shoreline of former lake inferred from indirect evidence. (Fine dots about 1/16 in. apart. Use this to connect or inclose patches of mapped lacustrine sediments where approximate, as in areas of L. Maumee 1 and S. part of L. Agassiz.) Add name of lake, preceded by "L.," in slant capitals, where appropriate.

866 — Illinoian drift & correlatives. (Show end moraine in dark tone; all other drift in light tone.)

893 — Kansan drift & correlatives (only in areas not glaciated in post-Kansan time. Cover entire Kansan glaciated area, even though drift is patchy.)

868 (horiz. stripes) Nebraskan drift (only in areas not glaciated in post-Nebraskan time).

(Black ink)

Striation direction. Locality is indicated by dot at center of staff. (Staff exactly 3/8 in. long; no arrowhead. Plot no more than 4 symbols per township, or area of 36 sq mi.)

(Black ink)

Two sets of crossing striations. (Do not distinguish between older and younger.)

(Black ink)

Indicator fans ("boulder trains"). Two (boundary) lines only. Plot to scale.

(Black ink)

Streamline feature, individual or group. (Drumlin, crag-and-tail, fluting, etc. (Staff 3/8 in. long, or to scale if long enough. Plot no more than 4 symbols per township, or area of 36 sq mi.)

(Black ink)  Locality of exposure, or former exposure, of significant interglacial or interstadial section, such as Farm Creek section, Ill., Two Creeks, Wisc. Triangle & circle each 1/8 in. in diameter. Number consecutively within each State. Please supply, in duplicate, text of footnote similar to those in Glacial Map of North America, following style exactly. Plot no more than 10 localities in any State.

(Black ink)  Contact lines between color areas.

Please apply pencil colors evenly and very lightly, just enough to insure clear distinction between adjacent color areas. Where end moraine & ground moraine are shown in tones of the same color, make end moraine just enough darker to contrast, but not so dark as to obscure base data. Please follow instructions exactly, to insure a uniform result that can be readily followed by draftsmen who prepare copy for engraver.

STATE OF ILLINOIS
WILLIAM G. STRATTON, GOVERNOR
DEPARTMENT OF
REGISTRATION AND EDUCATION
VERA M. BINKS, DIRECTOR
SPRINGFIELD

BOARD OF NATURAL RESOURCES
AND CONSERVATION
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UNIVERSITY OF ILLINOIS
REPRESENTING THE PRESIDENT—
W. L. EVERITT
SOUTHERN ILLINOIS UNIVERSITY
PRESIDENT - - DELYTE W. MORRIS

STATE GEOLOGICAL SURVEY DIVISION

JOHN C. FRYE, CHIEF
121 NATURAL RESOURCES BUILDING
UNIVERSITY OF ILLINOIS CAMPUS
URBANA

April 11, 1956

Mr. F. T. Thwaites
Geological and Natural History Survey
Science Hall
The University of Wisconsin
Madison 6, Wisconsin

Dear Mr. Thwaites:

Thank you very much for the Wisconsin glacial map which certainly is excellent. The compilation of a map as intricate as this is a big undertaking and we greatly appreciate your doing work when it was such a strain on your eyes.

The mailing tube was badly broken when it arrived, and the map certainly would have been torn if you had not had it mounted. It is somewhat crinkled but not seriously harmed.

We will have some problems to discuss when we get into the task of coordinating all the state maps, and I shall write you about them as soon as possible. I hope to see you in May on the Friends of the Pleistocene trip in Michigan.

Please give my thanks also to Mr. Hanson for his kindness in making this map available to us.

Sincerely yours,

H. B. Willman

H. B. Willman
Geologist and Head
Stratigraphy and Areal
Geology Division

April 3, 1956

Professor H. B. Willman
Illinois Geological Survey
Natural Resources Building
Urbana, Illinois

Dear Dr. Willman:

At last the glacial map of Wisconsin is ready to send. The delay was due to having a copy made. I have already written you in regard to some of the changes from directions and from published maps which I included in it to the best of my experience which now covers 50 years.

The boundaries in northwestern Wisconsin are adapted from soils maps and other information interpreted to the best of present knowledge. The boundaries of pre-Cary Drifts are most uncertain. I suspect that some are simply boundaries of eroded areas or sandstone versus hard rock areas. I did not venture to show a Valders boundary in the north. As drawn by others it simply must be wrong for it is along moraines and the Valders invasion did not make moraines. The footnote to the Forest Bed locality north of Two Rivers is unchanged from that of the old map of North America, (Wilsons' 2 papers). I hope, however, to have my report out by the time the whole map is done. Aldrich still has it at New York.

I enjoyed working on the map very much but am afraid it will be my last big job of compilation. My eyes bother me greatly now and I cannot work very fast.

Very truly yours,

WISCONSIN GEOLOGICAL SURVEY

F. T. Thwaites, Geologist

FTT:N

March 21, 1956

Dr. H. B. Willman
Stratigraphy & Areal Geology Division
State Geological Survey
121 Natural Resources Bldg.
University of Illinois Campus
Urbana, Illinois

Dear Dr. Willman:

Thank you very much for your letter of March 19. I recognize the difficulties inherent in preparing the glacial map and do not want to add to them. I am therefore having Thwaites' map redrafted so that we will have a copy here, and that you can use the original as you see fit. The copy should be completed by the first of next week at which time I will forward Thwaites' original compilation.

Very truly yours,

WISCONSIN GEOLOGICAL SURVEY

State Geologist

GFH:ac

STATE GEOLOGICAL SURVEY DIVISION

JOHN C. FRYE, CHIEF
121 NATURAL RESOURCES BUILDING
UNIVERSITY OF ILLINOIS CAMPUS
URBANA

March 19, 1956

Mr. George F. Hanson
State Geologist
Wisconsin Geological and Natural History Survey
115 Science Hall
University of Wisconsin
Madison, Wisconsin

Dear Dr. Hanson:

Concerning the return of the glacial map of Wisconsin prepared by Mr. Thwaites:

Dr. Flint believes that a final draft of the glacial map of each state will be needed after a period of study for coordination of the mapping of the physical features with other state maps. There will be plenty of time for making the final copy because publication will have to await general agreement on stratigraphic correlation. He suggests, therefore, that we return to you the first draft of the Wisconsin map unmarked. As the final draft will have to leave our hands for adjustment and fair-copying, it is difficult to see how we can give assurance that it will not be marked on. Further, it and all the state maps should be kept on file thereafter.

It has been my hope that the original maps would require so little change that the revisions could be made on the original and thus save the compiler's time in preparing final copy. However, this would require that the copy be used freely, and the map still might have to be made over for final copy, if extensive changes are necessary.

We shall definitely plan to not mark on Mr. Thwaites' original copy. If it becomes necessary to use it in any way that might mar it, I shall make a copy for that purpose. The original copy would be returned for your files and for preparation of final copy. It would be desirable for

Mr. Thwaites to prepare the final copy. That gives the author his best chance of getting boundary lines where he wants them. It seems desirable that the final copy be retained by the committee.

Sincerely yours,

H. B. Willman

H. B. Willman
Geologist and Head
Stratigraphy and Areal
Geology Division

cc: Dr. R. F. Flint

Ill. Geol. Survey

STATE GEOLOGICAL SURVEY DIVISION

JOHN C. FRYE, CHIEF
121 NATURAL RESOURCES BUILDING
UNIVERSITY OF ILLINOIS CAMPUS
URBANA

March 8, 1956

Mr. G. F. Hanson
State Geologist
Wisconsin Geological Survey
The University of Wisconsin
Science Hall
Madison 6, Wisconsin

Dear Mr. Hanson:

I have your letter of March 1 requesting assurance that the glacial map prepared by Mr. Thwaites can be returned to you in good condition as soon as the final map is compiled for publication.

As the map will be handled by various members of the committee and others, I am writing the Chairman, Dr. Richard F. Flint, for confirmation of my statement that the map can be returned. To my knowledge the point has not been considered by the committee.

A major question is whether modification of the individual state maps can be done entirely on other base maps without marking on the original map. Changes will have to be made before final compilation in order to give uniform treatment and adjust at state lines.

I believe it was the intent of the committee that the copy submitted by each collaborator would be for the use of the committee, and it was assumed that the collaborator would retain photographic or other copies for his own records.

I am glad that the map is turning out so well and I can readily understand your desire to have the original copy in your files. I shall write you further as soon as the matter is cleared with Dr. Flint.

Sincerely yours,

H. B. Willman

H. B. Willman
Geologist and Head
Stratigraphy & Areal
Geology Division

March 1, 1956

Dr. H. B. Willman
Illinois Geological Survey
121 Natural Resources Bldg.
University of Illinois Campus
Urbana, Ill.

Dear Dr. Willman:

Reference is made to your letter of February 10 to Prof. Thwaites in which you state, regarding the glacial map, that, so far as you know, the original map can be returned. Unfortunately, the state has no adequate glacial map published and the compilation by Thwaites is a step towards preparing such a map. Although much additional field work will be necessary in certain areas before publication will be warranted, the compilation represents the most complete general map available of the glacial deposits of the state. Many hours of work have gone into its preparation. I am sure that you will therefore understand that I would like definite assurance that the map will be considered the property of this survey, will be taken care of carefully while in your possession, and will be returned in good condition as soon as the final map is compiled for publication.

Very truly yours,

WISCONSIN GEOLOGICAL SURVEY

G. H.

State Geologist

GFH:ac

March 1, 1956

Dr. H. B. Willman
Illinois Geological Survey
121 Natural Resources Bldg.
University of Illinois Campus
Urbana, Ill.

Dear Dr. Willman:

Reference is made to your letter of February 10 to Prof. Thwaites in which you state, regarding the glacial map, that, so far as you know, the original map can be returned. Unfortunately, the state has no adequate glacial map published and the compilation by Thwaites is a step towards preparing such a map. Although much additional field work will be necessary in certain areas before publication will be warranted, the compilation represents the most complete general map available of the glacial deposits of the state. Many hours of work have gone into its preparation. I am sure that you will therefore understand that I would like definite assurance that the map will be considered the property of this survey, will be taken care of carefully while in your possession, and will be returned in good condition as soon as the final map is compiled for publication.

Very truly yours,

WISCONSIN GEOLOGICAL SURVEY

State Geologist

GFH:ac

STATE GEOLOGICAL SURVEY DIVISION

JOHN C. FRYE, CHIEF
121 NATURAL RESOURCES BUILDING
UNIVERSITY OF ILLINOIS CAMPUS
URBANA

February 10, 1956

Mr. Fred Thwaites
Wisconsin Geological Survey
Science Hall
University of Wisconsin
Madison 6, Wisconsin

Dear Mr. Thwaites:

In reply to your letter of February 6:

The distinction you make between the outwash deposits seems correct to me. I doubt if any state has mapping detailed enough to differentiate all the outwash deposits by number or percentage area of pits.

I agree that lakes should be mapped if you have convincing evidence of their existence, but this would be on the assumption that the area mapped is a relatively flat area probably in considerable part underlain by thin lacustrine deposits, even though we do not have exposures or auger holes to prove the presence of the deposits. If you have some lakes which covered moraines and eskers so temporarily that it did not leave deposits or shore features, you may not wish to map such a lake but would show only its spillway channel, if that is the major evidence for the lake. I feel that all distinct moraines and eskers should be mapped and should have preference where a choice is necessary. If we have them covered by lacustrine deposits we may wish to add a pattern to show this. If you think that such a situation is sufficiently widespread that a special pattern is needed, please let me know and I will take it up with the committee.

I agree that you have no basis for mapping Shaffer's Lake Savanna.

The mapping of shore features necessarily will be very incomplete in unstudied areas and in areas without good topographic maps. These blanks will emphasive the need for more field work.

So far as I know the original map can be returned eventually, but I imagine it will be needed for reference while we are discussing boundary line problems and until the final map is published, which is likely to be several years away. It will certainly not be in continuous use, and we could probably send it back if needed occasionally. If Mr. Hanson is considering publishing the map, there is much to recommend it. These maps would be very useful for the individual states if published on a larger base, perhaps the millionth base. Probably you would want to wait until we have discussed state boundary line problems and correlations. However, it is possible that for the final map we may have to do some standardizing that will not show some of your features to the best advantage. You may wish to publish a little more detail in some places than we can use, and you might want to use your own nomenclature, should we differ. In any case, there certainly would be no objection to your publishing this map.

Sincerely yours,

H. B. Willman

H. B. Willman
Geologist and Head
Stratigraphy and Areal
Geology Division

February 6, 1956

Dr. H. B. Willman
State Geological Survey
Natural Resources Bldg.
Urbana, Illinois

Dear Professor Willman:

Thank you for yours of 1 February which came today.

In reply to your points I think to find the number of pits in outwash, that is their relative abundance would be a very long job involving looking at all the air photographs of the state. Is not my distinction right, that is unpitted outwash outside the end moraine of a marked ice advance versus pitted outwash varying in degree of pitting up to what the old soil survey called "rough land" which outwash is inside the area of the advance?

With regard to lakes we have many where the presence of continuous sediment is not proved. If there was any over wide areas of shallow or short-lived lake it has been so weathered that it can no longer be distinguished, I have relied on elevation of spillways. Many lakes may have either been frozen much of the time, too shallow for sediments, or have been only a moat around the edge of the melting ice. Lake Oshkosh in the Green Bay region has fine spillways which are very prominent in the air photos but we could find no sediments. Another place is the lake in front of the Illinoian glacier in southern Wisconsin where any shorelines which might have been formed have long since been eroded away. I have no information on which to map Shaffers lake Savanna? in the Mississippi valley. Its bed is now filled with outwash of later age.

The principal change from early mapping of glacial deposits is the recognition that all kettles are not in moraines. The early students including myself included much pitted outwash in their moraines. I made extensive changes in the map where field inspection, wrong orientation of areas, and abundance of gravel pits causes one to doubt the morainal character of the areas.

My biggest problem was in interpretation of old soils maps made by persons who they did not want to know anything about glacial geology plus the use of maps made by beginners in the northern brush country. I used my own judgment in making changes.

I intend to take some color photos of the map before sending it on. Mr. Hanson wants you to return the original when through with it. If this is impossible please let me know.

I have already mentioned the matter of "moraine crests." I may supply a few in the clay till areas where moraines are wide.

The biggest problem now is to find where lake shore features are recognizable in the field. The shores of high levels of Lake Superior are fine but I can find no map showing them. Topo maps of this area are only partly done so far. Reports give spot information only and not distribution of strandlines.

I think Buells Waterloo boulder train is all we can show. There may be more but they have not been studied.

What about eskers and moraines which can be distinguised below levels of lakes? Your instructions do not seem to cover this point.

As mentioned before you can tell true red from purple by the fact that you cannot see it through a red filter. I added some red to my blue ink so use of a blue filter to tell blue from purple will probably not work. I will try it.

I put eskers on with brown ink.

Sincerely yours,

F. T. Thwaites, Geologist

FTT:N

STATE GEOLOGICAL SURVEY DIVISION

JOHN C. FRYE, CHIEF
121 NATURAL RESOURCES BUILDING
UNIVERSITY OF ILLINOIS CAMPUS
URBANA

February 1, 1956

Mr. Fred Thwaites
Wisconsin Geological Survey
Science Hall
University of Wisconsin
Madison 6, Wisconsin

Dear Mr. Thwaites:

Dick Goldthwait writes the glacial map committee about the questions you raised as follows:

"Concerning Willman's letter of January 16, I would confirm his ideas generally as follows:

"Paragraph 2: Outwash should be shown as ice contact to the deposit if there are many closely spaced pits, but not if there are rare pits and scattered.

"Paragraph 3: Our lakes in Ohio are all substantiated by bottom deposits at least three feet thick; failing this evidence, we have not shown them.

"Paragraph 4: We cannot be sure of the override of two of our moraines, so naturally we shall show them as surface end moraines. If the cover is thin, I am sure they should be shown as end moraines.

"Paragraph 9: By all means, reinterprete the mapping of early workers whose perspective did not include our stratigraphic information of today."

We would agree that the mapping of lakes should be substantiated by some deposits. Having accepted the evidence for the lake, its

distribution is mapped physiographically, on the premise that some deposits are present throughout the area mapped. We would have a hard time here in Illinois proving that there is 3 feet of deposits throughout any large part of the area covered by our very extensive Valparaiso (Kankakee Torrent) lakes. I am writing Goldthwait to see if he agrees.

Sincerely yours,

H. B. Willman

H. B. Willman
Geologist and Head
Stratigraphy and Areal
Geology Division

STATE GEOLOGICAL SURVEY DIVISION

JOHN C. FRYE, CHIEF
121 NATURAL RESOURCES BUILDING
UNIVERSITY OF ILLINOIS CAMPUS
URBANA

January 16, 1956

Mr. F. T. Thwaites
Geological and Natural History Survey
University of Wisconsin
Science Hall
Madison 6, Wisconsin

Dear Mr. Thwaites:

I am very glad to learn that you are making progress with the glacial map. The questions you raise may well apply in other areas, and I am sending your letter and my answers to other members of the committee. So far as possible we wish to get uniform treatment in the first copy, but we will have opportunity later to standardize some features. If others have different ideas, I am sure they will pass them along, and you will hear from me again soon.

Concerning your question:

(1) The choice of inks has been changed slightly as you know by now from my recent letter. It sounds to me like you are too advanced to change colors now and I would not be especially concerned about it. The changes were primarily to help us in compiling a preliminary map for further discussions. These are not necessarily the colors to be used in printing the map.

(2) Your decision seems right for your special case. The outwash pattern would be used largely for valley trains and for extensive outwash plains within drifts, if they lack ice-contact features. The object here is to combine the complex pitted plains, kames, eskers, and similar stratified deposits which would be difficult to differentiate on our scale.

(3) If there is adequate evidence to show the existence of a lake, we should attempt to map it, even though we do not have data to prove continuous lake deposits throughout the area submerged.

(4) The intent is to map the features of the uppermost drift, showing the boundary of a major buried drift by a line as indicated in the legend. This does not mean to map all buried moraines. I realize that you have some major moraines which are only slightly modified by a later thin drift. I believe that these moraines should be mapped as moraines because we are mapping topography. I would also map the boundary of the area covered by the later drift. We may wish to give a special pattern to the overridden moraines when we see how widespread this situation is. You are right in omitting buried outwash.

(5) As a line on the map may be nearly a half mile wide and many moraines are only one to three miles wide, the mapping of some crests is not practical nor needed. Omit them in such cases and where you do not have adequate maps. Use them only on a very wide moraine or in a morainic complex where individual moraines would not otherwise be differentiated.

(6) Drumlins will have to be shown only as drumlin fields, using a few symbols in the larger areas to show orientation. The map does not want to be cluttered with these symbols and it is up to you to show as many as needed to give the correct impression.

(7) Single isolated eskers long enough to map should go on. You will have to exaggerate the width slightly in order to show them.

(8) One symbol will do for a considerable group of closely spaced and similarly oriented striae. For strongly crossed striae you may use more than one symbol.

(9) We prefer your present interpretations.

Best regards,

Sincerely yours,

H. B. Willman

H. B. Willman
Geologist and Head
Stratigraphy and Areal
Geology Division

cc: R. F. Flint
R. P. Goldthwait
R. B. Colton

Enclosure

January 12, 1956

Mr. H. B. Willman
Geologist & Head
Stratigraphy and Areal
Geology Division
State Geological Survey Division
Urbana, Illinois

Dear Mr. Willman:

Could you please answer my other questions. A red filter will enable one to tell the red because it then vanishes.

Very truly yours,

WISCONSIN GEOLOGICAL SURVEY

F. T. Thwaites, Geologist

FTT:N

STATE GEOLOGICAL SURVEY DIVISION

JOHN C. FRYE, CHIEF
121 NATURAL RESOURCES BUILDING
UNIVERSITY OF ILLINOIS CAMPUS
URBANA

January 9, 1956

Mr. Fred Thwaites
Department of Geology
Science Hall
University of Wisconsin
Madison, Wisconsin

Dear Fred,

As it will be desirable to copy photographically the original drafts of the glacial map, it has been suggested that the purple ink indicated in the legend be changed to red violet and the blue be changed to indigo blue. These photograph much better. If you have started the map using some other shade of purple, I suggest that you continue with it, but if you have used the ordinary blue or the turquoise blue, it would be desirable to change, if possible.

Sincerely yours,

H. B. Willman

H. B. Willman
Geologist and Head
Stratigraphy and Areal
Geology Division

Could you please answer the other question. A red letter will make one to all the red became it then vanishes

STATE GEOLOGICAL SURVEY DIVISION

JOHN C. FRYE, CHIEF
121 NATURAL RESOURCES BUILDING
UNIVERSITY OF ILLINOIS CAMPUS
URBANA

December 9, 1955

Mr. F. T. Thwaites
The University of Wisconsin
Geological and Natural History Survey
Science Hall
Madison 6, Wisconsin

Dear Mr. Thwaites:

After a considerable discussion of legends and base maps, we are now ready to get the preparation of a glacial map of the United States underway.

Under separate cover we are sending the following:

Three copies millionth-scale base-map of Wisconsin
List of features to be compiled
Two photostat copies of South Dakota showing the detail that can be mapped - one, a natural-size copy of a drafting by Roger Colton on the scale of publication, and the other the same enlarged twice to about the scale of compilation. The colors of the original are not differentiated and the primary purpose is to show detail.

In the legend the committee has tried to cover all the features that can be mapped, but we anticipate that many questions will arise and hope that you will feel free to bring them up. You will note that the scale of compilation has been changed to the millionth map, since I first wrote you.

We are hoping that this preliminary compilation of the physical features can be ready by April 1, 1956. A composite map will then be made for further discussion among the collaborators and for consideration of state boundary-line problems.

Pitted outwash
or outwash, recessional moraines
lake basins or sediments
glaciated { moraines
[illegible]
drumlins

Sincerely yours,

H. B. Willman

H. B. Willman
Geologist and Head
Stratigraphy and Areal
Geology Division

Ill. Geol. Survey
Willman, H.B.

November 2, 1955

Dr. H. B. Willman
Illinois Geological Survey
Natural Resources Building
Urbana, Illinois

Dear Mr. Willman:

Your letter of 1 November to George Hanson was given to me for reply. I will be glad to draw the map to the best of my ability. So far as the Green Bay lobe goes we are all set with exception of some parts of Alden's map where he seems to have confused pitted outwash and endmoraine but these districts have not been remapped although I have tried for a long time to get someone to do this. The district west of Vilas County is "terra incognita" although we have some tentative maps. I will try to adjust these but to check with the air photos would be very time consuming and unless supported by ground surveys might be misleading. The late Lawrence Martin was the first to set us right on the outwash-endmoraine problem.

I am sorry I had to leave the Tri-State without saying goodby but darkness will wait for no man. We had to get home by then and just did.

Sincerely yours,

F. T. Thwaites

FTT:N

STATE GEOLOGICAL SURVEY DIVISION

JOHN C. FRYE, CHIEF
121 NATURAL RESOURCES BUILDING
UNIVERSITY OF ILLINOIS CAMPUS
URBANA

November 1, 1955

Mr. G. F. Hanson, State Geologist
Wisconsin Geological and Natural
History Survey
University of Wisconsin
115 Science Hall
Madison 6, Wisconsin

Dear Mr. Hanson:

The National Research Council has set up a committee with the lengthy title of Committee on Glacial Map of United States East of the Rockies. This committee is charged with the compilation of a map showing glacial drift and related features within the United States and between the Rocky Mountains and the Atlantic Ocean.

Compilation is contemplated on a scale of 1:2,500,000, the scale of the Geologic Map of the United States. This scale will permit showing much more detail than that which appears on the Glacial Map of North America. The Council of the Geological Society of America has considered the project, and has voted in principle to publish the map when it has been completed and accepted. We believe that when published it will prove to be a very useful research document for many geologists and workers in related sciences.

The committee has decided to appoint as collaborators persons whose knowledge, judgment, and position specially fit them to compile the map for specific States. In our opinion there is no one as well qualified to compile this map for Wisconsin as Fred Thwaites. If you agree, I would greatly appreciate your passing this request directly to him. If he will undertake it, I shall see that he receives the proper base map, the symbols to be used, and an example of the detail desired. The names of the collaborators of course, will appear on the published map.

We realize that correlations from one State to another are not entirely agreed upon at present. Accordingly our aim is to compile, during the next few months, a purely physical map that will show all glacial features except correlation. After the physical map has been fully discussed among the collaborators, adjusted, and corrected, the problem of correlations will be taken up, followed by publication.

For your information the members of the committee are Richard Foster Flint, Chairman, Roger P. Colton, Richard P. Goldthwait, and myself. Assembly of data for Wisconsin, Iowa, Kansas, Missouri, and Illinois has been assigned to me.

With best regards, I am,

Cordially yours,

H. B. Willman

H. B. Willman
Geologist and Head
Stratigraphy and Areal
Geology Division

June 27, 1955

Dr. H. R. Aldrich, Secretary
The Geological Society of America
419 W. 117th Street
New York 27, New York

Dear Crombie:

I am sending under separate cover the revised topographic map for our manuscript on the Pleistocene of the Door Peninsula which was given in 5 minute summary in 1951. Please substitute this map for the other which was sent. The older map may be discarded since there is no need to return it. The decision not to ask for a three color topographic map was based solely on the fact that they are doing the quadrangles for most of this area and one is already out. (Casco). In view of this we decided to eliminate all but the state and federal highways making the map fit to publish in black only.

Sincerely yours,

FTT:N

Aldrich

July 12, 1955

Dr. H. R. Aldrich, Secretary
The Geological Society of America
419 West 117th Street
New York 27, New York

Dear Crombie:

In reply to yours of 8 July I will be glad to write what I know of Lawrence Martin from his few years here. Information on his later life at Washington I can probably secure from Ken Bertrand, who lived near to him and worked with him for some time, or you may be able to get this information elsewhere. I think I saw him only once in later life when he testified in a boundary dispute here.

I have at hand reports of two readers of the Door Peninsula paper. In order to correct their false impressions I will make a few statements. I originally published the material on origin of the Lake Michigan basin, which is of vital importance in discussing Door County, in the Michigan Academy of Science. This is of limited circulation and reprints are now exhausted. I feel that it should be republished (in brief) where more widely distributed.

In respect to the maps. Both large maps are to be reduced to about half linear size making them not at all bulky and then they would match Aldens scale and my map west of Green Bay.

It is impracticable to superimpose contours for several reasons: first, the maps would not fit because one was a photographic reproduction of the other and we found differential shrinkage between them, second, the contours cannot be read even with a magnifying glass if superimposed on much below. We eliminated roads because of this fact from the topo map.

It would render the main glacial map valueless if put into patterns of black and white. I chose only three colors besides black for the base with patterns of each to differentiate different areas. Color separation sheets are now all ready showing these. Please remember that this project is called "Operation Shoestring" because we had so little financial support and never even asked for a grant. Hence we feel that we ought to get what others have: that is a colored map to match the two adjacent.

Sincerely yours,

F. T. Thwaites

FTT:H

Ulrich, H.R.

February 28, 1955

Dr. H. R. Aldrich, Secretary
The Geological Society of America
419 East 117th Street
New York 27, New York

Dear Crombie:

The manuscript on the "Pleistocene of the Door Peninsula, Wisconsin" is sent herewith. Following previous practice no orginals or final photos for plates are included, Plate 9, topographic map of the area is not yet finished. When done it will be for reproduction in black only as in the 1943 report. Decision to change this map, leaving out most of the roads was reached because of the near completion of quadrangles of the region, two of which are already published. The prints of figures and copies of plates are for readers only and originals will be sent later. The air photo stereopairs have not had the section lines and numbers put on them nor are they cut out to proper size. The copies for reading are from our file and are to be returned. The prints for final copy are glossy and all of them are slightly better than the readers copies. Figures are put in place in the manuscript and the intervening pages of text stapled together. Color separation copies of plate 10 geologic map have been prepared. Colors have been reduced to a minimum because of expense. The copy for reading only has too many colors. Scale of both Plates 9 and 10 is to be 1:250,000. The prints are 1:120,000. The text figures will, I think, all reduce to page size or smaller. Reductions are not marked on them. Some have two on one final copy.

Very truly yours,

WISCONSIN GEOLOGICAL SURVEY

F. T. Thwaites, Geologist

FTT:N

July 15, 1953

Dr. H. R. Aldrich
The Geological Society of America
419 West 117th St.
New York 27, New York

Dear Crombie:

I have been a long time in answering your letter of June 3, but there have been many delays - Tom's wedding, and our recent journey to Rochester, New York to get back the car after they moved there. Then I had to do some work on the map, communicate with Bertrand, and make arrangements for redrafting here.

The general opinion is that we really ought to make a three color map with contours in brown. This would involve 4 non-photographic blue line prints, for it would take two for the blue color, one for the overprint pattern on large lakes, the other for streams, lake shores, and lake bottom contours. If you can stand the expense of this, including the making of the copies mounted on metal, it is what all here desire very much. How about a partial reduction in size in this process to one intermediate between this map, 1:120,000, and the final scale of 1:250,000? Maybe this would save on part of the process although it would make the inking harder. I have made arrangements for the new drafting service here to do this job along with other research projects so we will take care of that plus all shipping charges. This project has been run on a shoestring minus all support except the photos.

I tried to correct many of the map defects you mentioned. In reinking we will move some of the place names. Originally these had to be put on before the contours were compiled in order to get a photographic copy of the base on which to place the geological boundaries. I have some reserve black line prints some of which will serve for readers. I plan to submit the manuscript before the final inking of the topographic map is completed.

Hoping you can do the job as outlined above,

Sincerely yours,

F. T. Thwaites

FTT:ac

Eldrich, H. R.
Memo: Foley, F. C.

June 29, 1953

Dr. H. R. Aldrich
419 West 119th St.
New York 27, N. Y.

Dear Dr. Aldrich:

Subject: Fellowship F. A. of F. C. Foley

1. Dr. Foley's contributions to geological research have been largely in ground water and for purposes of applied science.

2. Publications. Presentation of field data.

3. Administrative work. He proved to be an able administrator of the Ground Water work in Wisconsin, so good in fact that the Illinois Geological Survey persuaded him to leave Wisconsin.

4. Proved ability in training geologists. A number of young geologists have received excellent training in field methods from him.

As an administrator and teacher he has made important contributions to science. At the same time he has succeeded in increasing the interest of the general public in geology.

Very truly yours,

WISCONSIN GEOLOGICAL SURVEY

State Geologist

EFB:ac

May 21, 1953

Dr. H. R. Aldrich
Geological Society of America
419 West 119th Street
New York 27, New York

Dear Crombie:

I think that Herb's worry was not financial because he had a good life insurance load and a farm in Indiana. Instead, I think Ken Rawson's explanation may be accurate.

"To be caught between a penny saving Board of Education and a faculty -- townspeople all -- righteous clique is not easy for any man."

We attended the funeral and remarks of the minister suggested that some of the people in the community should have troubled consciences.

I did receive the telegram from you and Fritz and understood every word of it. I have been so busy with all of the odd jobs that come at this time of year that my correspondents have been neglected. My successor, George Hanson, is gradually getting acquainted with the work. He went underground on the 5th and 6th of May.

Very truly yours,

WISCONSIN GEOLOGICAL SURVEY

State Geologist

EFI:ac

THE GEOLOGICAL SOCIETY OF AMERICA

OFFICE OF THE SECRETARY

May 15, 1953

Mr. E. F. Bean
Science Hall
University of Wisconsin
Madison 6, Wisconsin

Dear Ernest:

Thanks for including me in on the circular letters to former W.G.S.ers. The news that Herb had taken his own life hit me on the button and the only thing I get out of it is that guys in his frame of mind should have attention and have their letters opened and read. Apparently Herb was in line for good news from the retirement bureau although I can't imagine he was of retirement age.

The word from Tom Tanaka was particularly refreshing and I expect to drop him a line to re-engage his recollections of some things that can't be dictated.

Believe it or not, I first saw these letters about three minutes after Hotch had left from having lunch and a couple of hours of reminiscence.

By the way, did you get a message from Fritz Conover and myself out of Nashville? When I found I was to spend a few days there with the Southeast Section, I recalled that Fritz was teaching at Vanderbilt and got him on the phone. He came into the hotel and we had lunch and a good time together. He was a bit out of whack, having dislocated one of the disks in his back, but we road over that as we dug back into the events of these thirty years. Could it be that you could not translate the message written out on a telegraph blank?

At Stanford in March I was introduced to Bill Bradley who was taking his degree in geomorphology, and last week at Butte I ran into Chink Bradley who is teaching at Bozeman. These two members of the Bradley family are certainly upholding traditions.

With best regards to everybody, including Jessie of course.

Yours sincerely,

Crombie

Secretary

HRA:djs

May 6, 1953

Dr. H. R. Aldrich, Secretary
Geological Society of America
419 West 117th Street
New York 27, N. Y.

Dear Crombie:

In respect to your letter of April 17 in respect to the Rthe and Gould manuscript I would be pleased to read this but have been and still am extremely busy with field trips, etc. Hence, if you could delay it a time it would enable me to finish it more quickly.

I have been meaning to write in respect to my paper on the Door Peninsula. The geolo ic map is smaller than for the other report but should by all means be colored. The topographic map is now all black but would be much improved if we could either use blue for water or a color for contours. The latter would involve redrawing and cause delay. A blue overprint for water would not take as much work but since this map shows all roads confusion with contours is possible. How do you feel about this? Would you like to see a print?

Very truly yours

WISCONSIN GEOLOGICAL SURVEY
By

F. T. Thwaites, Geologist
In Charge of Well Records

FTT:nv

4-20-53

THE GEOLOGICAL SOCIETY OF AMERICA

April 17, 1953

Dear Thwaites:

We have a manuscript which I should like to send you for critical reading and advice as to the originality and value of its data, whether the literary execution is such that the paper can properly be published with little or no editorial revision, and especially now that the manuscript reserves are so large, whether the paper would profit by intensive condensation.

With regard to this last point, for many years we have been striving for the condensation of manuscripts. During the past year with the decrease in income and increase in printing costs, we have had to redouble our efforts in this direction. Therefore, in reviewing the manuscript with this mind, will you please give us your opinion as to whether the paper really has an original contribution which will advance the science. If so, is it of local or general interest? Is the contribution presented in the most economical way? Are all the illustrations necessary? Which help to tell the story, which are merely pictorial supplements?

We feel quite sure that by intensifying cooperation of critics and authors we can continue to maintain our normal output of papers of merit in spite of reduced income.

We hope that you will be willing to accept this responsibility on behalf of the Society. And can you conveniently arrange to complete the critical reading within the space of two weeks from date of receipt?

Sincerely,
H R Aldrich
Secretary lr

Author: R. V. Ruhe and L. M. Gould

Title: Glacial geology of the Dakota County area, Minnesota, 59 pages, 4 plates, 10 figures

Mr. F. T. Thwaites
41 N. Roby Road
Madison 5, Wisconsin

THE GEOLOGICAL SOCIETY OF AMERICA

OFFICE OF THE SECRETARY

June 6, 1945

Mr. E. F. Bean
Sciance Hall
Madison 6, Wisconsin

Dear Ernest:

I always seem to be behind, as my Mother used to say, like a cow's tail. I do not know whether it is meor the job,or perhaps both of us have to share the blame for my neglect of your letter which you nowtell me was dated August 23.

I think that beyond reasonable question the reason why I neglected answering your letter was that it came at a time when with Dick's critical illness I failed to give your request careful attention.

I can't believe that I walked off with official notes and maps. I do have some tracings from which certain blue prints were made and sent to you in service to Al Walker, and I can send these and will do so. I never did write up thepaper and although I have resolved several times to do so I never quite got to it and the recollections are now so dim I would have to concentrate for some little time to reconstruct my views.

In simple language however my views are that the ores produced at the Florence, Ernst and Buckeye were from relatively non magnetic upper Huronian, i.e. the Crystal Falls, Iron River, and that the higher attraction in that vicinity and continuous with the area east and south beyond Spread Eagle and toward the ~~late~~ old Menominee was due to the middle Huronian of that range. I think that the section that I set down on this tracing and prints gives you the story as completely as I can put it together now in sufficient time to do you and Mr. Dougherty any good. It would be my view that any drilling for purposes other than straight geology, that is in search of commercial ores, should be done with respect to the heavier attraction and off to the east and south toward Iron Mountain. Above all things do not on your own account allow Mr. Dougherty

to believe that I am in any degree non cooperative. It might be possible to get to Madison but it would be much easier for meto meet with Dougherty here or in Washington. I do also recall that I sent copies of my conclusions, maps and brief statement to Hugh Roberts who told me at the time that he felt they were the most plausible, at least, explanations of the situation.

I also neglected to acknowledge receipt of the "bulletin" stating that Ernie Jr. was safe and on the way home. You will believe us that we were happy for you and Jessie and for Junior as well of course. Probably he is already there, and if so give him our best.

Bob is still at Meuselwitz living the life of Riley at least for a time. He has just been advanced to 1st Lieutenant and will presumably be conditioned for service in the CBI theater.

Dick is doing as well as might be expected.

To close off on a note of Auld Lang Syne and I think you will remember the old yarn. These rather hectic days have now been climaxed by the fact that I too have "lost my ticket", in this case my gasoline ticket. By some little detective work however I discovered that it went into the family wash in an old flannel shirt, the evidence for which is that two of the coupons held together by a paper clip were caught in the drain and "remains to be seen."

Tell me what I can do to make amends for the neglect of your letter now nearly a vear old.

Sincerely,

Lowell

PS. By golly, I did find the manuscript and just where it should be. It has a note in your hand writing I believe so supposing you use it for present purposes and then send it back. If you wish, let miss V make a copy of it.

And best regards to everybody. Yes, I forgot Louise - she is as ever and in good health although, believe me, we took a licking last 12-months! Incidentally, perhaps, I lost my mother on May 11 - just lacking a week of reaching 79 years. We took her back to Claremont New Hampshire and returned her to her mother and dad in the shadow of Mt. Ascutney. After all she helped me set my sights many years ago and I've been keeping on the trajectory since being on my own. So - I haven't lost her quite so realistically as sister and dad who had her constantly by.

HH

What was

the "Japanese

Connection"

of Bean '57

/

Bob Dott

4-29-99

LEE— Thanks for

yours about Tanaka.

Here's another in

return (I had it in

a file, but had

forgotten it). Tom

cooked for at least 3

summers. And one year (at least)

2 other Japanese did, too.

1918

Letter from Tom Tanaka - Our cook on Geological Survey - Summer 1918

3420 Sansom St.,Phila.,Pa.

February 15, 1919.

Dear Ronald:

The news from you made me wild with pleasure which refleshed my memory of summer camping with the wild fellows and rough-neck bunch of W.G.S. I am sorry to learn that you are not coming this summer to take part in moving the camp under vigorous fire of thunder, fearcely pouring rain, or in cultivating farmers how to be couteous toward W.G.S. boys and philathrophic toward the gentlemen of mighty W.G.S., or educating pretty girls of Wisconsin how to dance the dances of the most up-to-date such as Tango, Gingo and Fula Fula or what not.

I have accepted the ofer of Mr. Bean to feed the bunches this summer. Of course I would be financially better off if I should stay here this summer. But the summer here is very disagreeable , and I can not stand much heat like Philadelphia had the last summer,

I am glad to know that you are getting well with yiur studies. I am also taking accounting; it takes my lot of time. But I am glad that I feel this year much easier than than the last.

Please give my best regard to Marshall Iide, Davis Hull and other fellowswhom you think I know. Well so much for this time; I wish you sucess and good luck.

Yours sicerely Tom D. Tanaka

Land Classification

Birge
Weidman

STATE OF WISCONSIN

Geological and Natural History Survey

E. A. BIRGE
DIRECTOR AND SUPERINTENDENT

SAMUEL WEIDMAN, GEOLOGIST

Madison, Wis., Aug.4,1916.

Dr. E.A. Birge,
Director, Wisconsin Survey,
Madison, Wisconsin,

Dear Dr. Birge:

Altho I have talked over the subject with Professor Whitson, it seems to me quite proper that I should also call the matter to the attention of the Director of the State Survey and the Director of the U.S. Bureau of Soils.

I wish to call your attention to the "Reconnoissance Soil Survey of Northeastern Wisconsin" Wisconsin Survey Bulletin No.47, in which, it seems to me, inadequate recognition is given to S. Weidman and P.O. Wood for the Soil Survey of Marinette County, made in 1909. There is a statement on page 7 of this bulletin in reference to the Marinette County report and authorship, ending with the following words: "However, the map and all essential parts of the report are included in the present report."

The area of northeastern Wisconsin is given as 6,098 square miles, and that of Marinette County is 1,396, hence Marinette County is nearly one-fourth of the larger area. On the Soil Map of Northeastern Wisconsin, however, no credit is given for the Survey of Marinette County to Weidman and Wood, but the statement is made that the survey of the soils of the entire area is made by others. The soil map of Marinette County is incorporated directly into the map of the larger area without any change in soil boundaries, except in a small tract of about ten square miles at the Experiment Station at Crivitz, and a change of some of the soil names.

I have talked the matter over with Professor Whitson and he readily acknowledged that our names, Weidman and Wood, should have appeared not only on the soil map, but also as joint authors of the report, and that he would see that in future issues due credit be given.

The Northeastern Wisconsin Area, Bulletin No.47, also includes a portion of the area of the Soil Survey of North Central Wisconsin, Bulletin No.11 by Weidman, 1903, with later editions. There is no mention in No.47 to the fact that nearly one-half of the area of Langlade County, ten out of twenty-two townships, was previously surveyed and included in No.11 altho the area re-surveyed, is mapped much the same as I had mapped it, when due consideration to the change in soil names be taken into account. The descriptive text of the soil formations about Antigo in western Langlade County in No.11 is drawn upon and utilized to some considerable extent for No.47, but no reference to such source is made. (Compare description of the Antigo soil formations in the two reports.) Even granting joint authorship for No.47 to Weidman, a statement should have been made in No.47 concerning the earlier survey and the relation of the later survey to the earlier.

This entire matter is of especial importance, it seems to me, because the recent report on northeastern Wisconsin is intended to replace the earlier reports issued, for the respective areas, included in the earlier reports No.24 and No.11, the supply of which is exhausted. Hence, if due credit is not given in the later report, the identity of the earlier work is practically lost, a resultant almost certain to cause injustice to the authors of the earlier reports.

Yours very truly,

S. Weidman

SW/GD

Geologist.

WILLIAM L. SMITH
Neillsville, Wisconsin

Senator 24th District
Clark and Wood Counties

WISCONSIN LEGISLATURE
SENATE CHAMBER
MADISON

March 26-1922.

Dear Billy,

Sometime at your convenience, will you kindly write me concerning the Highway situation in the State. From what sources is revenue obtained; how expended; the good and bad features of our present Highway program etc.? Just, why does the present method place a burden upon some of the northern counties? How can the situation be best corrected?

Of course, I have my own ideas but I want to get the whole proposition before me from your angle. Make your letter as complete and exhaustive as possible. If for any reason you do not care to be quoted on certain details, just mark those portions of your letter in some manner to indicate their privacy.

If I should get into the campaign this fall I want to be able to handle the Highway problem in a fair and constructive manner.

With thanks for and Editto again for the fine evening you gave us. Sorry that we did not see your boys.

Sincerely W. L. Smith.

April 3, 1922.

Senator W. L. Smith,
Neillsville, Wisconsin.

Dear Bill:-

Your letter of March 26th gave me a rather large order which I have put off until today, but I am giving you a general outline herewith of the material that you want and I am also enclosing our Highway Commission Bulletin which will give you the details of all that you desire.

When the first State Aid Law was passed the county boards were authorized to lay out a system of Prospective State Aid Highways in each county. This was under the supervision of the State Highway Commission to the extent of adjusting these systems so that they joined at the county boundaries and made a complete system of Prospective State Aid Highways for the whole state. This gave us two systems of highways, the Prospective State Aid Highway System and the Town Highways. The Legislature of 1917, after the passage of the federal aid act, provided for a Trunk Line System of five thousand miles, and the Legislature of 1919 added twenty-five hundred miles to this. This seventy-five hundred mile system was laid out by the State Highway Commission and a Special Legislative Committee acting jointly. This gives us three highway systems in the State of Wisconsin which are recognized all through our law, the State Trunk Line System; the Prospective State Aid Highway System; and the Town roads.

Among the excellent features of our system in this state there should be mentioned first the maintenance system which has been adopted for the State Trunk System and in many counties for their systems of Prospective State Aid Highways. This has resulted in a large mileage of road that is maintained in the best shape that its material will permit, something which no other state in the Union has ever attempted before, and this is based on our fundamental policy of "Highway Service for the People of Wisconsin". Another very excellent feature of our present system is the fact that we have in most counties active and efficient committees of the county board which are in direct charge of all the work in their counties. Much of this work is under the supervision of the State Highway Commission. This situation results in a rather thorough understanding on the part of the county board and the local people of the policies to be pursued, and this understanding is one of the vital features of the success of our highway work in this state.

The outstanding evil feature in our present highway situation is one which we recommended to the last Legislature for change. [illegible] later under the "State Trunk Highway Funds". Page

April 3, 1922.

following refer to the Bulletin which is en-

Describe Trunks, Prospective State Highways, Town Roads.

STATE APPROPRIATIONS.

" 33 Sec. 20.49. (1) $168,000 from ~~State General Fund~~ Auto Fees for operation of Highway Commission forces. Salaries and expenses for engineering and overhead.

" 34 Sec. 20.49. (2) $785,000 from ~~Auto License Fees~~ Gen'l Fund for State Aid in constructing the County Systems of Prospective State Highways.

" 34 Sec. 20.49. (3) $100,000 from State General Fund as State Aid for Bridges 475 feet or more in length.

" 34 Sec. 20.49. (4) Trunk Highway Appropriations:
1. All Federal Aid Received.
2. State's share of net proceeds of auto licenses. This last is available for administering, planning, surveying, constructing and maintaining the Trunk Highway System.

" 34 Sec. 20.49. (5) Map Fund. $3,000 revolving fund for small maps and $25,000 in 1919 for the large wall map distributed by the members of the Legislature.

" 35 Sec. 20.49. (7) $1,700,000 yearly tax levied only in 1920, 1921, 1922 to help out auto license receipts in meeting state's share of Federal Aid. This was passed by Legislature of 1919 to provide for the first Federal Aid, with the idea that later Federal Appropriations would be met by 1921 Legislature(which failed of passage).

AUTO LICENSE FEES: For Year ending June 30, 1921, $3,650,029. These are appropriated as follows:-

First. To Secretary of State for plates, mailing, administration the amount of actual cost. For year ending June 30, 1921, $147,186.22.

Second. One-fourth of remainder($3,502,842.78)to counties on basis of auto registration $875,710.69. (Of this Clark County's share was $12,015.85 in 1921).

Third. Highway Commission for operation $168,000.00.

Fourth. Whatever is necessary to add to ~~$524,104.82~~ the $1,700,000 general tax to equal the Federal Aid(

Fifth. Remainder goes to maintaining State Trunk System ($1,935,027.26). (Of this Trunk Highway Maintenance Fund Clark County got $31,240.00 in 1921).

This maintenance fund is allotted by the Highway Commission.

April 3, 1922.

...00 per mile of State Trunk Highway. The ... on the basis of auto registrations from ... county can get over $275.00 per mile. The ... pro rated on the basis of auto registrations.

HWAY APPROPRIATIONS BY STATE, 1922:

...e Aid for County Highways,	$785,000.00	General Fund
" " Long Bridges	100,000.00	" "
Federal Aid Construction, (SEE NOTE ON BOTTOM)	1,700,000.00	General Tax.
To counties for County Road Maintenance from auto license fees in 1921 about.	900,000.00	
To State Trunk Line Maintenance from auto license fees, about.	2,000,000.00	
To Operation of Highway Commission from auto license fees	168,000.00	
Total, about. . .	$5,653,000.00	

NOTE:- In 1921 there was taken from the auto license fees $524,104.82 to meet the last of the first Federal Aid Appropriation. This amount will not be taken from the auto license fees in 1922, and $1,700,000 is all that is required to meet the federal aid in 1922.

COUNTY AID ROAD CONSTRUCTION: Page 45, Sec. 1317m-4. Town meetings may vote $500 or more(not more than one mill). County must appropriate an equal sum and construct the road. State has notpart in this work.

State Aid to the amount of $785,000 is distributed to the counties each year on the basis of county valuations. This must be met by twice as much county and local(town, village or city)money, or the county can meet it all by paying sixty percent of the cost of roads built with this money and charging forty per cent to the state aid fund. If the county distributes part of the cost on the locality the state pays 33-1/3% and the county and locality together 66-2/3%. These roads must be on the system of prospective state highways selected by the County Board and at least fifty per cent of the funds must be spent on the Trunk System.

STATE TRUNK HIGHWAY FUNDS: Federal appropriation is equalled by the state from the $1,700,000 tax plus what is necessary from the auto license fees. The counties are required to raise a third equal sums, so the Federal Government, the State and the Counties each pay one-third the cost of constructing Federal Aid Highways. The federal law does not require this but requires the state alone to meet one-half the cost and the Federal Funds the other half. The federal funds are apportioned among the counties one-third on the basis of total highway mileage; one-third on the basis of area; and one-third on the basis of valuation.

The Legislature of 1917 provided that in this state, not only would the state duplicate the Federal money, but that the counties must also. We recommended to the 1921 Legislature that this be changed so the counties would be relieved of this burden. If you will look at Col. 2 on Page 39, you will see that the counties have had large sums to put up for their share of Federal Aid Construction, one-third of the amounts named in Column 2.

April 3, 1922.

in 1920 had to raise over $100,000.
" " " " " nearly 130,000
" " " " " over 105,000
and so on.

We believe that desirable progress in road construction would be ample if the amounts required of the counties by the present law were cut down to the county aid and state aid roads and the expense of Federal Aid Roads were met by the state and the United States Government, leaving the counties out of this last item.

EXPENDITURE OF HIGHWAY FUNDS:

Construction of the Federal Aid Roads must be in charge of the State Highway Commission to meet Federal requirements. The work may be done by contract or by day labor, whichever is cheapest.

The State Aid Roads are built by the County by contract or by day labor. The County State Road and Bridge Committee has direct charge under supervision of the state.

Roads built by County Aid only are in direct charge of the County State Road and Bridge Committee.

MAINTENANCE:

The State Trunk Highway System is maintained by the County State Road and Bridge Committee with receipts from the auto fees under the supervision of the State.

State Aid Highways (and the County Trunk System where the County Board so votes) are maintained by the County State Road and Bridge Committee from the county's one-fourth of the auto fees, plus whatever appropriations are made for this purpose by the County Board.

All other roads are maintained by the local taxing unit.

Bond Issues: Read Pages 67 to 73.

If there is anything further which you want to ask about or if there is anything that I have said that is not clear, I shall be glad to go to any length to answer your questions.

Yours very truly,
WISCONSIN HIGHWAY COMMISSION
By

Secretary.

WOH-GH

The University of Chicago
Department of Geology

Hyde Park Hotel, Chicago,
April 3, 1925.

Dear Colleague in Pleistocene Study:

I have been trying recently to turn back from cosmic to glacial and climatic problems, partly because I wish to make a revised statement in our textbooks and partly because I have always purposed to do so. I am impressed with the feeling that the time is ripe for a concerted movement to round up several questions that relate especially to the correlation of the Pleistocene formations of the Mississippi Valley but have important bearings beyond. Several of these formations are the greatest of their class and Pleistocene science would be benefitted by giving them authoritative descriptions and interpretations supported by a consensus of opinion on the part of those who have worked upon them. This of course involves the concerted action of quite a number of workers. I had ventured to open the matter last fall with some of these and purposed to do so with others immediately after the Holidays but was prevented from doing so then. It has seemed to me that the following three lines of effort are especially desirable, and I will take the liberty of stating them briefly to cut preliminaries as short as may be, since the time before the opening of field work is short.

I. <u>A concerted and critical study of the great sheets of till between southern Iowa and the drift border in Missouri and Kansas</u>. It is desirable that representatives of the three states

mentioned and of the Government Survey should participate, if possible. With the progress that has already been made in the several states, there is good reason to think that a firm determination of the distance to which each of the main sheets extends may be reached, and also the modes of termination of the sheets, as well as the nature of the intervening more or less interglacial formations. Much of this may be already known to individuals, but there is no declared atatement of concurrent opinion now before the profession, supported by ample evidence such as should come from the joint study proposed.

II. Special study of the attenuation of the borders of these and similar drift sheets, including the scattered distribution of bowlders reaching out for varying distances beyond the borders of the continuous formations. This work is already under way, but it may be much helped by sympathy and coöperation. As the problem is peculiar and difficult, it is desirable that contributions from the whole series of attenuated border formations stretching from the Atlantic to the Rocky Mountains should be put at the service of the leader who, I assume, will continue to be Mr. Leverett. The interpretation of this border-material has been an outstanding problem for forty years, and it seems important that its bearings upon the correlation of the continuous drift sheets adjacent to it should be determined as soon as possible, and the results brought into service with the other criteria of correlation.

mentioned and of the Government Survey should participate, if possible. With the progress that has already been made in the several states, there is good reason to think that a firm determination of the distance to which each of the main sheets extends may be reached, and also the modes of termination of the sheets, as well as the nature of the intervening more or less interglacial formations. Much of this may be already known to individuals, but there is no declared atatement of concurrent opinion now before the profession, supported by ample evidence such as should come from the joint study proposed.

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III. Further critical inquiry relative to the formations that lie between the Illinoian and the Wisconsin, notably the uppermost formation in northeastern Iowa and the Green River formation of Illinois, which seem to be approximate correlatives in kind and time.

In addition to these specific questions, of course, study of other formations and other outstanding problems would receive attention so far as practicable, but we will be likely to reach good results about in proportion as we concentrate study on the most significant features.

I feel sure that you will all share with me the feeling that these three lines of inquiry invite special attention at this time and that the results of a concerted study of them would have important bearings on the correlation of the whole group of glacial formations of the Upper Mississippi Valley. I hope that you will pardon the initiative which I have taken, because of my early interest in these problems, and that you will be kind enough to come back with initiative on your part in regard to what you would like to see done and what part you can take in the matter.

Very truly yours,

T. C. Chamberlin.
(H.)