Correspondence re: Pleistocene - part of northeast Wisconsin. 1943-1954

Thwaites, F. T. (Fredrik Turville), 1883-1961
[s.l.]: [s.n.], 1943-1954

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Wichita

Stratigraphy

Wichita
3-27-45

Fred:

Thanks mightly for the three papers received this morning - but - I sure wish you had sent the paper on the "Buried pre-Cambrian"sooner.

For critical study the map (Fig 1) is too small to use even with a magnifying glass. Many of the location numbers (which are important) cannot be made out. Do you have a print of this map in larger size; presumably you must have to have had a plat made. Will you be good enough to send me a copy. If you have to have a print made, let me know the cost. I would like to have this by next Tuesday afternoon when I come back from Kansas City from getting my son married.

Also would you send me a log of Point Number 7 (I think it is) in Walworth county (presumably at Delavan) even though you indicate the record is poor.

And can you supply log or data on the point (number not clear) on the downthrow side of the fault probably in extreme northeast Waykesha county, seemingly just east of the high point at Mememonee Falls which I have. Also No. 47A at Boscobel. Also 102 Oregon.

No more available

Thanks a lot. Cordially.

Anthony

Oregon
NE SE 26 6-9E elev 936

Dift	101	101
Fine	8	109
Galena	131	240
E C	145	435
Mi S	415	850
pre-C	10	860

Delavan
2-16E
Bradley Knoll 60

Dift	415	415
g. Pv	75	490
Sil ?	265	755
	45	800
Fine		
galena	75	875
Eau Claire	140	1015
		1079
Mi S	664	
		1680
granite		

Waukesha
7-19E
North St.

Dift	20	20
Niag-Alex	180	200
Niag	182	382
O. Pv	258	640
Sil	115	755
E C	300	1055
Mi S	852	1907 TD

Mr. Anthony Folger,
238 Ridgewood Drive,
Wichita 8, Kansas

Dear Anthony:

Yours of yesterday came this morning. I have added the data on base of Trempealeau, top of Eau Claire and top Mt. Simon AS FAR AS POSSIBLE. You must realize that in central Wisconsin and clear up to the Michigan line the sandstones from bottom of Franconia to pre-Cambrian is alk just about the same thing. You recall that the exposures in the Dells show more cross bedding and thinner bedding than in the Galesville above but you just cant tell this in wells. In the same way the section at Friendship and in other high mounds to the north just cannot be subdivided. Raasch first called all these sub-Galesville beds Mt. Simon but this certainly is wrong and I think he abandoned it before the K.GS. trip of 10 years ago this summer. I have quit trying to distingusish any Eau Claire in this region.

The Trempealeau and Franconia continue through this region and the base of the latter is everyshere easy to find. When Cohee brought over some cuttings I was pleased to find that my 1934 ideas on the Cambrian in the Seul Choix Point widdcats were correct. But here also the lower part of the Cambrian section is poorly marked.

So you see that my failure to mark the horizons you wanted is due not to lack of study but to the fact that the phenomena by which Eau Claire was defined ARE NOT PRESENT IN CENTRAL WISCONSIN. It is these facts which made me subscribe to the Twenhofel-Raasch version of the term Dresbach, a conclusion which Mr. Bean did not concur in. He felt that Raasch changed his ideas too often and we had better stick to what drillers and engineers had got used to. I am gradually introducting the word Galesville as a synonym for Dresbach in the Ulrichian version. That he made a clear error in trying to carry the name across the Minnesota-Wisconsin line is recognized but is felt to be really of little importance. I think the matter will clear itself up in time.

Sincerely,

F. T. T.

Wichita
March 26, 1945.

Fred;

There is just one last thing you can do for me if you will be so kind. Enclosed is a rough tracing showing in red the contact of the top of the pre-Cambrian and the base of the Prairie du Chien. It is generalized, but it serves my present purpose well enough and it takes out all irregularities caused by erosion.

Would you take this and just sketch on hurryedly and roughly the following contacts

Base Trempealeau

Top Eau Claire

Top Mt Simon

Presumably since the state map does not make this seperation, either it has not be made or it is extremely difficult to make. HOWEVER I just want a sketchy picture of the approximate area these units may occupy.

From Pennsylvania to the Michigan-Wisconsin line I am showing map the following color bands:-

Prairie du Chien
Trempealeau
Franconia-Galesville
Eau Claire
Mt Simon

It is desirable to carry these bands of color on around through Wisconsin as far west as the Fourth Principal Meridian if it can be done. The wide expanse of country in central Wisconsin between my red lines is propably not divided equally between these units but I am not qualified to even make a guess as to the probably width of each. Can you attempt this for me. Please go to NO WORK to do this. Just sketchily and from menory will serve the purpose fine. Cordially.

Anthony

Mr. Anthony Folger,
238 Ridgewood Drive,
Wichita 8, Kansas

Dear Anthony:

Yours of the 24th was in my box this noon.

I am quite at a loss in regard to a log of the well at Jefferson County Farm as we have no sample-controlled log there and the farm is really in SE ¼ sec. 10. The old driller's log gives 848 feet of sandstone between top of Glenwood and top of pre-Cambrian. I think I sent you the much better log of Laddish-Stoppenback Co. No. 3 at Jefferson Junction which is only a few miles to north. This shows an interval from base of Glenwood to top of pre-Cambrian of 760 feet. I note in this interval 50 feet of Galesville, 300 feet of Eau Claire and 200 feet of Mt. Simon. I am positive Cohee does not have anything on this well, there is a mixup somewhere.

Co Farm

With regard to the Green Bay log I think it must refer to Cass Street, total depth 918. I also give the figures for Atlas Cold Storage which is just finished.

Formations	Cass St.		Atlas Cold Storage	
	Thickness	Depth	Thickness	Depth
Drift	130	130	140	140
Galena-Platteville	172	302	180	320
Prairie du Chien	238	540	250	370
Trempealeau	35	575	55	625
Franconia	115	690	95	720
Dresbach undivided	222	912	230	950
pre-Cambrian	6	918	6	956

I am glad the Platteville well checks. The old drillers were notorious liars and when they got a crooked hole and wanted to quit they might and often did pull something. The nearby Cuba City wells show:

Surface and Galena Platteville	235	235
St. Peter	50	285
Prairie du Chien	245	530
Trempealeau(inc. Jordan)	150	680
Franconia	110	790
Galesville	135	925
Eau Claire	355	1280
Mt. Simon	187	1467 T. D.

May I say again that the discrimination of Eau Claire is in many localities most uncertain and unsatisfactory so that I never made any isopachs of it.

Sincerely,

F. T. T.

Wichita
3-24-45

Fred:

As the work progresses there are seemingly two additional logs of granite holes which will be helpful. When in Ann Arbor I dod not bother to take down complete details from Cohee because I did not correctly anticipate my wants. Just jot down the correlations on this sheet & return in the enclosed stamped envelope.

In these logs IF THE GALESVILLE EAU CLAIRE & MT SIMON CAN BE DIVIDED please do so.

Anthony.

JEFFERSON COUNTY - County Farm Well - S.14; T.6N; R.14E. - T.D. 998 ✓

SE ¼ 10

848 Trenton to pre Cambrian very hard

Jefferson got 25-7-14 E

120 - 880 = 760 ft

Galesville 330-380

E C 380-680

mi S 680-880

BROWN COUNTY - Green Bay City Water Works - S.36; T.24N; R.20E. - T.D. 913'

Cam Sd.	130	130	alluv	140	140
GPR	172	302		150	320
L.m.	238	540		250	570
T	35	575		55	625
F	115	690		95	720
D	222	912		230	950
pc	6	918		116	956

On page 2 of your letter of 3-20-45 you state that granite was "supposed" to have been reached 1594 feet below the Platteville at the old well in Platteville in Grant county. This interval checks amazingly well with control points available in northeastern Iowa. Would you be so kind as to make a guess for me as to what the thickness of the Mt Simon might be in this hole. I need this badly even if it might be somewhat in error. A.F.

Cuba city

~~Sandstone + Gab~~	235	235	F	110	790
St P	50	285	G	135	925
L m	245	530	EC	355	1280
T r	150	680	mi S	187	1467

Wichita - Kansas.
3-22-45.

Dear Fred;

Many thanks for your letter of March 20th containing much information. My very special thanks for the many intervals and for the log at Indiana Harbor. The log compares favorably with that of the deeper test in Cook county, Chicago, of Donnelly & Sons.

Thanks anyway for thicking about the well in Ottawa county, Michigan. I guess I shall just have to let isopach contours reveal the thickness. For you information the mapping of this base Platteville to base Mt Simon interval is very critical and revealing, IF MAPPED REGIONALLY. It makes one of the most sensible maps I have seen.

I am now cleared up on what you mean by the term Niagaran in eastern Wisconsin. I ofcause knew that the Mayville, and probably the Byron, were Alexanderian - BUT - since you are generally so very careful in your statements I assumed that since you did not hyphenate the interval (calling it Niagaran-Alexanderian) it contained no Alexanderian. True that is cumbersome to use, but when one deal with these problems regionally over some 6 states, these things make a world of difference. It may be of no material consequence in Wisconsin, but it sure as heck is hen you go to tie Wisconsin into Pennsylvania. I am going to use from 150 to 200 feet for this Cataract interval in eastern Wisconsin and I hope that will not be too far out of line.

APPARENTLY the only thing now left for you to bring me up to date on is the USE OF YOUR TERM DRESBACH in those Wisconsin wells I wrote you about the other day. Seemingly in your log of the Indiana Haibbor well, by Dresbach you mean Galesville BECAUSE you have only a penetration into this interval of 63 feet and I assume this is all Galesville sand. Right?. Very probably it makes no difference to you, but personally I like and use Galesville, and then use Dresback for the whole interval top Galesville to base Mt Simon. With every good wish and best regards.

/ Anthony

March 21, 1945

Mr. Anthony Bolger,
238 Ridgewood Drive,
Wichita, 8, Kansas

Dear Anthony:

Your letter of March 19 is at hand this noon and I hasten to answer. The present classification used by thw Wisconsin Survey is illogical in that we still use the term Dresbach in the Ulrich sense where it is possible to separate the Eau Claire below. However, in central and northeastern Wisconsin such separation (at best a difficult and uncertain one not always along the same age level) is not possible and there the name Dresbach includes everything down to pre-Cambrian as it does in our paper on the Cambrian Strata of Wisconsin. Now in eastern Wisconsin it may well be that there is some Dresbach (Galesville) overlying Eau Claire and not separated from the St. Peter. But the heavy minerals of Dresbach (Galesville) and St. Peter do not permit discrimination. I am sorry there is so much confusion but present usage was continued because Mr. Bean though a change would confuse well drillers and angineers. Now we are out of line with adjacent states.

Sincerely,

I think the Eau Claire (member or formation) is the deep water phase of a cycle of marine advance wich closed with the Dresbach (Galesville)(member or formation.)

F. T. T.

Wichita
March 19, 1945.

Dear Fred;

Your letter of March 17th with data for cross section wells came this morning. The information is perfect and is all I need so that closes this chapter of requests. Thanks a million.

One question. In the logs of Menomonee Falls & Pewaukee you use the terms Eau Claire & Mt Simon. But in Kaukauna, Green Bay, Kweaunee, and Dundas you use the term DRESBACH.

Now, are you using the term Dresbach in the sense that Galesville was used in the Guide Book - or - are you using Dresbach to mean any sediments from top of Galesville to base Mt Simon, which is the way Dresbach was used in the Guide Book. PLEASE ANSWER. IT IS IMPORTANT THAT I KNOW THIS.

If you mean Galesville for your Dresbach, then, in Kaukauna and Green Bay, Galesville overlaps granite. But if you mean Dresbach in the larger sense, then it just means that in these particular wells you have not picked, or been able to pick, the three breaks of Galseville, Eau Claire, and Mt Simon.

Cordially,

WF

In reply to your of The 19th The Wisconsin Survey shed
uses the Velvet version name Dresbach in the same
as Galesville. But where no subdivision is possible
as in central Wisconsin there the
term Dresbach is used to cover everything down to the
pre-Cambrian. I know that it is not strictly correct
but we one started and do not like to change
Separation of Eau Claire is at best an uncertain matter.
It represents the deep water phase of a cycle
of marine advance.

March 20, 1945

Mr. Anthony Folger,
238 Ridgewood Drive,
Wichita, 8, Kansas

Dear Anthony:

Your two letters of the 16th arrived at noon yesterday too late to answer and then this morning's mail broughtyours of the 18th.? I will try to answer your questions in order as well as other duties permit. I had three of my recent papers mailed to you which may answer some questions. You will realize that a full study of all the questions would take much more time than I can find.

With regard to No. 1 Moe the thickness of 297 feet for Jordan and Trempealeau is way in excess of anything known in Wisconsin. Inasmuch as we used to confuse this interval with the overlying Prairie du Chien is it not probable that in deep wells the Franconia is also so dolomitic that it is confused with overlying formations. Along the strike to NW the Casco Jct. well has 91 feet of Trempealeau (I include Jordan where present) and farther on it is less than 50 feet. I simply CANNOT estimate how much farther down to pre-Cambrian. The pre-Cambrian surface is irregular as shown by map maps. I think the Trempealeau represents the deep water phase of a cycle of marine incursion and so does not overlap on older formations.

The line of pinching out of St. Peter can be roghly estimated by the fact that it is present in two deep wells in Sturgeon Bay so it must trend SE from a point on outcrop due west of Marinette.

With regard to the Black River-pre-Cambrian interval I have already stated why I never drew any map. However, the data I looked up for you are more consistent than I would have supposed. I cannot give section,town and range for all wells but only the city or village which is all we have for many records.

Jefferson Jct. 25-7-14E	760	feet interval
Oconomowoc	544	to quartzite monadnock
Watertown #3	615	
Hustisford 10-16E	63	to monadnock
Hartford see my map in K. G. S.	average = 0	to monadnock
Juneau	417	
Mayville	690	
Waupun prison well	604	
Brandon	640	
Rosendale 35-16-15E	310	
Winnebago 31-19-17E	595	
Neenah 22-20-17E	602	
Kaukauna 24-21-18 E	605	
Casco Jct. 24-23E	555	
Brothwrtown	0	to monadnock E. of Lake Winnebago

I did not try to give you data nearer to the preCambrian for it would take entirely too long to make estimates.

With regard to Indiana I have log of Youngstown Shhet and Tube Co at Indiana Harbor.

	Thickness	Depth
Drift	50	50

Devonian	50	110
Niagaran	455	570
Richmond-Maquoketa	170	740
Galena-Platteville	325	1065
St. Peter	135	1200
Prairie du Chien and Trempealeau	270	1470
Franconia	150	1620
Dresbach	63	1683

The wells at Gary were shallow wells for air conditioning. I presume you know Mrs. Wasson's paper in vol 40, pp. 673-687, Journal of Geology, 1932

As for the Cataract-Alexandirian the Mayville and possibly the Bryon of Wisconsin are of this age. The former is 60 to 100 feet thick and neither can be distinguished in well cuttings. The entire dolomite sequence is infested with reefs and size of grain is the only criterion you can apply. It is not at all satisfactory and I have given up trying to find divisions in this interval. You can run the Cataract right up to the outcrop.

No, I can make no suggestions as to the change in interval between Platteville and pre-Cambrian. You can get my best opinion from the section. I will note in passing that the old recrods of pre-Cambrian at Delavan and West Bend were both unreliable. These small holes drilled with pole tools yielded only fine cuttings. I also dis carded one supposed pre-Camrian occurence in Iowa, you may recall. Granite was supposed to have been found in the No. 1 well in Platteville 1594 feet below the Platteville. At Broadhead I was convinced that a boulder had been thrown into the hole. There just are no wells in this area which reach the pre-Cambrian. The west side Beloit well does have Platteville cover. But this well does not reach pre-Cambrian.

I hope I have included everything but must sign off and sort over papers for my next class at 3:30 No, we have five in the family and still have some points left although not enough. You really ought to hear the opinion of F. D. R. expressed by one of my neighbors in the building!

Sincerely,

Sunday.
March 18, 1945.

Fred;

Your very welcome air mail-special was delivered at 9:30 A.M. this morning, and was it grand to get it. My oh my you do do things up brown when you do them don't you. I was expecting a sketch showing just what I needed - but - this was that and more too. I only hope I can do as much for you someday Fred; my appreciation is great.

State lines don' change geology, but good gosh how the interval from base Platteville to base Mt Simon does thicken across your state line from 848 feet in Jefferson county to 2580 feet in Boone county, Illinois. An increase of 1732 feet in 43 miles - or a thickening of 40 feet to the mile. No where between the Niagara River in Ontario and here do indicated figures reveal such rapid thickening, although it may turn out to exist elsewhere when I get it contoured. Southward it does not thicken so rapidly, since it goes from 2580 feet in Boone county to 3265 feet in De Kalb county in only 30 miles or some 23 feet per mile thickening. DO YOU HAVE ANY SUGGESTIONS AS TO THE REASON FOR THIS RAPID THICKENING IN JUST THIS PARTICULAR LOCALITY. ?.

As I wrote the other day it is now evident (and all the more so as the map nears completion that intervals (base Platteville-Base Mt Simon) are critical in Grant, Iowa, Lafayette, and Green counties, and I think I already asked you for well data which you may have sent. But if their are no wells with Platteville cover can we skin the cat this way. Take your cross section opposite page 368 in KGS Guide Book. Well No. 22 seems to start at about base Platteville but has drift cover. Scaling your section to granite gives an interval estimated of 1400 feet which fits the picture fine. Similarly Well No. 20 starts about the same. Here I scaled an estimated interval of 1280 feet which also fits. IS THIS METHOD REASONABLY SAFE AND WOULD YOU ALTER ESTIMATES. Also, Well no. 24 at Beloit seems to have actual Platteville cover (although I don't quite make out your section) and here I have scaled an estimated 1600 feet which also fits. Does this well have Platteville cover?. AND ARE THERE OTHER WELLS, say 1 in Lafayette, 1 in Iowa, and 2 in Grant, WHICH CAN BE USED FOR THE SAME KIND OF AN ESTIMATE. If you will you send me the factual data if you have not already done so. A lot of isopach contours swing westward right in this area and I would like a little estimated reasonably safe control. Best regards.

Anthony

One last thing. The eastern Wisconsin wells show only NIAGARAN between Devonian and Richmond. What has happened to the Alexanderian-Cataract. Perhaps it has not been recognized in surface outcrops, but how about wells. For my money well data is far safer and more valid than outcrop data any day in the week. On my cross section, coming westward from Muskegon, AM I TO CUT OUT THE CATARACT UP DIP IN THE LAKE - or - am I to assume that the lower part of your Niagaran is Cataract. And if so about how many feet would you assign to possible Cataract. BE SURE AND ANSWER.

You mentioned studying a well at Gary, Indiana. If it went to the Trenton, or below, will you let me have the formational summary, location, elevation etc. Be sure and see that the top of the Cincinnatian is called.

Do you have anyother deep Indiana well sample study dope?. There no telling what you may have done. I am particularly lacking on Indiana material.

Jim Warner

March 16, 1945.

Dear Fred;

So many letters to you within a short time remind me of the 9th Field Conference. I thoroughly enjoyed those days of correspondence, and, as it has subsequently turned o out the hours I spent on that work has paid big dividens.

I anticipate this will be the last letter to you with requests for added data. I did not know until yesterday, when the prints were delivered, just how much blank white space I would have on the west of my small scale regional map. I was busy until 3:30 A.M. this morning plotting points reflecting the interval between the base of the Black River (i.e. base Glenwood) to top pre-Cambrian (i.e. base Mt Simon and top of any arkosic sand - like Jacobsville - if present, since, for my purpose these arkosic sediments should be included with the pre-Cambrian) around the circle from New York to Wisconsin and what a picture it gives.

Now - the blank white space on my map - allows me to go as far west in Wisconsin as Longitude 91 degrees, which, generally takes in everything east of the pre-Cambrian outcrop. From Cohee I have 9 points as follows:-

Fond du Lac county	S.17; T.16N; R.19E.	- St Lawrence College
"	S. 9; T.15N; R.17E.	- Fond du Lac city test well
Brown county	S.36; T.24N; R.20E.	- Green Bay city water works
Jefferson county	S.14¢ T. 6N; R.14E.	- County farm well
Manitowoc county	S. 1; T.19N; R.24E.	- Two Rivers City Well No. 2
Waukesha county	S. 4; T.8N; R.20E.	- Memomonee Falls City well No. 3
Marinette county	S. 6; T.30N; R.24E.	- Southern Craft Paper Mill
Waukesha county	S. 9; T. 7N; R.19E.	- Pewaukee city well
Marinette county	S.19; T.30N; R.23E.	- Badger Paper Mill well

Thus, if east of 91 degrees, there are other granite, or near granite tests with Black River cover, will you send me just the county, S.T.&R. and interval. No name, elevation, T.D. or any other data needed. Simply - Manitowoc; S.1; T.19N; R.24E.; 315 feet. The scale of this base is 1 inch to 16 miles. Between the line of Black River outcrop and pre-Cambrian, total intervals of sediments would be welcome and useable but such intervals should be marked by you showing that they do not have Black River cover. I am not interested in local variations or closely spaced points. This is all. Best of luck & may your wife not run out of meat points. Cordially.

/ Anthony

If interval does not quite reach pre-Cambrian indicate that it is a plus figure - like 380+.

24 Casco Jct. To base BR. elev 724 Temp 91

To base ⊖ 1675

✓

✓ 7 Oconomowoc 950 to prot. - Base BR at 410 = 540

✓ 18 Hanson Farm Burchardsony prot at 350 or base BR. = 0

✓ They may be varying over Fr… where devl.

✓ St Peter pinches out in outcrop just W of Marinette

✓ and is present as far north as Sturgeon Bay

Tippecanoe Jct. 25-7-14 1.20 - 880 = 760

✓ 6 ~~Commencing South … C at 825 BR at~~

✓ 8 Watertown #3 100 - 715 = 615

✓ 11 Juneau Fire Sta 247 - 664 = 417

✓ 15 Brandon 215 - 855 = 640

✓ 12 Mayville NW Tom #2 450 - 1140 = 690

✓ 20 Neenah 22-20-17 70 - 672 = 602

✓ 19 Winnebago 31-19-17 115 - 710 = 595

✓ 16 Rosendale - 35-16-15 - 130 - 440 = 310

✓ 16 Rosendale Prison 188 - 792 = 604

✓ 13 Waupun 205 - 268 = 63

✓ 10-16 Hustisford

✓ Hartford - see map = 0

24-21-18 Kaukauna 173 - 778 = 605

24 Casco Jct. 24-23 E 1105 - 1660 = 555
1675

Platteville 1594

West Bend Greenville Reedsville

Indiana Harbor
Dust 60 60
Dev 50
N 455 570
Rus 170 740
O.P. 325 1065
St P 135 1200
Rus 270 1470
L.M+T 270
Fam 150 1620

Mr Warren J G 40, 673-687, 1932 P 63 1683

3-16-45.

Fred;

Well I no sooner gave my letter to Eluned to mail downtown, telling you I was through with my questions, that I continued plotting thicknesses for Black River-pre-Cambrian interval - and - a most critical problem has come up.

Generally I prefer not to estimate an isopach interval in a well, but rather to let the isopach lines indicate the thickness; to make an estimate usually some what destroys the vaule of the isopach lines. But on the other hand one usually works in areas of considerable deep control.

In this one case there just is'nt any control even to guide the isopach lines, and this one point is critical because the interval penetrated is the maximum for wells in western Michigan and thus a reasonably approximate estimated total interval would be highly advantageous as a guide.

The Well is Michigan Petroleum Co., No. 1 Moe, in S.6; T.9N; R.13W., Ottawa county (6 miles east and 14 miles north of the intersection of 43 degrees & 86 degrees, if you don't have a township map of Michigan) and sample examination by Cohee, Workman, and Bays shows:-

5470 - 5490	Gleenwood
5490 - 5640	St Peter
5640 - 5755	Shakopee
5755 - 5767	New Richmond
5767 - 6013	Oneota
6013 - 6035	Jordan
6035 - 6310	Trempealeau
T.D. 6310 in	Trempealeau.

22 275 297

6310 6013 297

This gives a penetrated interval of 820 feet from base Gleenwood to T.D. Seemingly the closest pre-Cambrian tests are 120 miles to the west in Waukesha county, Wisconsin, but presumably wells in Manitowoc or even Marinette counties (though farther away) would be more generally on strike line of equal total thickness interval. I am a pretty high powered estimator (after 20 years of experience) but equally I feel that in this particular case I don't have the background to arrive at a justifiable estimate.

Accordingly, will you attempt a guess for me of approximately how many feet of

sediments might remain in the Ottawa county test between its T.D. and the base of the Mt Simon.

In Kankakee county, Illinois, both Franconia & Galesville are present (as should be) between Trempealeau and Eau Claire. In Howard county, Indiana, (right in the bottom of the Logansport structural saddle) both are absent and Trempealeay rest on Eau Claire. The same is true for Jay county, Indiana, also in the Logansport sag. Most of the deep wells in northern Ohio have Trempealeau on Galesville with no Franconia.

Thus, it is not only a question of how thick may be the subjacent formations, below the total depth of the Ottawa county test, but also what subjacent formations will be present. Ottawa county is appreciably closer to the above mentioned Wisconsin localities than it is to the localities of absent intervals in Indiana and Ohio. Therefore, if Wisconsin localities reflect no Trempealeau overlap, it appeals me safe to conclude that Ottawa county will have present all of the normal formations between Trempealeau and pre-Cambrian. It would then become a question of how thick they might be, and how much more thickness should be assigned to the Trempealeau below the T.D. of this test.

Your best guess, even though wrong, will be better than mine. Should you be in error you definitely would not be held responsible. But, as a guide point for all of western Michigan, this point is critical, and I would welcome the change to avail myself of your more full regional knowledge of this general area in helping me arrive at an approximate estimate. I know I can count on you.

Cordially.

Anthony

Black River rests on Prairie du Chien in the Southern Craft Paper Mills test in Marinette county, and rests on St Peter in the Two Rivers City Well No 2 in Manitowoc county. These localities are some 60 miles apart. Approximately how many miles north of Manitowoc would I be justified in pinching out St Peter ?. This is critical.

March 17, 1945

Mr. Anthony Folger,
238 Ridgewood Drive,
Wichita 8, Kansas

Dear Anthony :

Yours dated on Income Tax Day arrive this noon so I came back to the office to answer it and will mail on the way home again.

I have copied in longhand several well logs with elevation data so fa as we have it and went over to the back of your data sheet. Hope you can make them out. First I want it understood that the wells at Two Rivers, Menomonee Falls and Pewaukee strike high spots on the pre-Cambrian surface. The log at KeWaunee is more representative. Second, we have no good log of the deep test at Manitowoc below base of Niagara. It was abandoned as a dry hole in the sandstones and only a few samples reached me.

Granite reaches the surface nea r Weyauwega at elevation around 780, location a few miles straight east. Wells show it overlain by thick drift at most places and these logs would not help the picture. There is also a high knob of granite almost south from New London but I just have not the time this afternoon to look up location and elevation of top. It is 850+ on the map in my report. East from there we have no decent log of any well to pre-Cambrian except at Kauka una. This is sent you on data sheet also a shallower well at Dundas just east of there to show higher formations, also one at Brillion to give base of Niagara. You can pick out the localities on the map you have. Most of wells have not been visited and exact locations have not everywhere been found.

None of the records of deep wells at Sheboygan are based on samples. These are all salt water wells and I am trying to have them plugged. At Oostuburg a deep well gives a section like that at Milwaukee. It also found salt water. So did the Kewaunee test for that matter.

So far as we know no well has ever reached pre-Cambrian south of the Pewaukee-Menomonee Falls high.

The 5 o'clock whistle has blown and I must try to get this to the post office.

Sincerely,

238 Ridgewood Drive
Wichita - 8 - Kansas
March 15, 1945
INCOME TAX DAY

Dear Fred;

At the last minute in the rush of finishing up, I have concluded unwisely that if at the very last I have time it would be desireable to complete the pretty picture to prepare a roughly generalized cross section from the granite outcrop in Wisconsin to Muskegon county, Michigan, then to the bottom of the Michigan basin and thence southeastward through Port Huron and the Cincinnati Arch in Ontario to Erie and Butler counties, Pennsylvania.

Accordingly, in addition to the log of the Two Rivers City Well No. 2 (which you may have already sent) will you send 1 or 2 more logs and outcrop data. The General Route map in the Guide Book shows pre-Cambrian outcropping in eastern Waupaca county. Can you supply 1 or 2 or 3 logs between Manitowoc and this outcrop which will show the several units outcropping. Say in Manitowoc, Brown, Outagamie, and Waupaca counties?. For the first point choose some surface elevation of the pre-Cambrian outcrop and give me its location by section township & range. If wells do not exist, would it be possible to supply elevations and location for cross section points showing say top Silurian (west of Manitowoc) top Maquoketa, top Galena, base Platteville, top of suceedingly pre-Black River units, and lastly top pre-Cambrian. I dont know how satisfactory this would be. I am not interested in details, just general pinching out of the units at the outcrop.

Failing in this could be go across more successfully from say Sheboygan northwest to the pre-Cambrian outcrop. The reason I like Manitowoc is that there seems to be more section preserved at the Two Rivers well, unless Sheboygan has a better well also to pre-Cambrian. I shall leave this in your hands. Don't go to a lot of trouble. Just give me enough to make a pretty diagrammatic picture.

From Cohee I got the record of two pre-Cambrian tests in Waukesha county. Are their and pre-Cambrian tests in Racine, Kenosha, or Walworth counties. Presumably not. But if so may I have the formational summary of at least one. Cordially.

Anthony
Boy am I busy

March 16, 1945

Mr. Anthony Folger,
238 Ridgewood Drive,
Wichita 8, Kansas

Dear Anthony:

Yours of the 13th was at hand this morning but it was not until after 4 that I could really get down to answering it. I chiseled the postage from the U. W. this time and will try to mail this on my way home.

I am enclosing a sketch of Lake Michigan traced from the 1932 map of the U. S. with my ideas added. The red line is the west edge of the Salina as per my ideas. In the northern part of the area beyond the Devonian overlap off Sheboygan this is an erosional line and must certainly be inside the original line of pinching out beneath overlying formations. South of Sheboygan it is estimated from some incomplete sections I drew in 1942 before called to the Department of Physics which ended all such efforts. I have also delayed upon promised publication of a new map of the Straits region. I can not make much out of Landes letters for he uses new formation names which are not in the books. I have, therefore, left out any attempt to delimit the top og the Salina beneath the lake.

With regard to Big Sable Point I did not mean to infer that the Traverse or Dundee occur under the land there. The first rock at Manistee under nearly 600 feet of drift is Bedford and the top of the Traverse is at 940, top of Dundee at 1597. But the lake is 984 feet deep west of there plus quite a bit of drift and the dip therefore brings these formations up in the steep east slope under the lake not so very far west of Manistee.

The log of Two Rivers No. 2 test well is:

	Thickness	Depth, feet
Drift	100	100
Niagara	670	770
Richmond (Maquoketa)	330	1100
Galena-Platteville	195	1295
St. Peter	315	1610
pre-Cambrian quartzite	30	1640 T. D.

I note that the Indiana Survey does not recognize any Salina in their legend. It is probably overlapped by Devonian everywhere. In fact Devonia n lies upon the lower part of the Niagaran in that state. Your guess will be as good as mine there. Newcombe made out nearly 200 ft of Salina in the southwestern tip of Michigan so I drew the line west of there. I did not find any Salina at Gary which as far east as I have seen samples.

With regard to the bottom of Lake Michigan you must realize that there is considerable drift but the inferred escarpments do not trend in the direction we would exoect moraines. I do not like to hazard a guess about the escarpments in the Islands of Lake Michigan until Landes report is out. He says the old map is way off.

This looks like all I can do for you with existing data.

Sincerely,

238 Ridgewood Drive
Wichita - 8 - Kansas.
March 13, 1945.

Dear Fred;

Your air mail-special made good time. It was postmarked Madison at 4 P.M. March 12th and was delivered at my home at 5 P.M. today the 13th. It came after I had mailed my note to you about the areal map. Thanks a lot for your prompt and characteristically thorough reply. The fine thing about you Fred is that you can always be relied upon to not only state the facts but do it with thoroughness and amplification. Thats a splendid trait.

I was much interested in your statement that you have been working on a sublacustrine map of Lake Michigan - similar I presume to your excellent and much used map of Lake Superior (published opposite page 226 in the Guide Book) which during the past few years I have heard discussed by several geologists with favor - and I only hope this letter may give you renewed impetous to complete your work.

Your statement that the sublacustrine northern escarpment may be Dundee, and, that it takes off the Michigan coast at the point north of Ludington (Big Sable Point) has me all confused. Big Sable Point is mapped as Mississippian-Coldwater far above (in feet) the Dundee. I guess I just don't grasp the picture. I realize that the Michigan Survey mapping of the pre-Dundee sediments much farther northward is in error, but surely their mapping at Big Sable Point is not that far off.

I had a feeling when I wrote you last week that very probably Salina sediments pinch out under Lake Michigan. The question is - approximately where?. Without having time to spare to do it, I have none the less taken time this evening to hurriedly draw a cross section from the Two Rivers Cities Well No. 2 (S.1; T.19N; R.24E.) in Manitowac county, southeastward to S.8; T.10N; R.16W. Muskegon county and thance to S.6; T.9N; R.13W. Ottawa county (both tests penetrating pre-Black River sediments for considerable thickness), and from this rough sketch it is seemingly indicated that the point of pinch out (along this one line) is 30 miles southeast of the lake shore at the Two Rivers well.

Interestedly when one plots the datums of the top of the Trenton in these 3 wells, the joining of these points forms a straight line of dip, and, the line for the base of the Salina between Ottawa & Muskegon county is parallel to the top of the Trenton. Between Ottawa & Muskegon counties, the dip line for the top of Traverse line and top Bass Island is parallel (but flatter than the Trenton & Salina dip - but presumably across the lake it will steepen again, else the top of the Bass Island would come out below the surface of the ground at Two Rivers well which I assume is wrong) but the dip line for the top of the Salina is still flatter than all of the above dips. Thus, I have projected the base of the Salina northwestward parallel to the top of Trenton, and the top of the Salina at the same rate it reflects between Ottawa & Muskegon Co's, to arrive at the pinch out 30 miles east of the shore. Wonder how far wrong this is?.

By the way will you send me a formational summary of the Two Rivers City Well No. 2 please.

And will you do one more thnig for me, as an old friend. Will you take some little map you may have handy of Lake Michigan, and on it plot your idea (which will be your best guess) of the approximate position of the line of zero (0) thickness of Salina sediments which will then become the line of 0 thickness on my Salina isopach map. I can do this myself but it will be wild. While there is much you probably don't know as to where it ought to be, you will have some contributing lines of evidence in mind which I lack. And particularly where does this 0 line pass with reference to Chicago. In Berrien county Michigan Gulf sample examination shows a thickness of 280 feet from top Bass Island to top Niagaran with Salina top uncalled but Salina present. I don't have here an areal map for either Illinois or Indiana, and oh how I would hate to draw my 0 line across northeasternmost Illinois and northwesternmost Indiana through an area of surface outcrops of the wrong age. Or is Salina overlapped here also and not outcrop?. Boy theres lots I don't know. The end of a job is always the hardest, the most hurried, and the most critical. Your help will be swell, and don't forget to send it air mail-special. Is the Salina outcrop mapping of the Michigan Survey on Beaver, High, & Garden Islands in

Charlevoix county, Michigan, right. If so, then your 0 line would join the outcrop at this point. From here I can successfully carry it on around the look into New York state. But any Lake Michigan, Illinois, and Indiana data you can furnish for this 0 line will be welcome and appreciated.

If I do say so I have a handsome set of regional maps. I hope to get to Madison sometime this year and will bring them along for your constructive criticism. With every good wish, and yours for better geology and better maps.

Cordially & hurriedly,

Anthony

Your 0 line in Lake Michigan may be wrong, but, no one can prove you wrong. And most certainly it will be far better than any attempt I can make. The 0 line has to be somewhere. Just guess advisedly and geologically.

Traverse Dept	590	590
Bedford	160	750
Antrim	190	940
Traverse	520	1460
Bell	137	1597
Dundee	123	1720

March 15, 1945

Dr. Anthony Folger
238 Ridgewood Drive
Wichita 8, Kansas

Dear Anthony:

Yours of the 13th reached me this morning. You can get quicker service if you address me at 41 Roby Road, Madison 5.

We are sending you (1) geological map of Wisconsin, 1932, scale 1:1,000,000, and (2) base map of Wisconsin, scale 1:500,000.

I have noted that many eastern geologists do not seem to believe in samples, although I, myself, found them just as reliable as elsewhere.

A bill for the maps and postage is enclosed.

Very truly yours

WISCONSIN GEOLOGICAL SURVEY
By

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

FTT LMV

Enclosure

THE Lord Elgin
OTTAWA , CANADA

238 Ridgewood Drive
Wichita - 8 - Kansas
March 13, 1945.

Dear Fred;

At the last moment very evidently miscorrelated wells (at the northwest corner of Pennsylvania in Erie county, and in Erie county, New York) have unexpectly made a mess of things. Accordingly it is necessary to hold up the completion of my final maps for a few days until I can check samples. These easterners just don't think (geologically) like us mid-continent rock hounds do; they never seem to think about regional overlap, and thus their pre-Black River correlations are in a mess.

Presumably there is an areal geologic map of Wisconsin published. If so, will you be kind enough to forward a copy to me without delay. I am more especially interested at this time in easternmost Wisconsin. I want to get the Galena-Maquoketa contact and the Maquoketa-Silurian contact.

If it be evidnet to you that this map will not reach Wichita by Friday, please send special delivery. We get no delivery in the residential part of Wichita between the first mail Friday morning and Monday morning. I would like to use this map over this week end. Many thanks.

Most cordially,

Anthony Folger

P.S. - If you have two sizes of areal maps, send the 1 inch to 8 miles. As a matter of fact if you don't have an areal map on the 8 mile scale, but you do have a copy to spare of the regular USGE base map for Wisconsin (1 to 500,000) 1" to 8 Miles, why please include it with the above order. I need one of these anyway. But you need not send it if the areal maps on the 8 mile scale. H.A.F. co.

Dear Anthony:

Yours of the 13th reached me this morning. you can get quicker service if you address me at 41 Roby Road, Madison 5.

We are sending you (1) geologic map of Wisconsin 1939 scale 1:1,000,000 (2) base map of Wisconsin scale 1:500,000

I have noted that many eastern geologists do not seem to believe in samples although I myself found them just as reliable as elsewhere.

March 12, 1945

Dr. Anthony Folger
238 Ridgewood Drive
Wichita 8, Kansas

Dear Anthony:

Your air mail letter was in my box when I got down this morning, as I generally do not work on Sundays any more.

I took up the matter of Salina in Wisconsin with Twenhofel at once. He thinks there really is no Waubakee in the State. Either Raasch or Shrock once told me (so far as I can recall) that the Waubakee was confined to the to the type locality, for he found that all the extensions were actually Devonian. You can check this from Raasch's paper on the Devonian in the Guidebook. He is now in Italy and cannot be consulted. I have seen the original exposure but it was in 1914, and I only recall that it does not amount to much. Shrock still keeps the Waubakee in the section (see Swartz in GSA, 1942).

In 1942 I started a study of the bottom of Lake Michigan and got as far as contouring the latest charts and drawing a few cross sections. I found that a double escarpment runs from the point north of Ludington, Michigan, southwest toward Wisconsin. I concluded that the northern one is due to the Dundee. It reaches the Wisconsin coast near Sheboygan or just about the northern limit of where Raasch found Devonian. He thought that the exposure at the lighthouse in Sheboygan is just about the top of the Silurian with no Salina. The southern escarpment may be caused by the Traverse. It curves off the coast at Milwaukee apparently not reaching shore. A cross section to wells on the Michigan side shows definitely that the Salina pinches out under the lake. I went over all this with Cohee last summer.

North of the two escarpments the lake is very deep and has an irregular bottom, one feature of which is the islands and very deep bays along the Michigan side. I have corresponded with the Michigan geologists, who now think the published maps are all wrong and that this entire area is underlain by Salina and Bass Island strata. I feel that glaciation of these salt-bearing rocks produced the irregular topography which is also present on the Salina-Bass Island area beneach Lake Huron. I am sure that the Salina thins rapidly to the west where buried by Devonian but to the north where the overlying strata have been removed you just can't tell.

Very truly yours

WISCONSIN GEOLOGICAL SURVEY
By
F. T. Thwaites, Geologist
In charge of Well Records

FTT LMV

238 Ridgewood Drive
Wichita - 8 - Kansas
March 10, 1945
2:30 A.M.

Dear Fred;

It being very late at night or early in the morning and I want to get to bed may I make this note short and without formality.

I am preparing an isopach map of the Salina of Ontario and Michigan. Are there any sediments in extreme eastern Wisconsin equivalent to Salina ?

Sutton's correlation chart on page 269 (of the now famous K.G.S. Guide Book) says not. But this chart seems lacking in details, since, for Michigan he shows no Bass Island or Salina and there sure is heaps of both. Apparently your Waubakee is Bass Island. Workman's isopach map of the Silurian (same Guide Book) shows 800' of Silurian at Manitowoc and 700' at Sheboygan. This would be awful thick if <u>all</u> Bass Island.

I am not interested, now, in details. If you think you do have any Salina equivalent, would you give me a <u>few</u> well spaced points north & south with thickness and section, township, and range. My scale is an inch to 16 miles for the base map I am using.

Lake Michigan is only 80 miles wide. In Michigan, the most westerly points, show 1316' of Salina in Antrim county, ~~1566~~ 715' in Muskegon county, and 1566' in Newaygo county. While the Salina thins with tremendous rapidity <u>northward</u>, does it do this westward too?.

Would you be kind enough to answer this letter by <u>air mail special delivery</u>. I am taking my maps to Tulsa about the 20th and each day now counts. With every good wish and kindest personal regards. Cordially.

/ Anthony Folger

Misc.
F. T. Thwaites

Geologist Thwaites Believes Much Work Still to Be Done

EDITOR'S NOTE—This is another in a series of profiles on University of Wisconsin faculty members retiring this year.

For many University of Wisconsin senior scholars, retirement has come as a quiet reward.

For Frederick T. Thwaites, 41 Roby Road, "**who knows more about Wisconsin geology than any other living man,**" the July 1 official termination of academic years was a rude intruder.

He has taught for 38 years.

He has often acted as consultant, served a long curatorship of the university's geology museum and has for many years been in charge of the well-drilling samplings for the State Geological Survey.

According to his colleagues, he has "published on virtually everything" including "the best textbook on glacial geology."

But Prof. Thwaites thinks there is much work still to be done.

"The bounds of his thinking are the bounds of time," said Francis Hole, U.W. professor of soils. **"He is as familiar with the great glaciers of the past as we are with our campus, as intimate with the whole state as we are with our own back yards."**

"You feel that half the time he's living in geologic time—an infinite span, a kind of fourth dimension; the other half he is the citizen."

Prof. Thwaites was born Dec. 23, 1883 in Madison, only a stone's throw from the university campus, the son of distinguished historian Reuben Gold Thwaites and Jessie Turville Thwaites.

He spent his early summers at the Turville homestead on Lake Monona and for many years dwelled permanently there. He recalls trips across the Atlantic with his parents and an 1894 rowboat journey down the Ohio river with his father.

He enrolled at Wisconsin with his major subject engineering. In his junior year he abandoned engineering for geology, and received his bachelor's degree in 1906 and his master's degree in 1908.

Spotted in between classroom instruction was practical training in the field. Summers he prospected for silver and iron in Canada, worked on an irrigation survey, and worked with both state and federal surveys in Wisconsin.

"We wore full beards those days, and a man was competing with horses then," Prof. Thwaites recalled. **"A man staked his reputation on his ability to walk."**

Students of 1954 say he can still tramp the legs off the younger fellows.

His specialization in glacial geology was probably determined when he came under the influence of the widely known glacial geologist, William C. Alden of the federal survey.

to the Chief Growler in private . . . do not talk to the natives — they will only delay and confuse you."

There was a time when women students in geology evoked only his skepticism, but they have won his professional respect.

One among them, Amy Mueller, an editor with the State Geological Survey, who wrote her master's thesis on the geology of Wisconsin parks, became Mrs. Thwaites and is the mother of the professor's three sons.

Prof. Thwaites continues to treat retirement inhospitably and shows no signs of abandoning an active role.

He is now working on a comprehensive series of notes on geomorphology toward a new text; is completing—with Prof. Kenneth Bertrand—a study of the glacial geology and topography of Wisconsin's Door Peninsular; and is committed, come fall, to part-time teaching at the university and more work for the survey.

After his appointment to the Wisconsin Geological Survey in 1908, Thwaites logged well-cuttings and studied them in the university's Science Hall laboratories.

He gained a statewide familiarity wth the wells for Wisconsin's water.

"Brilliant, possessing a marvelous memory, Prof. Thwaites has given excellent advice on all matters dealing with both public and private water supplies in Wisconsin," said recently retired Ernest F. Bean, state geologist.

He began to teach at the university in 1916, and has taught courses in mapping, glacial geology, physiography, and physics.

Students flocked into his courses and "just about every major has taken his topographical field course, including all the great geologists out of Wisconsin for years past."

Prof. Thwaites' mapping course each spring at Devil's Lake and his annual glacial geology field trips were founded on the conviction that field training "will weed out the unfit."

Students who took the field trips with Frederick Thwaites are familiar with his wry instructions carefully covering routine conduct and all emergencies: — **"Do not jump fences or off of cliffs . . . any complaints about food, service, etc., must be made**

THE DAILY CARDINAL
Aug. 5, 1954

Prof. Thwaites Retires After 38 Years in Geology Dept.

For many of the university's senior scholars, retirement has come as a quiet reward . . . For Frederick T. Thwaites, the professor "who knows more about Wisconsin geology than any other living man," the July 1 officials termination of academic years is treated as a rude intruder.

Though he has taught for 38 years, served a long curatorship of the university Geology Museum, acted often as consultant, for years been in charge of the welldrilling samplings for the State Geological Survey, and, according to his colleagues, "published on virtually everything" including "the best textbook on glacial geology," there is still much work to be done, Prof. Thwaites makes apparent. The accolade "emeritus," conferred at retirement, touching him lightly if at all, will certainly bring no resting on these laurels.

"The bounds of Prof. Thwaites' thinking are the bounds of time," says Francis Hole, professor of soils, who first came under the Thwaites instruction as a graduate student. "He is as familiar with the great glaciers of the past as we are with the campus, as intimate with the whole state as we are with our own back yards. You feel that half the time he's living in geologic time—an infinite span, a kind of fourth dimension — the other half he is the citizen."

Prof. Thwaites began his citizenship in Cenozoic time Dec. 23, 1883. His birth at Madison, only a stone's throw from the campus, is the first entry in a life record strongly identified with the Wisconsin scene.

This only son of distinguished historian Reuben Gold Thwaites and Jessie Turville Thwaites took his elementary and high school instruction in Madison schools; spent his early summers at the Turville homestead on Lake Monona and later, for many years, dwelled permanently there. Trips across the Atlantic were made more than once with his parents, Prof. Thwaites recalls, but what seems more memorable is an 1894 rowboat journey down the Ohio. With his social historian father, the boy Frederick retraced the river routes of the early French missionary priests. The weeks afloat brought major contributions to the senior Thwaites' monumental 73-volume "Jesuit Relations." For the son they must have been the cementing of claims which the out-of-doors had already made upon his devotion.

"Islands and islanders have a mentality and personality of their own," is the way Prof. Thwaites makes total of the childhood explored largely among the rocks and around the water, especially at Turville Point. He offers this summation as a key to and then dismissal of his own character. Insularity seems to be at least one side of the solemn Thwaites personality. It could account for this recurring statement in the professional respect expressed alike by well-drillers and consulting engineers of the state: "—but with Prof. Thwaites it's all business."

When the time came for a university education, the Turville Point lad enrolled here, with engineering as his major subject, but horizons in that field seemed "too narrowing" and in the junior year were abandoned for those of geology. A bachelor's degree resulted in 1906, a master's in 1908. Spotted in between classroom instruction was practical training in the field: summers of prospecting for silver and iron in Canada, of working on an irrigation survey and with both the federal and state geological surveys in Wisconsin.

"We wore full beards those days, looked like men though we were only seniors," recalls Prof. Thwaites. He says also of the beginning and with no waste of words: "A man was competing with horses then. He staked his reputation on his ability to walk." Students of 1954 say he can still tramp the legs off the younger fellows.

Association at this time with the widely known glacial geologist, William C. Alden of the federal survey was important. Here under Alden the choice of special field was probably determined, and in those first searchings across the face of Wisconsin, the foundation for that mammoth knowledge of the state's glacial history was begun.

Thwaites received his first appointment to the Wisconsin Geological Survey in 1908 and in 1911 accepted additionally the curatorship of the university Geology Museum, a post he held for 16 years thereafter. First days with the survey produced a substantial piece of field research on the Wisconsin shoreline of Lake Superior—a kind of natural history parallel to the Ohio River—"Jesuit Relations" project.

"Like his father, retracing the explorations," suggests Prof. Hole, "Prof. Thwaites relieved the great chronology of the past, the order of events, but 500 million to a billion years ago, establishing that the Lake Superior sandstone is pre-Cambrian rather than Cambrian."

Services as the logger of well-cuttings were also undertaken early with the survey and carried out in the laboratories of Science Hall and in the field. Continued through the years into 1954, they have given this public servant a statewide familiarity with the wells for Wisconsin's water and earned these words from recently retired State Geologist Ernest F. Bean: "Brilliant, possessing a marvelous memory, Prof. Thwaites has given excellent advice on all matters dealing with both public and private water supplies in Wisconsin."

The teaching portion of Prof. Thwaites' career was begun in the fall of 1916 with a contract for part-time instruction in the department of geology. Since that date it has embraced courses in mapping, including those taught to a general student enrollment as well as to advanced geologists and U. S. trainees in World War I; courses in glacial geology, physiography, and advanced physiography; and in physics to UW engineers under the Navy V12 program of World War II.

"They told me I'd never make a teacher," Prof. Thwaites remarks, but colleagues report that students have flocked into the classes of this man, and "just about every geology major has taken Prof. Thwaites' topographical field course, including all the great geologists out of Wisconsin for years past."

Founded on the conviction that field training "will weed out the unfit" and has special learning rewards, Prof. Thwaites' mapping course conducted each spring at Devil's Lake—and the annual glacial geology field trips—have called forth a special energy and talent from the Wisconsin scientists. They also have revealed, in the close association that field work demands, a liking and concern for his students which the discipline of this solemn man is most often at pains to hide.

"Nobody could give that course the way he's been giving it," says Saul Aronow, geology grad student. "Nobody else would go to that much trouble—he's teacher, guardian, and host."

"There never was a person more generous with his time for students," adds Ernest Bean, whose years of close association with Prof. Thwaites at Science Hall equip him well for this judgment.

Almost everyone who has experienced those April out-of-door weeks with Frederick Thwaites is familiar with these wry instructions in a lengthy set, carefully covering routine conduct and all emergencies for the field trip: "Do not jump fences or off of cliffs." . . . "Any complaints about food, service, etc. must be made to the Chief Growler IN PRIVATE." . . . "Do not talk to the natives—they will only delay and confuse you." Almost everyone has smiled delightly and many have chalked up another score for their stern favorite.

"Probably more than any other member of the department, he evokes a warmth, affection, and respect," Prof. Sheldon Judson explains. "When you go off campus, there is one person especially that geology alumni ask about. 'How is Freddie Thwaites?' they inquire, rolling that first name around freely. 'How is Freddie'?"

"I've always had good relations with the students," is Prof. Thwaites' admission that he has enjoyed the years with the young men, and young women too, under his instruction. There was a time when women students in geology evokes only his skepticism, he will not deny, but since then they've won his professional respect, and "some of them are just natural born topographers."

One among them, Amy Mueller, an editor with the State Geological Survey, who wrote her master's thesis on the geology of Wisconsin parks, became Mrs. Thwaites and is the mother of the professor's three sons.

On May 12, when the Geology Club—a group of geology students, colleagues and other friends gathered around the banquet table to honor the 70-year-old classical geologist, Prof. Stanley Tyler, chairman of Wisconsin's geology department, paid this strong tribute: "A man of ability and humility, he has firmly established through teaching, research, and public service a reputation second to none."

The club said it another way.

"They gave me a watch," Prof. Thwaites admits in a rare burst of unsolicited autobiography, and in his palm he displays a thin gold timepiece. On the back of the watch is the simple engraved outline of the State of Wisconsin and within this incised "F. T. Thwaites, geologist and teacher." This is a solid statement of sentiment which Prof. Thwaites cannot dismiss. He doesn't even try to.

Prof. Thwaites continues to treat retirement inhospitably and shows no sign of abandoning an active role. He is working now on a comprehensive series of notes on geomorphology toward a new text; is completing, with Prof. Kenneth Bertrand, a study of the glacial geology and topography of Wisconsin's Door Peninsula; and, yes, he's committed, come the fall, to part-time teaching at Wisconsin and more work for the survey.

"How's Prof. Thwaites doing? How's Freddie?" Today and tomorrow, Freddie Thwaites is doing fine.

Science Hall
Madison, Wisconsin
March 24, 1943

Gentlemen:

We are enclosing a copy of "Pleistocene of Part of Northeastern Wisconsin," by F. T. Thwaites. This paper, published by the Geological Society of America, will interest some of your readers, because glacial materials are a matter of every-day importance. The soil, the clay used in the manufacture of brick, the sand and gravel employed in highway and other construction are all glacial materials. Many topographic features are of glacial origin.

You may decide to display Plates 1 and 10, thus directing attention to the report.

Additional copies of the report may be obtained for $1.00 from the Wisconsin Geological & Natural History Survey, Science Hall, Madison, Wis.

WISCONSIN GEOLOGICAL AND
NATURAL HISTORY SURVEY

LIST OF PUBLIC LIBRARIES IN NORTHEASTERN COUNTIES OF STATE

Brown County

DePere
Green Bay

Florence County

Florence

Forest County

Crandon
Laona
Wabeno

Langlade County

Antigo

Marathon County

Mosinee
Wausau

Marinette County

Marinette
Niagara
Peshtigo

Oconto County

Gillett
Oconto
Oconto Falls

Outagamie County

Appleton
Black Creek
Hortonville
Kaukauna
Kimberly
Seymour

Portage County

Almond
Amherst
Rosholt
Stevens Point

Shawano County

Birnamwood
Bonduel
Shawano
Tigerton
Wittenberg

Waupaca County

Clintonville
Fremont
Iola
Manawa
Marion
New London
Waupaca
Weyauwega

Waushara County

Plainfield
Wild Rose

C. B. Lester, Secretary, Library Commission, says:

Obviously a number of these libraries are small. There are also County Library system stations in the following:

Brown
Langlade
Marathon
Marinette
Oconto
Shawano

LIST OF HIGH SCHOOLS IN NORTHEASTERN COUNTIES OF THE STATE

Brown County

Denmark
Depere
Green Bay, East
Green Bay, West
Pulaski
West Depere
Wrightstown

Florence County

Florence

Forest County

Crandon
Hiles
Laona
Wabeno
Elvoy High School, Nelma

Langlade County

Antigo
Elcho
White Lake

Marathon County

Athens
Edgar
Marathon
Mosinee
Spencer
Stratford
Unity
Wausau

Abbotsford
Colby

Marinette County

Amberg
Coleman
Crivitz
Goodman
Marinette
Niagara
Pembine
Peshtigo
Waukaukee

Oconto County

Gillett
Lena
Mountain
Oconto
Oconto Falls
Suring

Outagamie County

Appleton
Bear Creek
Freedom High School, Freedom, R.R. Kaukauna
Hortonville
Kaukauna
Kimberly
Seymour
Shiocton

Portage County

Almond ✓
Amherst ✓
Bancroft ✓
Rosholt ✓
Stevens Point ✓

Waupaca County

Clintonville ✓
Iola ✓
Manawa ✓
Marion ✓
New London ✓
Scandinavia ✓
Waupaca ✓
Weyauwega ✓

Shawano County

Birnamwood ✓
Bowler ✓
Bonduel ✓
Gresham ✓
Mattoon ✓
Shawano ✓
Tigerton ✓
Wittenberg ✓

Waushara County

Coloma ✓
Hancock ✓
Plainfield ✓
Red Granite ✓
Wautoma ✓
Wild Rose ✓

Prof Chas J. Rooff, Lawrence University, Appleton, Wis. ✓
R. E. Karges, State Teachers College, Oshkosh, Wis. ✓

Armstrong Creek? no

Tablis Lebanon

abbotsford. yes
Colby yes
~~City~~

Black Creek. no
Plover no
Junction city. no
Aniwa ~~#~~ no
Cecil no
Eland no
Embarrass. no
~~Fremont~~ no
Royalton no

Public Libraries in Certain Counties
Feb. 1943

Brown = De Pere
Green Bay

Florence = Florence

Forest = Crandon
Laona
Wabeno

Langlade = Antigo

Marathon = Mosinee
Wausau

Marinette = Marinette
Niagara
Pashtigo

Oconto = Gillett
Oconto
Oconto Falls

Outagamie = Appleton
Black Creek
Hortonville
Kaukauna
Kimberly
Seymour

Portage = Almond
Amherst
Rosholt
Stevens Point

Shawano = Birnamwood
Bonduel
Shawano
Tigerton
Wittenberg

Waupaca = Clintonville
Fremont
Iola
Manawa
Marion
New London
Waupaca
Wayauwega

Waushara = Plainfield
Wild Rose

Obviously a number of these libraries are small.

There are also County Library system stations in the following:-
Brown
Langlade
Marathon
Marinette
Oconto
Shawano

C B Lester
Secy
17 Feb 43

1. List the public libraries in the following counties.

~~Florence.~~
~~Forest~~
~~Marinette~~
~~Oconto~~.
~~Langlade.~~
~~Brown~~
~~Marathon~~
~~Shawano.~~
~~Portage~~
~~Waupaca.~~
~~Outagamie.~~
Waushara.

2. List the High Schools in these counties.

PLEISTOCENE OF PART OF NORTHEASTERN WISCONSIN

List of Names to Whom Sent
4-28-43

Burt Karges, State Teachers College, Oshkosh, Wis.
L. E. Ness, Chairman, Board of Supervisors, Marinette County, Crivitz, Wis.
Sen. Philip Downing, Amberg, Wis.
Ernest G. Sauld, Pembine, Wis.
Orin W. Angwall, Marinette, Wis.
Chas. G. Bennett, Box 173, Niagara, Wis.
Judge Irving W. Smith, Niagara, Wis.
Chas. E. Broughton, Editor, The Sheboygan Press, Sheboygan, Wis.
John W. Ockerman, State Conservation Dept., Forest Prot. Hq., Tomahawk, Wis.
D. F. Culbertson, Wisconsin Highway Commission, Nicolet Bldg., Green Bay, Wis.
Alfred Mathewson, Wausaukee, Wis.
Ray Jensen, County Highway Commissioner, Chilton, Wis.
R. H. Licking, Superintendent of Schools, Ripon, Wis.
Irwin Lyons, Institute of Technology, Platteville, Wis.
Arndt Eklund, County Highway Commissioner, Peshtigo, Wis.
Neil Kivlin, Oregon, Wis.
W. A. Broughton, Geologist, Div. of Geol., Dept. of Conservation and Development, Pullman, Wash.
E. P. Whealdon, 845D Wilkinson, Shreveport, La.
Ray Schaf, Milwaukee Club, Milwaukee, Wis.