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Thwaites, F. T. (Fredrik Turville), 1883-1961
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THIS SIDE OF CARD IS FOR ADDRESS

Mr. F. T. Thwaites.
Science Hall,
Madison,
Wis.
Room 224

Dear Mr. Thwaites.

Getting things fixed up gradually, drove up in my brother's car. will write you more detail to-morrow. Address is Brussels, Wis. R. F. D. No. 2.

Regards,

Bob.

July 1, 1953

Code No. 45021

Memorandum

To: Ground Water Branch Field Offices

From: A. N. Sayre, Washington, D. C.

Subject: Attendance at 5th GWSC, Madison, Wisconsin, August 17 - 29, 1953

In response to our memorandum of May 8, 1953, requesting field offices to submit names of prospective students for the 5th GWSC, approximately 70 names were proposed.

Attendance at the school will be limited to 45 students, including those from other branches of the Division and from our cooperating agencies, and from foreign governments. Thus, approximately 25 names had to be deleted. We are extremely sorry that we could not take all of those proposed at this time; however, planning for the 6th GWSC, scheduled to be held at the University of Arizona at Tucson, April 12 - 24, 1954, is under way, and when arrangements are completed, names of personnel who could not be accommodated at Madison can be resubmitted if desired. The selection of students for the short course at Madison was made primarily on the basis of grade and geographic distribution.

It will be necessary for each district office to prepare appropriate travel authorization for each of the men who will attend the school. A per diem of $8.40 will be authorized. Attached are 1) a list of those selected to attend and 2) information regarding accommodations at the University of Wisconsin for the short course. The reservation blank should be clipped from this accommodation sheet, filled in by each prospective student, and mailed to Mr. William J. Drescher, District Engineer, U.S.G.S., 116 Science Hall, Madison 6, Wisconsin. Reservation blanks must be received in Madison not later than July 15 (for all persons planning to attend).

Monday night, August 17, will be given over to a social evening, a "Dutch" treat, so that students and faculty members may meet socially and, not only get to know one another, but have a good time. Please be sure to mark your choice of entree for the "Dutch" social.

A. N. Sayre
Chief, Ground Water Branch

Code No. 45021

STUDENT LIST - 5TH GWSC

MADISON, WISCONSIN

August 17 - 29, 1953

Washington, D. C.		Eakin, Thomas E.	Geol
		Hart, Rodney	Engr aid
		Paussek, Felix H.	Chem (QW)
	1/	Hastings, Warren W.	Chem (QW)
Alabama		Simpson, Thomas A.	Geol
Arizona		Irwin, James H.	P.S.A.
		Coates, Donald R.	Geol
		Hardt, William F.	Engr
Arkansas		Ryling, Roy W.	Geol
		Onellion, F. E.	Geol
California		Thomasson, H. G., Jr.	Engr
		Brown, Delbert W.	Geol
		Dutcher, Lee C.	Geol
Florida		Derragon, Eugene	Phys
		Kohout, Francis A.	Geol
Georgia		Wait, R. L.	Geol
Idaho		Stewart, J. W.	Engr
		Smith, Rex O.	Geol
Kentucky		Brown, Richmond F.	Geol
		Price, Wm. E., Jr.	Geol
		Hendrickson, D. G.	Geol
Montana		Steinhilber, W. L.	Geol
		Swenson, Frank A.	Geol
Nebraska		Keech, Chas. F.	Engr
		Johnson, Arnold I.	Engr
New Jersey		Fox, G. Sidney	Engr
New Mexico		Nicholson, Alexander, Jr.	Geol

New York		Warren, M. A.	Engr
		Grossman, I. G.	Geol
		Mack, F. K.	Geol
North Carolina	1/	Billingsley, Norman H.	Chem (QW)
North Dakota		Paulson, Quentin F.	Geol
		Powell, John E.	Engr
Ohio		Goudder, George D.	Geol
	1/	Laird, Leslie B.	Chem (QW)
Oklahoma		Schoff, Stuart L.	Geol
		Peden, George (Okla. Plan. & Resource Bd)	Engr
Pennsylvania	1/	Beamer, Norman H.	Chem (QW)
Tennessee		Rima, Donald R.	Geol
Texas		George, W. O.	Geol
		Kennedy, R. A.	Geol
Washington		Foxworthy, B. L.	Geol
		Mundorff, M. J.	Geol
Canada		Halstead, E. C.	Geol
India (USGS)		Taylor, George C.	Geol

1/ First week only

ACCOMMODATIONS IN UNIVERSITY OF WISCONSIN RESIDENCE HALLS

during the

5th GROUND WATER SHORT COURSE - August 16-29, 1953

The Division of Residence Halls of the University of Wisconsin has reserved space in Chamberlin Hall for those planning to attend the ground-water short course. Chamberlin Hall is located on the shore of Lake Mendota as shown on the enclosed sketch.

The rooms are equipped with twin beds, and daily maid service, all bedding, linens, towels, and soap will be provided.

Meals will be served cafeteria style in the Kronshage dining rooms as follows:

Breakfast Monday, August 17, through luncheon Saturday, August 29, except dinner August 17 1/ and luncheon and dinner August 23.

Those who will live elsewhere in Madison may purchase tickets for individual meals. Rooms will not be rented without board.

With lodging and food service as outlined above, the charge for the period will be about $70.00 per person, payable upon arrival at the Kronshage desk, which will be prepared to receive registrants after 3:00 p.m. Sunday, August 16.

Reservations will be for the period Sunday, August 16, through Saturday noon, August 29. Those who will not attend the full time will please specify on their reservations.

Reservations must be made by detaching and mailing the completed form below not later than July 15 to:

U. S. Geological Survey
116 Science Hall
Madison 6, Wisconsin

RESERVATION BLANK - 5th GWSC August 16-29, 1953, Madison, Wisconsin

Name _____

Address _____

City _____

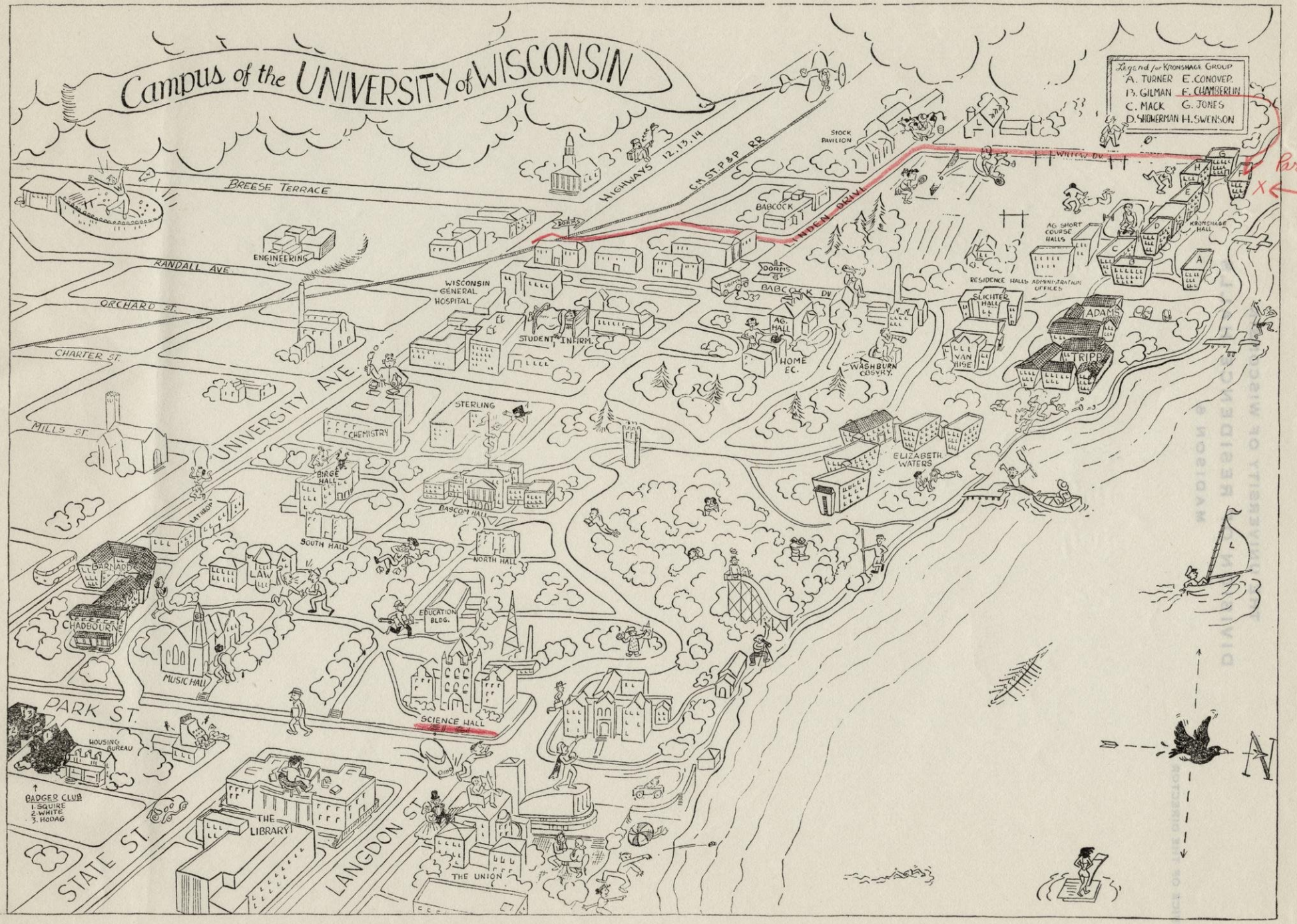
Please reserve _____ accommodation(s) for myself and the following members of my family:

_____

_____

Number of reservations for field trip _____

1/ Choice of entree at "Dutch" social Monday, August 17 (If more than one, specify number): Steak _____ Chicken _____ Shrimp _____.


Campus of the UNIVERSITY of WISCONSIN
Legend for Kronshage Group
A. TURNER
B. GILMAN
C. MACK
D. SHERMAN
E. CONOVER
F. CHAMBERLIN
G. JONES
H. SWENSON
Parking
BREESE TERRACE
RANDALL AVE
ORCHARD ST.
CHARTER ST.
MILLS ST.
PARK ST.
STATE ST.
LANGDON ST.
UNIVERSITY AVE.
LINDEN DRIVE
WILLOW DR.
BABCOCK DR.
CH. ST.P&P RR
HIGHWAYS 12.13.14
STOCK PAVILION
ENGINEERING
WISCONSIN GENERAL HOSPITAL
STUDENT INFIRM.
BABCOCK
DORMS
AG. HALL
HOME EC.
WASHBURN OBSVRY.
SLICHTER HALL
VAN HISE
RESIDENCE HALLS
ADMINISTRATION OFFICES
AG SHORT COURSE HALLS
KRONSHAGE HALL
ADAMS
TRIPP
ELIZABETH WATERS
CHEMISTRY
STERLING
BIRGE HALL
BASCOM HALL
SOUTH HALL
NORTH HALL
LAW
BARNARD
CHADBOURNE
EDUCATION BLDG.
MUSIC HALL
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MADISON 6

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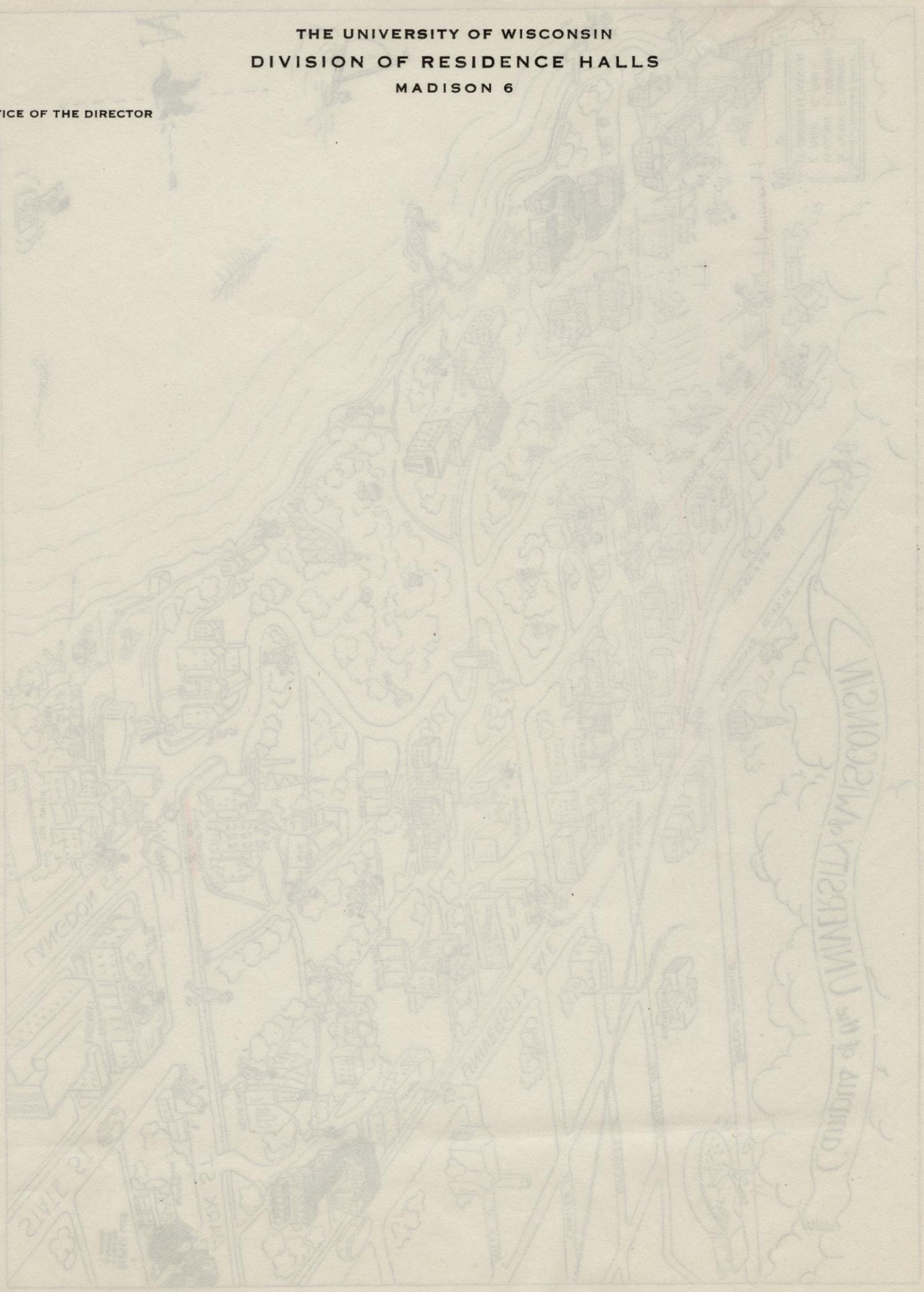

July 1, 1953

Code No. 45021

Memorandum

To: Students attending the 5th GWSC

From: A. N. Sayre, Washington, D. C.

Subject: Pre-school reading lists

Unlike ordinary college students, who can accomplish assigned reading during the course of study, students of the GWSC must do all their preparatory reading prior to the beginning of the course. Once at the school, the opportunity to read on the subjects to be presented in each class is practically gone, for activities of the short course utilise almost all available time, including many of the evenings.

The fields to be covered are broad and diverse, ranging from a history of the Branch and the Survey to concepts explaining aquifer performance. It is realized that it will not be possible for each student to study, or even to hastily scan all pertinent literature in the time available before reporting to the school. Nonetheless, it is recommended that each of you will make a serious effort to avail yourself of every opportunity to study. To facilitate this, it would be best if each of you would reserve a certain period of time every day or evening that can be devoted solely to study. A minimum amount of preparatory reading should be done by every student. This preparatory reading would vary with individuals, and is a matter of personal decision.

To aid you in preparation for the short course, lists of the most important references and useful supplementary references are attached hereto. It is realized that many of these references may not be available in your local offices. Some of these items may be borrowed from the Survey library in Washington, D. C., or may be obtained locally from universities or from some of the larger public libraries. In any event, the obligation to make adequate preparation lies with each student.

A. N. Sayre
Chief, Ground Water Branch

Attachments:
Reading lists
1. History
2. Report Writing
3. Ground-water Geology and Hydrology
4. Ground-water Hydraulics
5. Geochemistry
6. Geophysics

Code No. 45021

I. HISTORY

a. Most Important References

1. Follansbee, Robert, History of Water Resources Branch of the U. S. Geological Survey to June 30, 1919. Pp. 93-96; 169-175; 247-248; 310-311; 313-314; 431-441.

2. Meinzer, O. E., Forty years of progress in ground-water investigations: Proc. West-Central Branch Conference, April 9-12, 1947, Lincoln, Nebr. (USGS mimeog. rep't. 1947).

3. Darrah, William Culp, Powell of the Colorado, Princeton University Press, 1951.

b. Useful Supplementary References

1. Rest of Follansbee's book.

2. Bass, W. W., Adventures in the canyons of the Colorado, Grand Canyon, 1919.

3. Dale, H. C., The Ashley-Smith explorations and the discovery of a central route to the Pacific, 1822-1829, Cleveland, 1918.

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5. Davis, A. P., Irrigation works constructed by the United States Government, New York, 1917.

6. Fairchild, H. L., The Geological Society of America, 1888-1930. A chapter in earth science history, New York, 1932.

7. Fenton, C. L. and Fenton, M. A., The story of the great geologists, Garden City, New York, 1945.

8. James, G. W., Reclaiming the Arid West, New York, 1917.

9. King, Clarence, First annual report of the U.S.G.S., Washington, 1880.

10. Merrill, G. P., Contributions to a history of American State Geological and Natural History surveys. U. S. Nat. Mus. Bull. 109, Washington, 1920.

11. _____, The first 100 years of American Geology, New Haven, 1924.

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13. Owen, David Dale, Report of a geological reconnaissance of the Chippewa Land District of Wisconsin, 30th Cong., 1st Session, Sen. Exec. Doc. No. 57, Washington, 1848.

14. Powell, J. W., Survey of the Colorado of the West, 42nd Cong., 2nd Session, H. R. Misc. Doc. No. 173, Washington, 1872.

15. _____, Geographical and geological surveys west of the Mississippi, 43rd Cong., 1st Session, H. R. Report No. 612, Washington, 1874.

16. _____, Expedition of the Colorado River of the West and its tributaries, Washington, 1875.

17. _____, Report on the lands of the arid region of the United States, with a more detailed account of the lands of Utah, 45th Cong., 2nd Session, H. R. Exec. Doc. No. 73, Washington, 1878.

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20. Summers, R. A., Conquerors of the River, New York, 1939.

21. Tewksbury, D. G., The founding of American colleges and universities before the Civil War, New York, 1932.

22. U. S. Congress, Report of the Special Committee of the United States Senate on the irrigation and reclamation of arid lands, Washington, 1890.

23. U. S. Geological Survey. Annual Reports.

24. Wheeler, George M., Chronological account of explorations of the Colorado River of the West, Washington, 1880.

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26. Willis, Bailey, A Yanqui in Patagonia, Stanford, 1947.

II. REPORT WRITING

a. Most Important References

1. Landes, K. K., 1951, A scrutiny of the abstract: Am. Assoc. Petroleum Geologists Bull. 35, p. 1660, July.

2. Ridgeway, John L., 1920, The preparation of illustrations for reports of the United States Geological Survey, Govt. Print. Office, 101 pp.

3. Wood, G. McL., and Lane, B. H., 1935, Suggestions to Authors, 4th ed. (5th ed. in preparation), 126 pp.

b. Useful Supplementary References

1. Eisenlohr, W. S., 1949, Typing copy for photo-offset reproduction, U. S. Geological Survey multilithed report, 35 pp., April.

2. Greeves, Garland, and Jones, E. S., 1942, Century handbook of writing, 4th ed., D. Appleton-Century Co., 364 pp.

3. Livingston, Penn, 1951, Preparation of annual water-level reports, U. S. Geological Survey multilithed report, 39 pp., July.

4. Nelson, J. Raleigh, 1947, Writing the technical report, 2nd ed., McGraw-Hill Co., 388 pp. (for organization).

5. Quality of Water Branch, 1952, Instructions for preparation of mamuscript for annual reports on quality of surface waters, U. S. Geological Survey multilithed report, 31 pp., October.

6. Rickard, T. A., 1931, Technical writing, 3d ed., John Wiley & Sons, Inc., 337 pp.

III. GROUND-WATER GEOLOGY & HYDROLOGY

(Numbers indicate rank in respect to purposes of the short course)

a. Most Important References

1. Meinzer, O. E., 1923, Outline of ground-water hydrology, with definitions: U. S. Geological Survey Water-Supply paper 494, 71 pp., 35 figs.

2. Meinzer, O. E., 1923, The occurrence of ground-water in the United States, with a discussion of principles: U. S. Geological Survey water-supply paper 489, 321 pp. See in particular chapters 1 and 2.

3. Gilluly, James, Waters, A. C., and Woodford, A. O., Principles of Geology: W. H. Freeman & Co., San Francisco, 631 pp. If not readily available, some other good textbook of geology. Prospective student will need absorb only a working familiarity with geologic concepts and terminology.

b. Useful Supplementary References

4. Theis, C. V., 1940, The source of water derived from wells - essential factors controlling the response of an aquifer to development; Civil Eng., vol. 10, no. 5, pp. 277-280, May.

5. Theis, C. V., 1938, The significance and nature of the cone of depression in ground-water bodies: Econ. Geol., vol. 33, No. 8, pp. 889-902, Dec.

6. Meinzer, O. E. (editor), 1942, Hydrology (physics of the earth ser.): McGraw-Hill (1942) or Dover Publications (1949). See particularly chapters 9 and 10.

7. Thomas, Harold E., The conservation of ground-water, 1951: McGraw-Hill Book Co., Inc. See particularly chapters 2 and 3.

IV. GROUND-WATER HYDRAULICS

a. Most Important References

1. Ferris, J. G., Memorandum concerning a pumping test at Gas City, Indiana: Ind. Dept. of Cons. Bull. No. 1, 1945.

2. Ferris, J. G., Ground-water hydraulics as a geophysical aid: Mich. Dept. of Cons. Tech. Report No. 1, 1948.

3. Meinzer, O. E., Compressibility and elasticity of artesian aquifers: Econ. Geol., vol. 23, No. 3, pp. 263-291, 1928.

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b. Useful Supplementary References

1. Cooper, H. H., Jr. and Jacob, C. E., A generalized graphical method for evaluating formation constants and summarizing well-field history: Am. Geophys. Union, pp. 526-534, vol. 27, 1946.

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3. Ferris, J. G., Cyclic fluctuations of water level as a basis for determining aquifer transmissibility: Ground-water Hydraulics Section, Contribution No. 1, April 1952.

4. Greenlee, A. L., and Wenzel, L. K., A method for determining transmissibility and storage coefficients by tests of multiple well systems: Am. Geophys. Union, part 2, pp. 547-560, 1943.

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6. Hubbert, M. K., The theory of ground-water motion: University of Chicago Press, 1940.

7. Jacob, C. E., Correlation of ground-water levels and precipitation on Long Island, New York: N. Y. State Dept. Cons., Water Power and Control Comm. Bull. GW-14, 1945. Also published in A.G.U., 1944.

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9. Jacob, C. E., On the flow of water in an elastic artesian aquifer: Am. Geophys. Union, pp. 574-586, 1940.

10. Jacob, C. E., Notes on the elasticity of the Lloyd sand on Long Island, N. Y.: Am. Geophys. Union, pp. 783-787, 1941.

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12. Jacob, C. E. and Lohman, S. W., Nonsteady flow to a well of constant drawdown in an extensive aquifer. 22 pp., 8 figs. (for publication in Am. Geophys. Union Trans.)

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16. Robinson, T. W., Earth-tides shown by fluctuations of water levels on wells in New Mexico and Iowa: Am. Geophys. Union, pp. 656-666, 1939.

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V. GEOCHEMISTRY

a. Most Important References

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2. Paulsen, C. G., and others, 1952, Quality of surface waters of the United States, 1947: U. S. Geol. Survey water-supply paper 1102, pp. 2-14 (or water supply paper 1050, pp. 2-10).

3. Piper, A. M., 1945, A graphic procedure in the geochemical interpretation of water analyses: Am. Geophys. Union Trans., 1944, pt. 6, pp. 914-923, figs. 1-6.

b. Useful Supplementary References

1. Behre, C. H., Jr. and Garrels, R. M., 1943, Ground-water and hydrothermal deposits: Econ. Geol., vol. 38, pp. 65-67.

2. Clarke, F. W., 1924, the data of geochemistry: U. S. Geol. Survey Bull. 770.

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4. Hem, J. D., 1950, Geochemistry of ground-water: Econ. Geol., vol. 45.

5. Jeffords, R. M., 1948, Graphic representation of oil-field brines in Kansas: Kansas Geol. Survey Bull. 76, pt. 1, pp. 1-12.

6. Krumbein, W. D., and Garrels, R. M., 1952, Origin and classification of chemical sediments in terms of pH and oxidation-reduction potentials: Jour. Geology, vol. 60, pp. 1-33.

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15. Rogers, G. S., 1917, The interpretation of water analyses by the geologist: Econ. Geol., vol. 12, pp. 66-88.

VI. GEOPHYSICS

Electric Logging

a. Most Important References

1. Archie, G. E., 1942, The electrical resistivity log as an aid in determining some reservoir characteristics: Am. Inst. Min. Met. Eng. Tech. Pub. 1422, 8 pp.

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3. Guyod, Hubert, 1945, Electrical log interpretation, pt. 3, True resistivity: Oil Weekly, vol. 120, No. 3, pp. 15-20.

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NATURAL RESOURCES COMMITTEE OF STATE AGENCIES
Minutes of the Thirty-First Meeting, December 16, 1957

The meeting convened in the Governor's reception room, State Capitol, at 9:30 A. M., pursuant to notice given. Mr. Steinmetz, the Vice-Chairman, presided.

Members present or represented

Legislative Council
Senator Frank E. Panzer
Assemblyman Harvey R. Abraham
Conservation Department
L. P. Voigt
University of Wisconsin
I. L. Baldwin
Raymond J. Penn
Public Service Commission
George P. Steinmetz, Vice-Chairman
Warren Oakey
Department of Agriculture
Walter H. Ebling
Arthur R. Kurtz
Board of Health
O. J. Muegge
Attorney General's Office
James McDermott, representing Mr. Honeck
State Soil Conservation Committee
Harry M. Schuyler
Department of Taxation
Harry W. Harder
State Highway Commission
William F. Steuber
Division of Industrial Development
Philip Sundal
Planning Division
M. W. Torkelson, Secretary

Members not present or represented

The Governor, the Honorable Vernon W. Thomson, Chairman ex officio
Conservation Department--Mr. George E. Sprecher

Also present: Members of the Subcommittee on Water Use Legislation not members of the Natural Resources Committee--Harvey Wirth, Board of Health, Secretary; Theodore Wisniewski, Director, Committee on Water Pollution; Thomas Calabresa, Well Engineer, Board of Health; George F. Hanson, Wisconsin Geological Survey.

Also present: Earl Sachse, Executive Secretary, Joint Legislative Council.

Minutes of the Meeting of September 30, 1957

There being no objection, the minutes were approved as circulated.

The Water Use Problem

Mr. Sachse, Secretary of the Joint Legislative Council, appeared at the request of the Secretary, and made the following statement:

"Mr. Torkelson and I have been in almost daily, or weekly, contact since Jt. Res. 101,S, establishing the Water Resources Committee, was passed by the Legislature. Some months ago I was present at a meeting of the NRC Subcommittee on Water Use Legislation which wanted to determine some method of procedure that would not conflict in any way with the proposed activities of the 101,S Committee. As a result, the NRC Subcommittee deferred the proposed meetings with the various organizations having an interest in water use legislation--industry, farm, sportsmen's groups, etc. The 101,S Committee membership has now been completed. The Legislative Council made its appointments some months ago, and last week the Governor announced the appointments of the citizen members. The first (organization) meeting of the Committee will be held Monday, January 6, at 10:00 A. M., in the Legislative Council meeting room. We think it will be most appropriate if representation from your Committee, or at least from the Subcommittee, can be present. The NRC Vice-Chairman, Mr. Steinmetz, is the NRC representative on the 101,S Committee. This establishes a firm liaison between the two groups. At the time the Legislative Council discussed the matter and Mr. Torkelson presented the brief background of what your Subcommittee has done, Senator Panzer and Mr. Marotz, Chairman of the Legislative Council, both expressed the view that they felt the whole study should be a cooperative effort, that the two groups should not go their separate ways. Your Subcommittee has very definite ideas in the matter. Mr. Abraham, the Chairman, is also a member of the 101,S Committee and of the Legislative Council, so I do not believe there is any danger of conflicting interests, since the two committees are closely allied. The NRC Subcommittee is in an especially good position to provide information and background data for the 101,S Committee.

Now I am not sure just what the 101,S Committee will do on January 6, but I think it is safe to assume that they will try to work out an overall method of procedure for carrying out the study. The series of meetings with water use organizations can very well be a joint venture by the 101,S Committee and the NRC Subcommittee. The organizations concerned can present their views pro and con, their criticisms of existing laws, suggestions for improvement of the laws, etc., to the joint meeting. In that way we can accomplish the purpose desired with only one hearing for each group. I hope that by tight scheduling, the hearings, or group meetings, can be finished in three or four months. There will probably have to be some two-day meetings and we will need to hear several groups at one session. Otherwise there will not be time to study the material and formulate recommendations for presentation to the 1959 Legislature. After

January 6, I am sure we will have a pretty clear-cut working procedure outlined, and I am hopeful that it will move along in good shape. Of course, as I have said, I can not predict precisely what the 101,S Committee will do, but from expressions by Senator Panzer, Assemblyman Abraham, Assemblyman Marotz and others, I am confident that the procedure will be substantially as stated."

In response to a request for a statement, Mr. Abraham said that he thought the subject had been covered very well by Mr. Sachse, that the matter of the 101,S Committee and the NRC Subcommittee is in good hands, and that he was confident that the two groups will work together toward the desired objective. He believed the entire matter would be gone over very thoroughly at the January 6 meeting, and that the coordination of the proposed hearings will be worked out to the benefit of both committees.

Mr. Steinmetz said that he would attend the January 6 meeting in his capacity as a member of the 101,S Committee. Mr. Abraham, Chairman, Mr. Wirth, Secretary, and Mr. Torkelson, Vice-Chairman, of the NRC Subcommittee, all agreed to attend. Senator Panzer said that he would try to be there. He expressed his feeling that the matter is proceeding very well. The subject of water use has been ignored for a long time and should not be neglected. With the two committees cooperating, there will certainly be some sound and constructive work done toward the preparation of recommendations to the 1959 Legislature.

With reference to the hearings to be held, Mr. Torkelson stated that 46 organizations have expressed their intention to present written statements, as outlined in the circular letter of June 25, 1957. He stated further that in his conversations with Mr. Sachse, it was decided that an advance notice to these organizations might be desirable, and he had prepared a draft of letter to accomplish this, which he read. It was Moved by Mr. Voigt, Seconded by Mr. Abraham, that Mr. Torkelson be authorized to send out the letter so that the organizations concerned may have time to prepare their written statements. Motion Carried. (Copy of the letter is attached to these minutes.)

Mr. Torkelson also referred to a communication addressed to the 101,S Committee which he had prepared at the suggestion of Mr. Sachse, in which there is set out what the NRC Subcommittee has done to date, and their offer of cooperation. He read the letter. As stated by Mr. Steinmetz, this is in essence the offer which the 101,S Committee will have to consider. (Copy of the letter is attached to these minutes.)

Senator Panzer pointed out that this is perhaps the first time the conflicting interests among water users--the conservation, drainage, irrigation and other groups--have had an opportunity to get together. They have been pulling in opposite directions, and this is one of the most forward-looking activities proposed since he has been a member of the Legislature. It was his conviction that this is the proper approach.

In response to a request for a statement, Mr. Wirth said that he had nothing to add. The Subcommittee has held no meetings and has made no progress since July 29, while waiting for the 101,S Committee membership to be completed.

Report of the Subcommittee Chairmen

(1) Subcommittee on Education, Dr. Baldwin, Chairman

Dr. Baldwin reported that the Subcommittee on Education has held one meeting since the last meeting of the NRC. Another meeting is scheduled for early 1958. There has been a feeling among the Subcommittee members for some time that its principal value might be to aid and stimulate the groups in the public school system which are concerned with the problems of conservation education pursuant to law, and even beyond the law. There has been a feeling for some time that if it could be done, conservation education could be greatly improved if the story of conservation could be woven into every subject taught in the schools: English, chemistry, botany, economics, etc. There are some very real difficulties, however, because there is no curriculum and there are no textbooks or other things at the present time that would make possible that kind of approach. On the other hand, it is believed that the subject is worth pursuing, and work is proceeding in two directions: (1) by cooperation with a curriculum committee of the State Department of Public Instruction in an attempt to develop a curriculum, and (2) by attempting to find some school that will be willing to cooperate in the development of an experimental program of this kind. Fair progress is being made, but it is slow. It is hoped that some real progress will be made in the next year or so.

Mr. Steinmetz expressed his thought that work is proceeding properly. He agreed with Dr. Baldwin that the matter of education along these lines is a continuing one, like the birth and growth of children.

(2) Subcommittee on Land, Dr. Ebling, Chairman

Dr. Ebling read a prepared statement which was distributed and copy of which is attached to these minutes. One item not included was the report of the Working Group on Game. Mr. J. R. Smith, Chairman, has lost two or three members and is now in the process of finding replacements. It is hoped that a meeting can be held next month.

(3) Subcommittee on Water, Mr. Oakey, Chairman

Mr. Oakey reported, with reference to surface water, that there have been no formal meetings of the Working Group, but it is continuing to accumulate information with respect to the availability of water and its possible uses.

Mr. Muegge reported that the Underground Water Working Group has not met recently. There has been some activity on the proposed recharge project of a well in the Milwaukee County area (Wauwatosa). Attempts are being made to clear up some red tape. This is well along and actual recharge may be started shortly after the first of the year.

Report of the Secretary

The Secretary stated that his activities have been largely concerned with the water matters that had been covered so well by Mr. Sachse's statement. He distributed a list of the membership of the Water Resources Committee of the Joint Legislative Council (the 101,S Committee) and the NRC Subcommittee on Water Use Legislation.

The Secretary reported that, at the invitation of the Citizens Natural Resources Association of Wisconsin, he had appeared on a panel with Dr. Penn, Mr. Hembre, and Mr. Virgil Muench of the Izaak Walton League, before their group in Milwaukee on December 7. In his presentation he had read excerpts from an analysis on Wisconsin's Water Uses and Water Resources which he had prepared (October 1957) principally to organize his own thinking and which he had circulated among the members of the NRC and the Subcommittee on Water Use Legislation only. The President of the Citizens Natural Resources Association, Mr. Harold Kruse of Loganville, wished to circulate the statement among members of the Association. The Secretary stated that while he had made a sincere attempt to be wholly objective, he wished to have the authorization of the NRC before he distributed the statement further. Mr. Steinmetz and Mr. Voigt both said that they had read the statement, believed it to be entirely objective, and saw no reason why it should not be circulated generally. It was Moved by Mr. Voigt, Seconded by Mr. Abraham, that the Secretary be authorized to proceed with such circulation. Motion Carried.

The Secretary also stated that it would be necessary for him to request clerical service from some of the other departments. It was so authorized by Mr. Steinmetz, the Vice-Chairman.

Inventory of Natural Resources

Dr. Baldwin inquired of the Secretary regarding progress in the distribution of the Inventory. The Secretary replied that this is proceeding very well. The Superintendent of Public Instruction has reported that nearly 13,000 of the 16,000 free copies authorized have been distributed to the public schools. The free distribution made to other schools is approximately 6,000. There have been reserved for sale between 6,000 and 7,000 copies. Requests are being received every day.

Date of Next Meeting

It was decided to hold the next meeting on Monday, March 17, at the usual time and place. (March 17, 1958)

Adjournment

On motion made, seconded and carried, the meeting adjourned at 10:20 A. M.

Minutes approved _____ M. W. Torkelson, Secretary

WATER RESOURCES COMMITTEE, JOINT LEGISLATIVE COUNCIL
(Jt. Res. 101,S, 1957 Legislature.)

3 Assemblymen
Franklin M. Jahnke, Route 3, Markesan.
Ora R. Rice, Delavan.
Ervin J. Ryczek, 3631 West Ruskin Street, Milwaukee.
3 Senators
Hugh M. Jones, 612 Kent Street, Wausau.
Walter L. Merten, 2325 North 50th Street, Milwaukee.
Robert S. Travis, Platteville.

Governor's Appointees:
Conservation and Recreation--Virgil Muench, 232 St. Matthews Street, Green Bay.
Hydroelectric Power--J. Don Howard, 122 West Washington Avenue, Madison.
Industry--John E. Becker, Rhinelander.
Natural Resources Committee--George P. Steinmetz, 720 State Office Bldg.,Madison.
Agriculture--Leon Zuehls, Markesan.
Local Government--Robert Roemer, Mayor, City Hall, Appleton.
The General Public--Ralph Theiler, Tomahawk.

SUBCOMMITTEE ON WATER USE LEGISLATION,NATURAL RESOURCES COMMITTEE OF STATE AGENCIES

Legislative Council and Natural Resources Committee--
Assemblyman Harvey R. Abraham (Chairman), 194½ Ceape Street, Oshkosh.

Office of the Attorney General--
Roy G. Tulane and Warren H. Resh, Assistant Attorneys General,
114 East, State Capitol.

State Board of Health--Harvey E. Wirth (Secretary), Assistant Sanitary Engineer, assisted by Thomas Calabresa, Well Engineer, 453 State Office Building.

Public Service Commission--Warren Oakey, Chief Engineer, assisted by William H. Cartwright, Water Engineer, 663 State Office Building.

Conservation Department--George E. Sprecher, Assistant Director,
830 State Office Building.

Water Pollution Committee--Theodore Wisniewski, Director, 453 State Office Bldg.

Department of Agriculture--Frederick J. Griffith, Jr., Counsel, 18 East, Capitol.

Wisconsin Geological Survey--Dr. George F. Hanson, Science Hall, University of Wis.

Soil Conservation Committee--Prof. Jacob H. Beuscher, Law School, University of Wis.

College of Agriculture, University--Prof. Raymond J. Penn, Agricultural Economics, 340D Agriculture Hall.

College of Engineering, University--Professor Arno T. Lenz, Hydraulics and Civil Engineering, 4 Hydraulic Laboratory.

State Planning Division--M. W. Torkelson (Vice-Chairman), Consultant,
300 State Office Building.

December 13, 1957

Virginia, Minn.. Sept-30-1922

Mr J. L. Thwaites- Science Hall
Madison, Wis -

504 Third st North
Virginia,
Minn

ANALYTICAL CHEMISTS

TO **LERCH BROS.** DR.

MINING ENGINEERS

Laboratories on the Mesaba Range in Minnesota at Biwabik, Virginia, Buhl, Chisholm, Albany, Hibbing, Mahoning, Keewatin, Nashwauk and Calumet.
On the Cuyuna Range at Ironton, Minn.; also on the Menominee Range at Crystal Falls, Mich.

		SAMPLES	DETERMINATIONS	PRICE PER DETERMINATION			
Sept.	26	1	2	50¢	#	1	00

Paid Oct 4 1922
Lerch Bros.

I don't think it amounts to much.

Saturday P.M.
Brussels, Wis.
R.F.D. No 1.
c/o Louis Destree

Dear Mr. Thwaites:

No doubt you are quite anxious to know what the whole thing amounts to. Well, as far as I can see now it will not be much. Our first day consisted more or less of feeling around with the drill and also dug a test pit on the road side. We began east of the crossroads, first hole

was about a forty from the road intersection. This test showed very faint traces of ore at about 5½'; the rest was red clay. At about 6' 2", we struck rock and had to abandon the hole. I didn't think the rock was that close to the surface, so we drilled another hole about 25' West, toward the crossroads; in this hole it was the same, rock at 6" 2" and very faint traces of ore. After this we dug a test pit about 300' from crossroads (east); here it was ledge rock, pebbles, fragments of ore (about 3" to 4"), all mixed with a reddish clay, fairly good signs of ore at a few inches from the surface, and the larger fragments at about 2' and continuing down to a depth of 5', where we struck a disintegrated shaly dolomite, more or less iron stained, and water. Then the next day, Saturday, we dug a test pit north of crossroads

about 50'. This was all good ore (clean) from surface to about 3½'. Then there was a layer of very hard compact blackish, altered ore, about one foot. Under this was a white and greenish clay, very impervious, showing occasional pieces of hard altered ore, which was so hard after a few inches, that we couldn't pick it, and since it was close to evening, we filled up the pit. I imagine we were getting on to the shale. Tomorrow we're going to scour a bit more with the drill and Monday dig another pit West of C.R. (Didn't want anything on Sunday) Will write you more Monday. Any suggestions? Regards Sincerely, Bob

about Sturgeon Bay ore

Science Hall, Oct. 10, 1922.

Dear Bob: Yours of Saturday evening came this noon and was very welcome. I had begun to think that the natives had captured you. Your results do not look encouraging at first glance but I would not give up yet. In the case of the eastern holes I am far from sure that you did not strike the limestone above the ore horizon. See if you cant find this horizon exposed so that you will know whether or not you are below the ore level. As you probably know the black ore is generally at the top of the ore formation so I am not sure that your last pit got through to the shale. If this is the case then you may have something big but even if not there is still the question of extension to the southeast under the limestone of the hill. Finding water looks bad for that may mean drilling even at shallow depths. I would like very much to see a test south of the cross roadsI would save samples from every foot if you get any thickness of ore.

While you are in the neighborhood you might pick up some more dope of the Calumet Land and Oil exploration in Sec. 36. If you get to Sturgeon Bay you might see Phillips the well driller and seee about that oil showing in the city well. I have looked at the samples and it would be in brown shale if at 800'.

Cheer up and keep trying. Hope to hear better news tomorrow, so,

Good by,

1-1537

GEOLOGICAL SURVEY OF CANADA

CANADA
DEPARTMENT
OF
MINES AND TECHNICAL SURVEYS

QUOTE FILE:

Ottawa, Ontario,
November 12, 1957.

Dear Sir:-

We have recently issued a few publications on Pleistocene Geology and would be pleased to send you complimentary copies of any of those which are of interest to you. These are as follows:

(1) Geological Survey of Canada Bulletin No. 37 - The Erratics Train Foothills of Alberta by A. MacS. Stalker (1956)

(2) Map 2-1956 - Surficial Geology, Fredericton, New Brunswick by Hulbert A. Lee (1957)

(3) Paper 55-7 - Beiseker, Alberta (Surficial Geology, Map and Marginal notes) by A. MacS. Stalker (1956)

(4) Paper 55-15 - Surficial Geology of Edmundston, Madawaska and Temiscouata Counties, New Brunswick and Quebec (Preliminary report and map) by Hulbert A. Lee (1955)

(5) Paper 55-17 - Geological Notes on Central District of Keewatin, Northwest Territories (Map and preliminary account) by G.M. Wright (1955)

(6) Paper 55-19 - Surficial Geology of Deloraine, Manitoba (Preliminary map) by J.A. Elson (1956)

(7) Paper 55-40 - Surficial Geology of Vancouver Area, British Columbia (Map and report) by J.E. Armstrong (1956)

(8) Paper 55-41 - Surficial Geology of Smooth Rock, Cochrane District, Ontario (Preliminary report and map) by O.L. Hughes (1956)

(9) Paper 56-3 - Surficial Geology of Shubenacadie Map-Area, Nova Scotia (Report and map) by Owon L. Hughes (1957)

(10) Paper 56-10 - Geological Notes on Eastern District of MacKenzie, Northwest Territories (Report and map) by G.M. Wright (1957)

At the request of the Pleistocene Section, we are taking the liberty of placing your name on our notification list through which you may request our Pleistocene publications in the future, and be kept up to date as to the results of Pleistocene investigations carried on by the Geological Survey,

Yours truly,

J.M. Harrison,

Per: L.B. Leafloor

LBL/dev

IN REPLY REFER TO:
L58

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
Region Five
421 Walnut Street
Philadelphia 6, Pa.

May 21, 1959

Prof Thwaites: you have probably already been contacted on this matter.
Geo R.

AIR MAIL

Mr. George Hanson
State Geologist of Wisconsin
Madison, Wisconsin

Dear Mr. Hanson:

To facilitate the study of the Ice Age, or Moraine, Park proposal we are arranging for Interpretive Planner Robert H. Rose of our staff to confer with certain geologists in Wisconsin, and elsewhere, who have intimate knowledge of the locations of significant features connected with continental glaciation in the Pleistocene. We would especially like for him to confer with you and with any members of your staff whom you think could be of help.

He also has in mind contacting any active and retired faculty members of the Geology Department of the University of Wisconsin who have a special interest in Pleistocene glaciation in the region. Mr. Rose knows who some of these authorities at the University are, but believes you will know of still others not familiar to him.

His schedule calls for departure here on May 31 and arrival in Madison late June 3 (Wednesday). He hopes he might see you at your convenience on June 4. Since the University will still be in session, he thinks he could arrange for conferences with geology faculty members after his arrival there.

We would appreciate word on whether you would be available at your office on June 4 to discuss the matter. If a few geologists with intimate knowledge of the subject of glaciation in the region occur to you, we would appreciate having you include in your reply information on their names and locations.

Sincerely yours,

Daniel J. Tobin
Regional Director

RECEIVED
MAY 25 1959
Wisconsin Geological Survey
Madison, Wisconsin

May 25, 1959

Mr. Daniel J. Tobin
Regional Director
National Park Service, Region Five
421 Walnut Street
Philadelphia 6, Pa.

Dear Mr. Tobin:

I have your letter of May 21 and will be glad to confer with Mr. Rose on Thursday, June 4.

Prof. F. T. Thwaites has been associated with the study of the glacial geology of the state for almost half a century and should most certainly be contacted. He has recently retired and his address is 41 Roby Road, Madison. Dr. Black is our current glacial geologist and will, I assume, be in the building on June 4. Prof, E. F. Bean, retired State Geologist, should also be contacted. His address is 1210 Sweet Briar Road, Madison. I shall notify the above persons of Mr. Rose" proposed visit.

There are also several federal geologists working in this office on a cooperative groundwater program who have substantial knowledge of the glacial geology of the state and would be available for consultation.

Very truly yours,

WISCONSIN GEOLOGICAL SURVEY

State Geologist

GFH:ac

Sunday P.M.

Dear Mr. Thwaites:-

Today was spent in scouting with the drill; we tried it from all sorts of angles and the main area of ore was narrowed considerable and tomorrow we will find our definitely how thick it really is. I didn't want to do any digging today for fear we

might have so many standing around asking foolish questions, and this other work had to be done anyway. My tests with the drill didn't show the area up so favorable so I didn't go into the proposition with every detail which might be demanded otherwise, because I thought it would be unnecessary under existing conditions. I surely hope something comes of our other proposition. I am wondering if Dr. Leith has heard from his man.

We are staying at a farmer's place just west of Stephenson's Pier. You remember where you set up the instrument in front of the house and a man came up and watched you, and then later they drove

ours of the field with a load of oats. I am sort of glad we're not living in a tent just now, because it sure is cold around here. Saturday, we worked in a cold rain for five or six hours.

I will let you know more about the situation after tomorrow's work,

Best regards

Sincerely,

"Bob"

26th April, 1959

Hotel Eau Claire,
S. Barstow St.,
Eau Claire, Wis.

Gentlemen:

Please reserve me double room with bath for nights of May 8 and 9 for Friends of the Pleistocene trip.

I will be accompanied by Mrs. Thwaites. Enclosed is check for $6.00 to cover registration and Saturday night dinner.

I am enclosing a stamped envelope for reply.

Sincerely yours,

Tenth Annual Field Conference
May 9-10, 1959
MIDWEST FRIENDS OF THE PLEISTOCENE
from
Eau Claire, Wisconsin

First and Last Announcement

The tenth annual field conference of the Midwest Friends of the Pleistocene will be held May 9-10, 1959, in west-central Wisconsin. Problems of mapping and differentiating glacial deposits of pre-Cary age will be stressed. Headquarters will be the Eau Claire Hotel, Eau Claire, Wisconsin, where participants may wish to gather informally Friday evening, May 8.

By agreement a distinct effort is being made this year to reduce the size of the organization and to reverse the trend of increasing cost in time and money, which if continued, will prevent all but State Surveys and other (?) well-heeled organizations from holding a conference. It is hoped that the conference eventually will return to the role it played initially, that of permitting those most interested in the area or topics being covered to participate fully. A Cook's Tour is not contemplated. Services will be kept to a minimum.

Registration for the conference shall be automatic upon receipt of your check or money in the amount of $3.00 to the Eau Claire Hotel to cover the cost of the Saturday evening dinner and use of the dining room for an informal gathering. Deadline for receipt of your reservation shall be Wednesday, May 6, 1959. Dinner receipts may be picked up Friday evening at the hotel. Lunches on Saturday and Sunday will be arranged for the number attending the dinner and can be paid for later.

Housing shall be arranged personally by each participant. For your convenience a list of accommodations in Eau Claire is appended.

Transportation shall be by personal automobile. Because of the distance to be traveled to the first stop, departure shall be at 7:30 a.m. Saturday from an assembly point to be announced Friday night when outlines of the trip will be distributed. A formal guidebook will not be prepared. Those interested in details may wish to bring the following U.S.G.S. topographic maps: Elk Mound, Menomonie, Knapp, Baldwin, River Falls, Red Wing, Maiden Rock, Arkansaw, Durand and Mondovi. The field trip will be confined within lines from Eau Claire to Hudson, Prescott, Mondovi, and back to Eau Claire. The trip will close about noon, Sunday.

For further details address correspondence (which I hope can be kept to a minimum) to:

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

M O T E L S

Name	Units	Capacity	- R A T E S - 1	2	3	4
Albrecht's Motel Rt. # 19 U.S. Hy 12 at 53	28	75	$5.00	$6.50	$8.50	$10.00
Blue Dream Motel Rt. # 28 U. S. Hy 12	8	30	$5.50	$6.00	$8.50	$10.00
Blue Mound Court Rt. # 1 U.S. 12 E of 53	16	50	$4.00	$5.00	$7.00	$ 8.00
Evenox Motel S. Hastings Way U. S. Hy 53	20	76	$7.50	$10.00 12.00	$12.50	$14.50
Garton's Rt. # 19 U.S. 12 E of 53	10	38	$5.00	$7.00	$8.00	$ 9.00
Hillcrest Motel Rt. # 1 Hy 12 E of E.C.	10	26		$7.00 9.00	$9.00	$10.00
Motel DeLuxe Rt. # 4, Chippewa Falls U.S. 53 N of E.C.	15	51	$6.00	$7.00 8.00 twin	$9.00	$12.00
Motel Eau Claire Rt. # 1 U. S. Hy 12	29	75	$7.00	$11.00	$12.00	$14.00
Motel 53 Rt. # 4 U.S. 53 N of E.C.	8	34	$5.00	$6.00	$9.00	$10.00
Northward Court Rt. # 4, Chippewa Falls U.S. 53 N of E.C.	15	62	$5.00 & 6.00	$7.00 8.00 twin	$9.00	$12.00
Scott's Motel Rt. # 4, Chippewa Falls U.S. 53 N of E.C.	10	32	$5.00	$6.00	$8.00	$10.00
Starlite Motel Rt. # 3 U.S. 12 W of Junction	10	22		$6.00 & 6.50	$7.50	
Tork's Motel Rt. # 2 U.S. 12 W of E.C.	10	26	$4.00	$5.00 6.00 twin	$7.00	$8.00
Westgate Motel Rt. # 5 Hy 12 & Cameron St.	16	40	$5.00	$7.00	$8.00	$ 9.00

H O T E L S

	Hotel Eau Claire S. Barstow	Hotel Edwards Galloway St.	Hotel Commercial N. Barstow	Inn Hotel 678 Wis.
Single				
With Bath	$4.50 & up	$4.00 & up	$4.00 & up	$3.50
Without Bath	$2.75 & $3.25	$3.50	$2.50 & up	$2.50
Double				
With Bath	$7.50 & up	$6.60 & up	$6.00	$6.00
Without Bath	$5.50 & up	$5.25-Share Bath	$4.25	$4.50
Twin Beds				
With Bath	$9.00 & up	$7.00	$7.00	$7.00
Without Bath	$6.00		$5.00	$5.00

M O T E L S (Continued)

Name	Units	Capacity	1	2	3	4
White House Motel Washington Heights U.S. 53	25	66	$7.50 & 8.00	$ 9.00 10.00 12.00 twin	$12.00	$14.00

19th May, 1959

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

Dear Dr. Leighton:

I have been slow writing you about the radiocarbon dates in the mimeographed fourth list of the Yale laboratory. I was very tired and sleepy after we returned from Eau Claire and so let things slide.

Careful reading of the list shows no dates from Illinois. The only two which may interest you are Y-488 which is a rerun of the old C-419 which was so far off that it cast much doubt on the entire method. It is now given as 11,280 ± 100 years which is much more in line with the results given in my 1957 paper on the Door Peninsula. As you remarked it shows that laboratory errors were larege in early tests and suggests that many more need redoing. I sent this sample in and so got a report.

The other sample is Y-572, Woodville, Wis. given at 30,650± 1640 years. This sample came from a cut on the Omaha railroad and was collected by the late Samuel Weidman. This and the log found by Black are driftwood and could be much older than the till they are in.

We had a good trip home and arrived about 5.

Sincerely yours,

Report ____. Application of stratigraphic classification and nomenclature to the Quaternary

Introduction

Preparatory to drafting a revision of the Stratigraphic Code (Ashley, and others, 1933) the Commission has published a series of reports on the nature, usage, and nomenclature of different categories of stratigraphic and geologic-time units.

Two categories of rocks having peculiar problems of classification and nomenclature are those of the Precambrian and the Quaternary. A discussion of the nature, usage, and nomenclature of time-stratigraphic and geologic-time units with respect to the Precambrian has been published (American Commission Report 3, 1955).

In 1955 the Commission established a committee on Pleistocene, consisting of J. E. Armstrong, R. K. DeFord, H. N. Fisk, R. F. Flint, J. C. Frye, (chairman, 1955-1957), R. P. Goldthwait, J. F. Lance, and G. M. Richmond, (chairman, 1958), with the expressed objective of collecting opinion on problems of classification and nomenclature in the Quaternary and submitting reports thereon. The present report discusses the application of stratigraphic and certain other kinds of classification and nomenclature to the Quaternary.

Statement of problems

That the principles of stratigraphic classification and nomenclature applicable to Paleozoic, Mesozoic, and Tertiary rocks should apply equally to those of Quaternary age might seem to require no special explanation. Yet, owing to long accustomed habit, the treatment of the Quaternary in North America has differed in several respects from that accorded older rocks, and is in fact so endorsed by the existing code (Ashley, and others, 1933).

The abundant stratigraphic record available from Quaternary deposits, the ease of interpreting genesis and environment of origin, and the opportunity of observing active processes of deposition, erosion and weathering in nature would suggest that the Quaternary stratigraphic record should be easily classified. But this very abundance and variety of available data from the short span of Quaternary time has proven, except for local areas, a deterrent to correlation and to the development of inter-regional chronology by the methods applicable to older rocks.

Two important factors lie behind this difficulty. The first is the problem of physical correlation of the deposits themselves, owing primarily to their commonly thin and discontinuous nature as originally deposited, the extent to which they have been eroded, the variety of their genesis, the similarity of like genetic units of different age, and the lack of fossils diagnostic of age differences.

The second factor, a direct consequence of the first, is the problem of determining time-parallel boundaries, by which time-stratigraphic and geologic-time units may be defined, in rocks that contain but few widespread time-parallel lithologic markers, and whose contained fossils appear to lack abundant critical differences in vertical range.

As a result of these two inherent difficulties a host of substitute and not always reliable criteria have been developed for both the correlation of rock-stratigraphic units and the definition of time-stratigraphic units. For example glacial deposits in the Rocky Mountains have been correlated with the Wisconsin, merely because they appear to be relatively youthful in appearance and to represent the last extensive glaciation in the region; the standard time-stratigraphic subdivisions of the Pleistocene in North America are defined from lithologic units such as till sheets and gravel deposits, whose boundaries, except over relatively small areas are not time-parallel. The boundary between the Pleistocene and Recent (Holocene) has been variously placed: on a faunal basis, at several different unconformities, and at localities marking appoint in the recession of the last glaciation.

Inevitably, in treating the Quaternary as "a thing apart" the definition and usage of stratigraphic nomenclature has proceeded somewhat differently from that for older rocks. The term stage was for many years applied as a "Pleistocene subdivision of formational rank" (Ashley, and others, 1933). Names of morphologic units have been applied to rock-units without redefinition, as have also names of biostratigraphic units, and, in general, a clear distinction has not been maintained between stratigraphic units and other kinds of geologic units.

In the following paragraphs stratigraphic and certain other kinds of geological classification and nomenclature as defined by the commission or in the publications of individual workers for use in the older parts of the geologic column are discussed with respect to their possible and, it is hoped, legical application to the Quaternary. Certain suggestions are also made for the solution of classification problems that are primarily peculiar to the Quaternary.

Stratigraphic units

Stratigraphic units have been defined (American Commission, Report 2, 1952, p. 1628) as "divisions of the rocks of the earth's crust which in a general way parallel the stratification of these rocks", and different kinds of stratigraphic units are no less numerous than the criteria by which rocks may be differentiated stratigraphically. Three bread categories of stratigraphic units have been defined: rock-stratigraphic (American Commission, 1956), time-stratigraphic (American Commission, 1952), and bio-stratigraphic (American Commission, 1957). A fourth category, soil-stratigraphic, has recently been suggested by Richmond and Frye (American Commission, Note 19, 1957). Stratigraphic units, such as the above or any others based on characteristics of the rocks themselves, are clearly set apart (American Commission, 1952, p. 1628) from other kinds of geologic units, such as geologic-time units, which are not of themselves units of rock. This distinction between stratigraphic or material rock classification and other kinds of classification should be made equally clear when dealing with the Quaternary.

Rock-stratigraphic units

Rock-stratigraphic units are divisions of rock, defined by observable physical features, primarily gross or specific lithologic and mineralogic characters; they are concordant or discordant natural bodies with arbitrarily chosen, discernible boundaries, which may be placed at sharp contacts or within a zone of gradation (American Commission, Report 4, 1956).

Fossil content, concepts of time (whether geologic or absolute) and inferred geologic history properly play no part in defining rock-stratigraphic units. Rock-stratigraphic unit boundaries commonly do not coincide with biostratigraphic unit boundaries and, where they do, the units should be independently defined. Radiocarbon dates should not define rock-stratigraphic units. Lithologic markers that are also time parallel, such as ash beds, may define rock-stratigraphic unit boundaries, but the fact that they are time markers should not be a factor in the definition. As is commonplace in Quaternary deposits, "the accumulation of material assigned to a particular (rock) unit may have begun earlier in some localities than in others, and may have ended sooner or lasted longer in different places; also, removal of rock material by erosion may (have) reduce(d) the span of the unit" (American Commission, Report 4, 1956, p. 2005). Rock-stratigraphic unit definitions should thus be independent of time concepts.

The morphologic character of a rock-stratigraphic unit may be a factor in its definition, but should be subsidiary to the character of the rock itself. The same geographic name may be applied to a rock-stratigraphic unit and to its constructional form, but each should be defined separately.

The recognized ranks of rock-stratigraphic units, in decreasing order of magnitude, are: group, formation, member, lentil and tongue, and bed. Of these, the formation is the fundamental unit and units of less than member rank generally are not included in formal classification. Application of these units as defined in American Commission Report 4 (1952, p. 2006-2007) to Quaternary deposits is urged. In particular, the term formation or the lithologic designation of a named rock-stratigraphic unit (i.e. Wisconsin till) should be applied instead of the loose and improper use of the term stage, still found in some reports.

Definition of new Quaternary rock stratigraphic units that are to receive a formal name should include all information suggested in Report 4 (American Commission, 1956, p. 2011), including: (1) the name and location of the geographic feature from which the unit is to be named, (2) the specific location of the type section, (3) facts leading to discrimination of unit, (4) a complete description of type section or sections, giving important identifying features, lithology, and contact relations, (5) criteria for age, (6) observations on aerial extent and correlation, (7) a statement of intent to introduce and establish a new name. In this connection it should be pointed out that many existing and widely recognized named rock-stratigraphic units of the Quaternary have never been adequately defined. The importance of adequately defined rock-stratigraphic units is basic to the framework of stratigraphic knowledge, especially to the correlation of rock units in terms of time. Suggestions for redefinition of rock-stratigraphic units are given in Report 4 (American Commission, 1956, p. 2013).

Time-stratigraphic units

The primary application of time-stratigraphic classification is in the local correlation of strata in terms of geologic time. Thus, "time-stratigraphic units are material units, each of which comprises all rock formed in an interval of geologic time defined by the beginning and ending of the deposition or other mode of origin of those rocks contained in the type section or otherwise designated type of unit". "Time-stratigraphic units differ fundamentally from all other kinds of stratigraphic units in that their boundaries are not drawn on physical properties but are based on geologic time, i.e., they are isochronous surfaces" (American Commission, Report 2, 1952). Formal ranks of time-stratigraphic units are system, series, and stage, as defined in Report 2 (American Commission, 1952). The stage is the fundamental working unit in local time-stratigraphic correlation.

Flint and Moore (American Commission, Note 5, 1948) have pointed out that the term stage has been used in a conflicting and divergent sense in some reports dealing with the Quaternary and that, in fact, such usage is recognized by the existing code (Ashley, and others, 1933). Stage has also been loosely used in a rock-stratigraphic sense as, for example, in describing a local sequence of rock-stratigraphic units without implication of correlation. The Commission has endorsed use of stage as a time-stratigraphic term (American Commission, Report 2, 1952) in conformity with the usage adopted by the 8th International Geologic Congress (Paris, 1900) (Renevier, 1901). Use of the term substage as a subdivision of a stage has been recommended (American Commission, Report 2, 1952).

The boundaries of time-stratigraphic units should be based on objective criteria that are as nearly time-parallel as possible. For purposes of local correlation of Quaternary strata such criteria include faunal zone boundaries, pollen zone boundaries, petrographically distinctive ash beds, eustatically controlled marine shoreline and associated shore deposits not affected by subsequent crustal movement, the terminal deposits of a glacier, soils whose ready identification and regional extent qualify them as time markers, identifiable sequence of varves, and in some instances archeologic cultural levels. Radiocarbon dates keyed to a well defined rock-stratigraphic unit at a type locality serve as a means of dating it in terms of absolute (physical) time, but do not define it as a geologic time-stratigraphic unit. Climatic change inferred from lithologic changes in the stratigraphic succession have been extensively employed as a basis for defining time-stratigraphic units. However, many lithologic boundaries are known to transgress time significantly[1], and others may not be valid as time-parallel markers for more than short distances. The fact that few of the above criteria are reliable time horizons for inter-regional time-stratigraphic correlation is

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[1] The discordance between time and rock in Quaternary deposits is strikingly illustrated by radiocarbon dates from a till sheet in Ohio. These range from about 27,500 years in northerly exposure to 18,000 years at the terminal moraine, a difference in age of about 9,500 years in the top of the same till sheet across a distance of approximately 200 miles (Goldthwait, personal communication). It is thus probable that a greater span of time is transgressed by the surface of the deposit than across its thickness at any point.

evidenced by the many divergent attempts to correlate the so-called standard stages of the midcontinent area with those of other regions, and poses one of the most difficult problems for the Quaternary stratigrapher.

Where a stage is defined formally in combination with a geographic name, the Commission has suggested that the initial letter of stage be capitalized (American Commission, Report 2, 1952). In addition, it is recognized that innumerable time-stratigraphic units of local significance may also be usefully employed and informally named for purposes of local time-stratigraphic correlation. In 1952, a plurality of opinion received by the Commission favored designating such units as stages or substages, but with the initial letter a small s. Most named stages of the Quaternary have been defined with this usage. However, those defined on the boundaries of till sheets and intervening interglacial deposits or soils probably transgress time and therefore should probably not be considered time-stratigraphic units.

Where a time-stratigraphic unit is given the same name as its corresponding rock-stratigraphic unit, care should be taken to indicate whether the time-stratigraphic unit is based on the time of deposition of the type section of the rock-stratigraphic unit or on the entire scope of time embraced by that rock-stratigraphic unit.

Biostratigraphic units

"Biostratigraphic units are bodies of rock strata which are characterized and unified by features of their content of fossils." "The general basic unit in biostratigraphic classification is commonly known as a zone." (American Commission, Report 5, 1957). Zones are named for a characteristic fossil.

Quaternary biostratigraphic units are distinguished on the same basis as those of older parts of the column. It need only be emphasized that though biostratigraphic unit boundaries may coincide with both rock-stratigraphic and time-stratigraphic unit boundaries, care should be taken not to apply a fossil name to a time-stratigraphic unit without proper redefinition at a type locality; nor to treat biostratigraphic units as if they were rock- or time-stratigraphic units. The upper and lower limits of fossil zones are, however, among the most reliable means of defining time-stratigraphic unit boundaries. The three vertebrate faunal zones tentatively recognized in North America appear to be the only currently available, reliable basis for defining time-stratigraphic stages for the Pleistocene of this continent, though pollen zone boundaries show considerable promise of serving to define potential time-stratigraphic units in late Pleistocene and Recent (Holocene) deposits, as they have for many years in Europe.

Soil-stratigraphic units

It has recently been recommended (Richmond and Frye, 1957) that ancient soils in the geologic column be given formal status as "soil-stratigraphic" units distinct from both rock-stratigraphic units and pedologic classification units. The recommendation has particular application to the Quaternary column in which numerous soils have been recognized as distinctive and important stratigraphic markers.

Because a soil is a layer of residual alteration or weathering products formed in large part from, and in, diverse pre-existing rocks it cannot of itself be considered a rock-stratigraphic unit. Thus distinctive classification appears justified, the sole rank or working unit being simply a soil. Names of soils should be chosen and defined in accordance with the rules of nomenclature that govern the naming of rock-stratigraphic units.

The use of soils either as time-stratigraphic units or as markers of time-stratigraphic unit boundaries appears to hold some promise, as many soils are readily identified and essentially time-parallel over large regions.

Other kinds of geologic units

A number of kinds of geologic units useful to stratigraphy, but not of themselves stratigraphic units, have important application to the Quaternary. Among these are geologic time units, absolute (physical) time units, morphologic (physiographic) units and possible varieties of climatic or environmental units such as glacial and interglacial units, pluvial and interpluvial units, units based on inferred or calculated changes in temperature, eustatic sea level and fluctuations in snowline, tree line, the fluctuations of lower limit of frost action, and the like.

Geologic-time units

Geologic-time units are not in themselves stratigraphic units, but are framed in terms of time-stratigraphic units. "Therefore a geologic-time unit comprises the time necessary for the formation of the rocks included in its corresponding time-stratigraphic unit" (American Commission, Report 2, 1952). Ranks of geologic-time classification applicable to the Quaternary are: period, epoch, and age, corresponding respectively to the time-stratigraphic units: system, series, and stage. Though the term subage has been locally applied, and might have widespread usefulness as a subdivision of an age, especially for the Quaternary, the Commission has recommended (1952, p. 1936) that the word time be used informally "for geologic-time divisions corresponding with units smaller than a stage, such as a substage." Further, subage has not been recognized by the International Geologic Congress which in 1900 adopted the term phase for a time unit smaller than an age (Renevier, 1901). Phase, however, has received almost no acceptance in North America.

As the Quaternary period contains but two epochs, the Pleistocene and the Recent (Holocene), the common working unit of geologic time is the age, defined from a stage. Some ages of the Quaternary are defined from stages that are bounded by faunal zones which appear to have inter-regional value as time-stratigraphic units, at least in the middle latitudes. Other ages in the Quaternary have been defined from stages whose boundaries are drawn from lithologic evidence of climatic change in the deposits. As has been pointed out, such a boundary is apt to transgress time significantly with changes in latitude, altitude, and other environmental factors, thereby limiting its value as a time-parallel horizon suitable for defining a stage or age in the sense adopted by the International Geological Congress (Renevier, 1901).

The naming of geologic-time units has been discussed by the Commission (Report 2, 1952). The name of an age is commonly the same as that of the stage from which it is defined, the stage in turn being named either for the rock-stratigraphic unit from which it is defined or after a previously unused geographic name of a feature at or near the type locality. "The International Geological Congress (Paris, 1900) recommended use of the adjectival endings--an or ian for the names of stages and ages, and most of them are universally known in this way (as Bajocian Stage, Bajocian Age). It is also permissible to use simple geographic names without special endings in naming stages and ages (as Chemung stage, Chemung age) provided ambiguity is avoided."

Absolute (physical) time units

The advent of radiocarbon dating has made available to students of the Quaternary a much more accurate means of dating than is currently available for older parts of the geologic column. Radiocarbon dates are a measure of absolute, physical, or calendar time and are commonly expressed in years B. P. (Before present, i.e., date of analysis). Radiocarbon dates are a valuable means of relating rock-stratigraphic, time-stratigraphic and geologic-time units to absolute time. In places, where radiocarbon dates can be keyed to the boundaries of a readily identified rock- or time-stratigraphic units, they serve to describe such units in terms of absolute time. Care should be taken, however, not to define a geologic time-stratigraphic unit in terms of absolute time, and conversely not to apply the terms age (in a geologic time sense) or stage (in a time-stratigraphic sense) to units defined on the basis of absolute time.

Climatic- or environmental-time units

Common usage of the terms glacial stage and interglacial stage in reports on the Quaternary reflects the long continued custom of defining stage boundaries on the assumption that lithologic changes from which climatic change can be inferred are essentially time parallel. That such rock boundaries transgress time over more than very local areas is however, an accepted fact. Yet, the concept of alternating glacial and interglacial intervals whose duration varied more or less uniformly with latitude, altitude, and other environmental factors is as important to an understanding of the Quaternary as a comprehension of the time element involved in the advances and recessions of epicontinental seas is to the Paleozoic and Mesozoic. These wedge-shaped units of geologic time represent the duration of a particular climate or environment with respect to its geographic distribution. At least for purposes of the Quaternary such climatic or environmental time units might simply be designated as intervals, and named informally after the geographic name of the lithologic unit from which they are defined. Thus, for example, the Kansas glacial interval (or glaciation) would represent the time of deposition of the Kansas Till which lasted longer at northern latitudes than at southern. The Yarmouth interglacial interval would represent a time of soil-formation or climatic amelioration which lasted longer at southern latitudes than at northern. Similar treatment might be accorded pluvial and interpluvial intervals, thermal intervals based on inferred or calculated temperature changes, and other such climatic or environmental intervals. In this manner, the existing widely recognized geographic nomenclature currently applied to stages of the Quaternary defined on time-transgressive lithogenetic boundaries could serve a useful purpose in the correlation of climatic events without misunderstanding or misuse of the time-parallel concept implied by the term stage.

Morphologic (physiographic) units

Morphologic or physiographic units, defined in terms of surface forms, have great significance and utility in studies of the Quaternary. Such a unit is, however, a surface--either depositional or erosional--not a body of rock, and therefore cannot be a stratigraphic unit and should not be used with stratigraphic implications. In this connection, the stratigraphic code (Ashley, and others, 1933) and the Commission (Report 4, 1956) have indicated that the term moraine may be used in a formal sense, i.e., Cary Moraine, both as a morphologic unit and as a rock-stratigraphic unit. Despite common practice to this effect, it is suggested that such dual formal use of a word is confusing, even where adequately defined. The term moraine should be reserved for the morphologic unit and the terms till or drift for the rock-stratigraphic unit.

A geographic name that has been applied by definition to a morphologic unit should not, without adequate redefinition, be applied to the associated rock-stratigraphic unit, and even then in many instances caution should be exercised. For example, a constructional form and its associated rock-stratigraphic unit might logically have the same geographic name. However, what of erosional forms and rock-stratigraphic units on which they are cut or which overlie them? In figure 1a the question arises whether the same geographic name could apply to any of the lettered units; the strath or erosion surface (A), the rock-stratigraphic unit (B), the constructional surface (C) of the rock-stratigraphic unit, or the erosional scarp (D) cut across rock-stratigraphic unit (B) to some depth into bedrock, thus forming the terrace (C-D). In figure 1b can a geographic name that has been applied to the terrace (A-B), which includes the constructional surface (A) of rock-stratigraphic unit (C) and the erosional scarp (B), also be applied to either or both of the rock-stratigraphic units (C and D) across which the scarp of the terrace is cut? These and similar problems can rarely be answered categorically. Each should be judged on its own merit with emphasis centered on clarity of meaning, and on which units, if any, actually require formal nomenclature.

Figure 1a

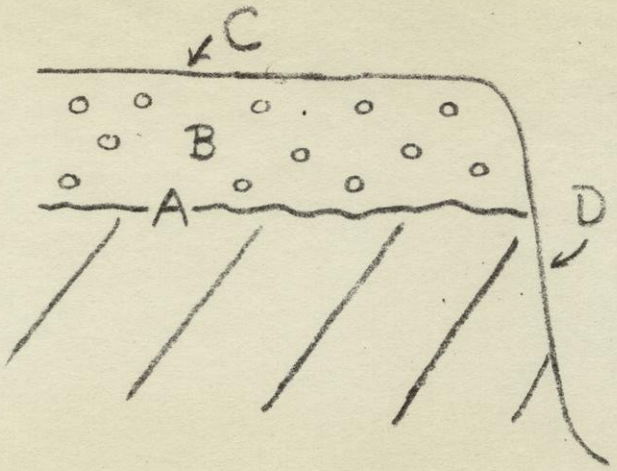
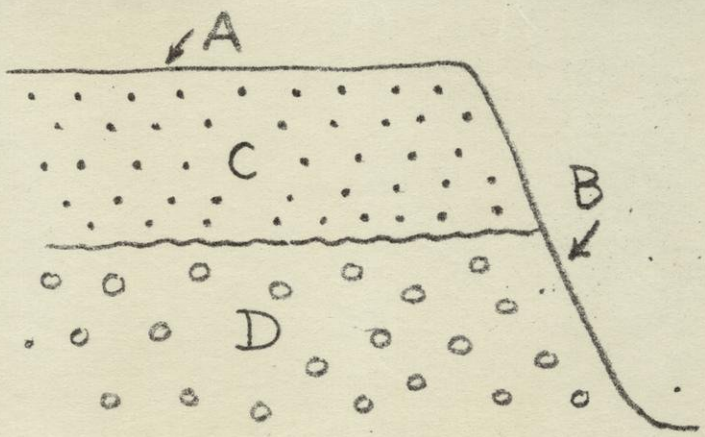


Figure 1b



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MORRIS M. LEIGHTON
611 WEST PENNSYLVANIA AVENUE
URBANA, ILLINOIS

August 11, 1958

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

Dear Fred:

A majority of those to whom I sent my multigraphed letter of June 24th have replied stating in effect that they favored the suggestion of holding a meeting of glacial geologists who are familiar with the classic area. A few who have not replied may still do so since Gerry was late in mailing his report.

Some have suggested that we have an earlier meeting than the St. Louis date, and that it be held in Chicago, the center of glacial studies over the years.

Can you attend a meeting in September in Chicago? Do you have a preference for any of the Saturdays in September? Time? Your prompt reply will be appreciated, also any suggestions you have, regarding the agenda, etc.

It would be desirable for everyone to be prepared to discuss Gerry's preliminary report.

Cordially yours,

Morris M.

Morris M. Leighton

To Dear Fred:

FROM DR. M. M. LEIGHTON

There a slip of a temporary secretary your name was left off. It was on my original and I had been expecting an answer. Trowbridge called my attention to it.

Morris Mch.

7/12/58.

THE CHAMPLAIN PRINTERS PHONE 3535 BURLINGTON, VERMONT

MORRIS M. LEIGHTON
611 West Pennsylvania Avenue
Urbana, Illinois

June 24, 1958

Ernst Antevs	Paul MacClintock	Robt. P. Sharp
E. T. Apfel	Helen M. Martin	Wm. D. Thornbury
J Harlen Bretz	W. M. Melhorn	A. C. Trowbridge
Charles N. Brown	Louis L. Ray	Wm M. J. Wayne
G. E. Ekblaw	Robt. V. Ruhe	H. B. Willman
Chauncey D. Holmes	Robt. Schneider	H. E. Wright, Jr.
Laurence M. Gould	Paul R. Shaffer	Jas. H. Zumberge
Jack L. Hough		

F. J. Thwaites

Dear Colleagues of the Classic Pleistocene Area:

Some time ago, Gerry Richmond, Chairman of the Pleistocene Committee, American Commission on Stratigraphic Nomenclature, was good enough to send me a preliminary draft of a report on "Application of stratigraphic classification and nomenclature to the Quaternary" for my reading and comments. A copy of my comments of June 2, 1958 and of subsequent correspondence with Gerry are herewith enclosed, with his ready consent.

I felt obliged to dissent from the report in its present form for the reasons stated, one being that the recommendations made are those of a committee composed of persons who, in the main, represent areas of research that are marginal to or remote from the classic glacial drift area of the world. The omission of representatives from this source area of the North American classification moves me to rise to a point of order. The point of order is that this committee to whom is entrusted the high charge of formulating an annotated classification, designed to promote scientific inquiry and documentation, should be representative of all of the various geographic areas, including of course the area where much of the basic evidence is so clearly portrayed. To have it otherwise is to defeat the aims of the committee.

I suggest that we who appreciate from our research the basic importance of the classic area to any classification of the Pleistocene, consider meeting for group consideration and expression in connection with the meetings of the G. S. A. at St. Louis in November. In case you favor this suggestion, and the reason for it continues, I shall proceed with the arrangements, consult with some of you

regarding the planning and the agenda, and inform you as soon as possible. Please indicate the earliest date that you could attend. Our meeting should precede the other.

In closing I wish to reiterate what I said in my comments of June 2nd, that the preliminary report has its fine points. I doubt if anyone opposes a careful study of the present classification or any change if it will more effectively promote the science. The change that is most needed right now, however, is to correct the organizational shortcomings of the Committee.

I shall appreciate your suggestions if it appears to you that any person who qualifies has been omitted from my list.

Sincerely yours,

Morris M. Leighton

P. S. Gerry plans to send each of you a copy of the preliminary report.

Cc. for the information of
Gerald H. Richmond
Chairman of the Pleistocene Committee
John C. Frye
Chairman of the Commission

Enclosures

American Commission on Stratigraphic Nomenclature

Nov. 1957-Nov. 1958

Manuel Alvarez, Jr.	SGM	John C. Frye, Chairman	AASG
M. N. Bramlette	AAPG	Charles B. Hunt	USGS
Lewis M. Cline	GSA	Kenneth E. Lohman	USGS
Carle H. Dane	USGS	Ernesto Lopez Ramos	AMGP
Ronald K. DeFord*	GSA	Raymond C. Moore	AASG
Jesus Ruiz Elizondo	Mexico	Grover E. Murray	AAPG
Charles Deiss	AASG	Louis C. Sass	AAPG
R. J. W. Douglas	GSC	C. H. Stockwell	GSC
Hans Frebold	GSC	Harry E. Wheeler	GSA

*to be replaced by John Rodgers after Nov. 1958 meeting.

Pleistocene Committee

J. E. Armstrong	R. P. Goldthwait
R. K. DeFord	J. F. Lance
H. N. Fisk	Wm. C. Putnam
R. F. Flint	G. M. Richmond Chairman, 1958

C. Bertrand Schultz is Chairman, S. V. P. Pleistocene Committee.

MORRIS M. LEIGHTON
611 West Pennsylvania Avenue
Urbana, Illinois

June 23, 1958

COPY

Dr. Gerald M. Richmond
Chairman, Committee on Pleistocene American
Commission on Stratigraphic Nomenclature
c/o General Geology Branch
U. S. Geological Survey
Denver Federal Center
Denver, Colorado

Dear Gerry:

Having considered yours of June 16th, I do not question your desire to be fair, but am concerned that apparently you do not plan action on one essential.

If any importance is to be attached to the matter of classification, which to me is significant; if it is good scientific practice to explore with informed students in all areas before deciding what viewpoints shall govern--then you must give precedence to the matter of correcting the organizational shortcomings of your committee; this before you consider having a "hearing," with the potential participants from the classic area sitting on the side-lines.

Later, I note, you expect to have someone from this area placed on the small final committee to share responsibility for the ultimate report along already-determined lines.

I hope that I have misunderstood and that you can extend the necessary assurances. In the meantime I am writing my associates, attaching copies of our correspondence. Herewith is a copy of my letter to them which contains their names, and I would appreciate it if you would forward each of them a copy of the preliminary report that you sent me.

If we have a meeting in St. Louis it should precede yours as matters now stand.

Sincerely yours,

Morris M. Leighton

Enclosure

(Seal)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Geologic Division
Denver Federal Center
Denver, Colorado

COPY

June 16, 1958

Air Mail

Dr. Morris M. Leighton
611 West Pennsylvania Avenue
Urbana, Illinois

Dear Morris:

Your letter of June 11 catches me at work on the ACSN Report, and I am delighted to learn that you still have the problem in mind.

It seems to me that if the report is to be of any value to the profession, that it would be well to iron out as many points of known disagreement as possible in advance of publication. I would not want my name to appear as chairman of the Report, knowing that you and others were dissatisfied. Furthermore, I have no desire to take part in any controversy in print.

I agree fully with you that haste is not a factor and, although the Commission has expressed a desire to have the report this fall, I would be glad to defend deferrment on the grounds that a substantial disagreement remains to be worked out.

Therefore, if you are considering acquainting your colleagues with what you have written me, I would like again to invite each of you to meet with us in St. Louis to fully discuss the manuscript, with the idea of revising or rewriting such parts as may seem necessary as a result of these discussions.

Naturally, I would want to name one or more to membership on the committee to take part in any rewriting that appears necessary, and to share responsibility for the report with the rest of us.

If you will forward me a list of those interested in this proposition I will be glad to send to each a copy of the report and an invitation to attend a discussion in St. Louis. At that time selection of one or more to participate in further work on the Report can be mutually arranged.

Your request to enclose a copy of my letter of June 2, 1958, and of this letter also if you will, is much appreciated.

Sincerely yours,
(Signed) Gerry Richmond

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

MORRIS M. LEIGHTON
611 West Pennsylvania Avenue
Urbana, Illinois

June 11, 1958

COPY

Dr. Gerald M. Richmond
Chairman, Committee on Pleistocene American
Commission on Stratigraphic Nomenclature
c/o General Geology Branch
U. S. Geological Survey
Denver Federal Center
Denver, Colorado

Dear Gerry:

I am considering acquainting my colleagues in the classic area with what I have written you, and in case you have no objections I should like to enclose a copy of your letter to me of June 2, 1958. Kindly let me know if this would be satisfactory to you.

Sincerely yours,

Morris M. Leighton

MML:jp

MORRIS M. LEIGHTON
611 West Pennsylvania Avenue
Urbana, Illinois

June 7, 1958

COPY

Dr. Gerald M. Richmond
Geologic Division
Denver Federal Center
Denver, Colorado

Dear Gerry:

I thank you for your letter of June 2 and for your own gracious invitation to join you and your Committee in your review of the report at St. Louis next November.

I regret that I must decline for cogent reasons. This decision is unavoidable under the circumstances that have attended the selection of the Pleistocene Committee, and in view of the opportunity now lost for representatives of the classic area to participate in the preliminary discussions so necessary to the determination of viewpoint and content of the report. As matters now stand I feel obliged to await the publication of the report at which time I can best judge its merits and shortcomings from the standpoint of the science.

Sincerely yours,

(Signed) Morris M. Leighton

(seal)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Geologic Division
Denver Federal Center
Denver, Colorado

COPY

June 2, 1958

Air Mail

Dr. Morris M. Leighton
611 West Pennsylvania Avenue
Urbana, Illinois

Dear Morris:

Thank you for your letter and pertinent comments on the Pleistocene Committee's proposed report. I have felt the lack of someone from the classic area on the committee, but until now have not been in a position of choice. The present group who are writing this report include J. E. Armstrong, R. K. DeFord, H. N. Fisk, R.F. Flint, J. C. Frye, R. P. Goldthwaite, J. F. Lance, W. C. Putnam, and myself. As chairman I am both entitled and delighted to ask you to join us in our review of this report at St. Louis next November. If you do not feel up to this, I would be glad to invite Trow.

I have been advised that the function of this committee expires with the completion of this report and that final writing of that part of the stratigraphic code dealing with the Quaternary will fall to another group named by Ray Moore. This second group, includes R.F. Flint, C.B.Hunt, W. C. Putnam, C. B. Schultz and myself (chairman). Again, I note the absence of mid-continent personnel, but in this instance, I could only suggest additional personnel to Ray.

That your viewpoint with respect to the objective of the report -- to bring the treatment of Quaternary stratigraphy into line with that applied to the older parts of the column -- is apparently the opposite of my own and of that of others on the committee makes it imperative that it be given due consideration. I am sure you are not alone in your views and though the comments received from about fifty critics suggest that we are satisfying the majority of those working in the field, I would prefer that others have the opportunity to express their views fully in advance of publication.

I am sorry that I could not attend the Friends meeting in North Dakota and talk these matters over with you at first hand.

With warmest personal regards,

(signed) Gerry Richmond

Gerald M. Richmond

MORRIS M. LEIGHTON
611 West Pennsylvania Avenue
Urbana, Illinois

May 29, 1958

COPY

Dr. Gerald M. Richmond
Chairman, Committee on Pleistocene American
Commission on Stratigraphic Nomenclature
c/o General Geology Branch
U. S. Geological Survey
Denver Federal Center
Denver, Colorado

Dear Gerry:

Herewith are my comments. I have made notes on the copy that you sent me and trust that I may keep it.

I had hoped to see you on the North Dakota trip.

Sincerely yours,

M. M. Leighton

In response to Richmond's
request of 4/25/58

May 29, 1958

COPY

Comments on Proposed Report on
"Application of Stratigraphic Classification
and Nomenclature to the Quaternary"

I regret that I must dissent from this report in its present form. It urges that the same pattern of stratigraphic classification and nomenclature be applied to the Pleistocene as has been heretofore worked out expressly for the older rocks; and this to be done under the auspices of a committee who, in the main, represent by their research areas marginal to or remote from the classic glacial drift area of the world where the present classification was evolved.

Reputable as these geologists are who compose the present Pleistocene committee, authorities though they be in the fields of their research, none of them has that source of intimate knowledge of this classic area so necessary to an appraisal of some of the points involved. On the other hand, none of their professional colleagues who do have extended knowledge of the area has been given speaking voices in the Committee.

According to the report published in the A.A.P.G. Bulletin, v. 38, p. 1334-1335, 1954, a committee on Pleistocene Classification was first established with R. C. Moore in charge. Its membership later included able workers in the Gulf Coast, the Great Plains and the southwest and the northwest margins of the Continental Drift Area, the

Rocky Mountains, and eastern and western United States. Obviously the present report cannot be taken to represent the views of those who have intimate knowledge of the "home area" of the present classification.

In the records of the meeting held in New Orleans this statement occurs:

> "At the request of John C. Frye, chairman of the committee on the Pleistocene, the Commission formally resolved that a three-fold classification consisting of (a) rock-stratigraphic, (b) time-stratigraphic, and (c) time units, such as that recommended by the American Commission (1947-1952), be applied to the Quaternary."

It is possible that I fail to remember, but I do not recall any previous discussions of this matter by him with his colleagues.

T. C. Chamberlin put his finger on the viewpoint that must be recognized but is not apparent in this proposed report when he wrote, at the very beginning of his chapter on "The Pleistocene or Glacial Period" in volume III of his and Salisbury's textbook:

> "Though it derives its systematic name from the fact that its life constitutes the closing stage of the transition from the great past to the present, the distinguishing feature of the Pleistocene period is its phenomenal glaciation. Ice-sheets spread over six or eight million square miles of the earth's surface where not long before mild climates had prevailed. Were it not for this great ice deployment, and for its profound effects on the conditions under which man has developed, this period would more properly be joined to the Pliocene, the two constituting a single period of great land relief and oceanic restriction."

Chamberlin also emphasized throughout his distinguished career a fundamental principle of classification that seems to be completely buried in this proposed report by technicalities which we all recognize in fact, if not in the same terms. He stressed that the geologic classification should be natural just as there were natural divisions in the history of geologic times. He, more than anyone else, directed the building of the present classification of the Pleistocene in that spirit. Is it possible that the responsibility for recommending revisions to that classification is to be placed exclusively on a selected group whose research has not been an extended one in the classic area?

Needless to say, this proposed report is not all bad. It contains some fine points, but it needs to be entirely revamped in expression of viewpoint, pattern of organization, and clarity of expression. I trust that there is not the feeling that haste is imperative. Haste has no part in good scientific practice. No one objects to changes if changes are warranted. Let us have an analysis of the present classification that recognizes (1) how it evolved, (2) its short comings, if such, (3) any special virtues that are inherent in the Commission's stratigraphic classification insofar as it can be applied to the Pleistocene, and (4) suggested changes in nomenclature that might logically follow.

Because of the fact that there is no one on your committee who is steeped by experience in the glacial geology of the classic area, I suggest that you consider

an authority like Arthur C. Trowbridge, to work with you, whose familiarity with the whys and wherefores of the present classification and whose fairness and open mindedness cannot be questioned.

M. M. Leighton

General Geology Branch
U. S. Geological Survey
Denver Federal Center
Denver, Colorado

COPY

April 25, 1958

Dr. Morris M. Leighton
U. S. Geological Survey
611 Pennsylvania
Urbana, Illinois

Dear Dr. Leighton

The enclosed draft of an American Commission on Stratigraphic Nomenclature Report on the "Application of stratigraphic classification and nomenclature to the Quaternary" is sent to you by the Commission's Committee on Pleistocene. It is our hope that you will find time to read it carefully in the capacity of critic and comment constructively thereon. This kind of report should be based on as broad experience as possible, and we are genuinely interested in obtaining your ideas for the benefit of the profession as a whole. Please feel free to express yourself fully.

It is planned to submit the report for approval by the Commission next November after further revision based on your comments and those of others. We would therefore, appreciate it if you could return your suggestions not later than June 1st. The report when published will serve as a basis for revision of the Stratigraphic Code, work on some aspects of which has already begun.

Sincerely yours,

(Signed) Gerry Richmond

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

YALE UNIVERSITY
DEPARTMENT OF GEOLOGY

BOX 2161, YALE STATION
NEW HAVEN, CONNECTICUT

January 15, 1959

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

Dear Mr. Thwaites,

With the publication of the GLACIAL MAP OF THE UNITED STATES EAST OF THE ROCKY MOUNTAINS, the NRC compilation committee would like to thank you most sincerely for the earnest effort you have put into your contribution. We have asked the Geological Society to send you a complimentary copy of the map, and this goes to you with our individual and collective thanks.

The first reaction to the map has been very favorable, and we hope your opinion will be similar. If you find errors, or other points you would like to discuss with the committee, please write to the committee member responsible for your State or other area.

With great appreciation of your contribution to a most useful map,

Sincerely,

Richard Foster Flint

RFF/g

Richard Foster Flint
Chairman
(For the Committee)

3rd October, 1959

Dr. Richard Foster Flint,
Box 2161, Yale Station
New Haven, Connecticut

Dear Dr. Flint:

Through some error I lost yours of 15 January and neglected to thank you for the copy of the Glacial Map of the U. S. east of Rocky Mountains. This came although the tube was broken in passing the Chicago postoffice. However the damage was slight.

I do not like your term "ice contact deposits" including eskers of the ground moraine areas with pitted outwash. I wish we could have discriminated the non-pitted outwash in front of moraines of distinct substages. I can find no such deposits in front of the Port Huron Moraine. This is explained in the new edition of my "Outline of Glacial Geology".

Sincerely yours,

F. T. Thwaites

41 N. Roby Road,
Madison 5, Wis.

Edwardx Brothers,
Publishers,
Ann Arbor, Michigan

Gentlemen:

I have a manuscript on Geomorphology which was written while I was teaching at the University of Wisconsin. It was first prepared to be published by you. Later several publishers of printed books were interested but it was not finished and they dropped out. I also worked for a time with two younger people only to have them loose interst and also drop out. When I retired in 1955 the manuscript was almost finished. Last winter I drafted all the illustrations many of which are proportioned to cover just one column of lithoprinting.

The manuscript, not counting partial pages, now stands at 278 pages all double space on 8½ x 11 paper. The total length of illustrations stands at 974 inches of single column although 47 of the drawings would take two columns.

I fully realize that being retired it is much harder to sell copies although the "Outline of Glacial Geology" which you have done for me is still in demand.

Before going any further on the project I would like to know about what this would cost to finish. I would probably have to do the typing here as I did before but would like an estimate on that also and on the cost of reducing the 47 two column drawings to single column. I have the photographic equipment to do that myself if it is worth while. What do you offer in advertising? Also do you have any offer on financing as you did once before? If I type the manuscrip it will have to be with elite type, single space like the "Outline".

Sincerely yours,