master the spiritual nature and the spiritual development of the individual and of the race.

And, finally, our view of man as the measure of all things is an exhortation to an increase of sympathy and of sympathetic cooperation among all the different sciences. Of the particular sciences and their subordinate branches and subdivisions, there is an ever-increasing number. But their aim is one aim; and in the pursuit of this aim they should be as brethren dwelling together in a spirit of friendly criticism and also of friendly unity. The aim of all human science is the better to understand man by himself, and the greater nature which environs him; and the better to adjust himself to this greater nature, in the pursuit of his economic, social, artistic and religious ideals.

I venture to close with the words which Plato puts into the mouth of Socrates as he closes his conversation with Theætetus:

> But if, Theætetus, you have or wish to have any more embryo thoughts, they will be all the better for the present investigation; and if you have none, you will be soberer and humbler and gentler to other men, not fancying that you know what you do not know. These are the limits of my art; I can no further go; nor do I know aught of the things which great and famous men know or have known in this or former ages. The office of a midwife I, like my mother, have received from God; she delivered women, and I deliver men; but they must be young and noble and fair.

GEORGE TRUMBULL LADD

PLEISTOCENE GEOLOGY OF NEW YORK STATE. II

LAKES

Glacial Lakes: Occurrence.—The term "glacial" is used by the writer to include only lakes which existed by virtue of a glacier ice barrier. The lakes and lakelets now existing and called "glacial" by some authors should be discriminated mostly as morainal or drift-barrier lakes.

The conditions necessary for a glacial lake are a valley or depression sloping toward and blocked by the ice front. These conditions were fulfilled in New York on so large a scale, in area and time, that the state, it is confidently believed, held the largest number and the most remarkable succession, with varied outflow, of glacial lakes of any district in the world. The reason for this superiority is found in the peculiar topography of the western part of the state. In the great Ontario-Erie basin we have a broad depression with its lowest passes on the east and west, and with a deeply trenched southern slope where lie the parallel valleys of the Finger lakes.

The only glacial lakes of which clear evidence is preserved are those which lay against the receding front of the latest ice sheet. But it should be clearly understood that every ice sheet which transgressed the state blocked the waters both during its advance and its recession.

We do not know what portions of the Valley-Heads moraine, which now constitutes the divide and forms the south limits of the basin, were left there by Prewisconsin ice sheets, but we may be quite sure that the lakes during the advance of even the last glacier were somewhat different in dimensions and relations from those of the ice recession, which are the subject of our field study. We may also be sure that the earliest ice invasion found the series of parallel valleys with fairly mature and graded forms, and open clear through to their heads, and the larger ones heading in Pennsylvania. Those earliest ice-impounded lakes must have been longer and deeper in the valleys than the lakes of later episodes, when the valleys had become more or less occupied by glacial and lake deposits. The lacustrine conditions of the episodes antedating the Laurentian ice retreat are as yet a matter of interesting speculation. One further difference may be noted between the ice-advance and the ice-recession lakes. The primitive lakes of the ice advance were the lowest in altitude and the most northerly in location and with the lowest outlets. As the ice advanced and closed the outlets the waters were lifted to higher levels and pushed southward. The last lakes of the ice advance being in the heads of the valleys were the smallest, the highest, the most detached and most southerly. The lakes of ice-front recession had precisely the opposite history.

Erosional Work.—The lake features that are preserved for our study may be discriminated as erosional and constructional. The erosion phenomena are the wave-cut cliffs. The glacial lakes were commonly too ephemeral or too unsteady in their levels to produce conspicuous erosion features. However, the larger and longer-lived lakes, as Newberry, Warren, Dana and specially Iroquois, have left many cliffs.

Constructional Work.—Beach Ridges, embankments of sand and gravel, the bars and spits of wave and shore current construction, are the complement of the erosion work but are much more common and are frequently very prominent features. They have long been recognized by the people as the work of mysterious waters at high altitudes. For long stretches the beach ridges have been utilized for "ridge roads," while the level stretches of wave-base along the beaches have afforded graded paths for railroads and canals. The strongest ridges are those of Whittlesey and Warren in the Erie basin, and of Iroquois in the Ontario basin.

Deltas: Of the several shore phenomena deltas are the most useful in proving the former presence and determining the altitudes of the extinct lakes. The production and size of the delta deposits are not wholly conditioned by the size of the receiving water body, but by the volume of the stream detritus relative to the distributing work of the receiving waters. Hence deltas may be built in small lakes, and these hung-up mounds and terraces of gravel on the valley sides serve well to mark the shores of lakes that were too ephemeral or too small to produce either cliffs or bars. Naturally the deltas occur in the courses of land streams, and a vertical succession of bisected delta terraces commonly indicate the falling levels of the lake. Fine examples of these gravel terraces are found on the slopes of the Finger lakes valleys and some of them are conspicuous features, like the terraces by Coy glen, visible from the Cornell University campus.

Delta Plains: Genetically related to deltas are the plains of gravel, sand or clay which may be extended in area and indefinite in limits. Such plains usually represent wave-base, perhaps twenty feet or less beneath the water surface. When partially eroded the remnants present extended horizontal lines, excellent examples of which may be seen throughout the Mohawk Valley and about the Irondequoit Valley east of Rochester, clearly visible from the trains on the New York Central Railroad. Some of the larger valleys declining toward Lake Erie exhibit broad terraces at various levels. A fine display may be seen from the Pennsylvania Railroad from East Aurora up to Machias. Evidently such lake plains can occur only north of the divide. Some plains similar in appearance in the valleys south of the divide fall into the categories of outwash plains or of river flood plains.

Scores of examples of detrital plains built in glacial waters by the land drainage might be cited. In the Erie basin the great plain in the Cattaraugus Valley below Gowanda and that built by Silver and

Walnut creeks between Forestville and Silver Creek villages may be mentioned. A very fine illustration is found on the Rochester sheet. The area between the Genesee River and Irondequoit Bay and between Lake Ontario and Iroquois beach ("Ridge Road") is the submerged delta plain of the Genesee River in Lake Iroquois, now much dissected by present-day streams. The flat stretches about Irondequoit Bay bounded by the 400-feet contour are remnants of the silt plain which in Iroquois time filled the whole breadth of the valley.

Sandplains built by the ice-border glacial drainage are also numerous. These include, for example, the plains on the west side of the Genesee Valley opposite Avon; the eroded area north and northwest of Geneva; the mesa-like plains in the Onondaga Valley at South Onondaga and northwest by Cedarvale; and the plain on which stands the business part of Syracuse.

The very extensive and conspicuous sand plains and terraces on both sides of the Champlain and Hudson valleys, including the great delta plain between Schenectady and Albany contributed by the Iromohawk River, were built in sea-level waters that occupied this depression during the time of the ice removal.

Clay Plains: Where the static waters were wide and deep so as to permit full assorting of the detritus, more or less clay was spread over the bottom in the more quiet water. The best example is found in the Iroquois Lake basin. In the St. Lawrence Valley east of Cape Vincent, Alexandria Bay and Ogdensburg are extensive stretches of finely laminated and deep clays, the glacial origin of which is indicated by the abundance of lime concretions. The heavy clay deposits of the Hudson Valley belong in this class, but were deposited in sea-level waters.

Morainal Lakes.—This class includes the hundreds of lakes and lakelets (so-called ponds) now in existence that are scattered over the state and most numerous in the Adirondacks. They owe their existence to the blockade of valleys or drainage courses by glacial drift. The term drift-barrier lakes would be the more accurate name. Great numbers of such lakes have already been obliterated, mostly changed into swamps by marl and peat accumulation or by detrital filling; and all these lakes are doomed to similar ultimate extinction either by filling or draining.

The Finger lakes probably owe their origin in part, at least in their upper levels, to drift barriers.

Cataract Lakes.—The most singular and interesting lakes in the state lie in the courses of ancient ice-border rivers. These occupy the plunge basins of extinct cataracts. Niagara to-day illustrates the method in production of a basin or bowl by the excavating work of a large cataract. If Niagara River were to be diverted above the fall so as to extinguish the cataract a rock basin holding a lake would be left in the amphitheater beneath what is now the "Horseshoe" falls. South and east of Syracuse the predecessors of Niagara River plunged over cliffs of the Onondaga limestone in their eastward flow and produced several plunge basins with lakes, two of which outrival Niagara.

The Jamesville Lake, four miles southeast of Syracuse, is a circle of emerald-green water about one eighth mile in diameter, and 60 feet deep, lying in a half-circle amphitheater with perpendicular rock walls 160 feet high. Two and one half miles east of Jamesville Lake, across the Butternut Valley, is Blue Lake, resting in a cataract basin and rock amphitheater equaling the Jamesville in dimensions but not so symmetrical. White Lake, one half mile north of Blue Lake and Round and Green lakes nine miles east of Syracuse, have basins with low and sloping walls because the rocks are the soft Salina shales.

These lakes were formerly regarded as mysterious and with their enclosing amphitheaters were the cause of much speculation. Their nature was first announced by G. K. Gilbert and the first geologic description in recognition of their true character was by Quereau.[10]

These cataract lakes are very remarkable features, and representing as they do an ancient drainage of the Great Lakes area, held at high levels by the glacier front, they have a scientific and educational value not yet appreciated.

Lakes of Complex Origin.—This title is intended to include Lake Ontario and the larger Finger lakes, as Cayuga and Seneca, the genesis of which is not entirely clear. The bottoms of these lakes are below sea-level, and we do not know what depth of drift lies yet deeper beneath the water. At Watkins a well boring penetrated 1,200 feet without reaching rock, which shows drift at a depth 600 feet lower than the deepest part of the lake, and 750 feet beneath sea-level.

It seems probable that the valleys of the Finger lakes are blocked on the north, along the drumlin belt, by deep drift fillings, which can be determined only by borings at close intervals. That these valleys were gouged out by ice erosion, even by any number of continental ice sheets, seems to the writer extremely improbable. If they were so deepened, then the basin of Lake Ontario was probably also scooped by ice erosion. But if the Ontario basin is a depressed river valley, then the valleys of the Finger lakes must be fairly graded to the bottom of Ontario and be of similar origin. If the Ontario and other basins were excavated by river work and weathering, then it must be admitted that there have been great changes in the height and attitude of the land in late geologic time. But such changes are quite certain. It appears probable that the valley-cutting occurred during a time of land elevation, and that the Laurentian and the Finger lakes basins are the complex product of land warping, land depression, and of glacial drift filling. Until the later Tertiary and Pleistocene diastrophic movements of the area including New York have been determined and the drift-buried valleys mapped by borings the deep lake basins may remain the subject of speculation and dispute.

[10] "Topography and History of Jamesville Lake," by E. C. Quereau, Geol. Soc. Am., *Bull.*, Vol. 9, pp. 173–182, 1898. See also illustrated article by Fairchild in the 20th Ann. Rep., N. Y. State Geologist, 1900, pp. 126–129.

GLACIAL LAKE SUCCESSION

The story of the succession of the glacial waters that laved the receding front of the Laurentian glacier is a dramatic episode in the geologic history. Beginning in small pondlings of water in the heads of the valleys along the north side of the morainic divide, the lakes were enlarged as the ice barrier receded, and were captured, drained, blended or otherwise affected by changes in outlets. The romantic story can not be satisfactorily told in words alone, but requires cartographic representation, and a series of maps has been constructed to show the better known and more striking changes in the ice recession and the lake succession.

The control of the glacial waters depended on the altitude of the lowest passes affording immediate outflow along with the relation of these passes to some ultimate escape. The waters of the Laurentian basin outflow to-day by the St. Lawrence

(246 feet). With that escape blocked the lowest pass is at Rome (460 for the water surface) to the Mohawk-Hudson, and which for many thousands of years was the point of escape of the waters while the ice body lay over the St. Lawrence Valley. The next higher pass is at Chicago, which was occupied by the glacial outflow for a very long time, but to reach this ultimate escape the Ontario-Erie-Huron waters were compelled to cross Michigan by the valley of Grand River.

The lowest pass leading southward in New York is at Horseheads, the head of the Seneca Valley, leading to the Chemung-Susquehanna with altitude of 900 feet. These three outlets, Horseheads, Grand Valley, Michigan and Rome were the channels of ultimate escape for the waters of western and central New York until the ice was removed from over Covey Gulf, north of the Adirondacks. In immediate control of the waters of central New York, the Seneca-Cayuga depression and the Genesee basin, there were two localities, the salient or highland on the Batavia meridian and the highland in the Syracuse district. The earliest glacial waters in New York were held in the Genesee Valley, and this continued for a long time as a distinct basin with several successive outlets.

When we consider the glacial lakes and drainage in chronologic order we find that the earlier waters were confined in two separate basins, the Genesee and the Seneca-Cayuga. That for a brief time the Horseheads outlet (Lake Newberry) probably occupied the Genesee Valley, and then for a long time the control was alternately west on the Batavia meridian or east in the Syracuse district. Then, when the ice front weakened on the Batavia salient the westward control was across Michigan (Lake Warren level). All the later flow, subsequent to Lake Warren, was eastward to the Hudson until the northward flow through Covey Gulf and the Champlain Valley to the Hudson.

The most extended series of glacial lakes was in the Genesee Valley. This long valley, the surviving example of the Prepleistocene northward drainage, heads in Pennsylvania, at the terminal moraine, with altitude on the cols over 2,200 feet, and extends across the state to near Rochester, where it blends into the Ontario lowland at about 600 feet altitude. The fall of 1,600 feet in a right-line distance of 80 miles gave opportunity for many successively lower outlets and water planes as the ice released passes on the east or west borders of the basin. Probably the glacial lake history of the Genesee Valley is more complicated than is now known, but no less than eighteen distinct outlets with correlating lake levels have been recognized. Then the drainage was directly into the sea (Gilbert Gulf), and finally into Lake Ontario. In this varied outflow the Genesee glacial waters were contributed to several far-separated river systems. Named in order of time these are: (1) Pine creek-Susquehanna; (2) Alleghany-Ohio-Mississippi; (3) Canisteo-Chemung-Susquehanna; (4) Erie basin (Lakes Whittlesey or Warren)-Michigan basin (Lake Chicago)-Mississippi; (5) Seneca Valley (Lake Newberry)-Susquehanna; (6) Mohawk-Hudson; (7) Champlain-Hudson; (8) Ocean-level waters direct; (9) Lake Ontario-St. Lawrence. Some of these systems received the Genesee Valley overflow more than once, or by different immediate outflow, making the twenty stages in the drainage history as now understood. It would seem unlikely that any other valley in the world can approach the Genesee in the complexity of its drainage history.

The series of seventeen maps depict the waning Laurentian ice sheet with the glacial and marine waters that lay against its receding border. The local lakes in the side valleys of the Hudson depression and about the Adirondack highland are not indicated; and the ice border is more or less generalized. The latter is located definitely along the lines of the ice-border drainage.

GLACIAL LAKES OF NEW YORK STATE

Drainage Provinces						
Erie	Genesee	Seneca	Mohawk	Black	St. Lawrence	Hudson-Champlain
Ice	1. Three Primary	*Ice*	*Ice*	*Ice*	*Ice*	
	2. Pennsylvania					
	3. Wellsville					
	4. Belfast-Fillmore					
	5. Portage-Nunda	Several Primary				
Whittlesey	6. Dansville					*Hudson inlet* (*marine*)
	7. Mt. Morris-Genesee	Newberry	Herkimer Schoharie Amsterdam			
	8. Newberry					
Warren	9. Hall	Hall		Forestport Port Leyden Glenfield		
	10. Vanuxem	Vanuxem				
	11. Avon	Montezuma	*Glacio-Mohawk river*			
	12. Second Vanuxem	Second Vanuxem				*Hudson-Champlain inlet*
	13. Warren	Warren				
Dana	14. Dana	Dana				
Erie	15. (?)	Iroquois	*Iromohawk river*			
	16. Dawson			Iroquois		
	17. Iroquois				Iroquois	
	18. Second Iroquois.	Second Iroquois	*Mohawk river*	*Black river*	Second Iroquois	
	19. *Gilbert Gulf* (*marine*)	*Gilbert Gulf* (*marine*)			*Gilbert Gulf*	*Hudson-Champlain strait*
	20. *Ontario*	*Ontario*			*St. Lawrence river*	

The accompanying chart shows the time relationship of the waters in the several basins of the state. The vertical spacing is only suggestive of the succession of the waters and their geographic relations, and has little significance as to the duration of the episodes.

MARINE WATERS

During the waning of the latest ice sheet the Hudson-Champlain Valley and the St. Lawrence and Ontario basins were beneath the level of the ocean. As the ice front receded northward the sea-level waters followed up the Hudson Valley, finally reaching the Champlain basin and eventually uniting with the oceanic waters of the St. Lawrence Gulf. The Hudson inlet thus became the Hudson-Champlain inlet and finally the Hudson-Champlain strait, connecting New York Bay with the Champlain Sea. When the ice front backed away from the Covey Hill promontory the glacial waters of the Ontario basin, the Second Iroquois, fell to and became confluent with the sea-level waters. The highest plane of the sea-level waters in the Ontario basin is relatively weak and has not been fully determined, but an inferior level of long persistence showing heavy bar construction has been mapped and named Gilbert Gulf. This stage, which includes the series of strong bars at Covey Hill postoffice, is depicted in map number 16.

On the parallel of New York City it appears that the land at the time of the ice recession was at, or perhaps somewhat above, sea-level. Northward the land was increasingly below sea-level. The upraised and tilted water plane which indicates the amount of Pleistocene submergence or of Postpleistocene uplift rises steadily from zero or present sea-level in the district of New York City to over 750 feet on the Canadian boundary.

The supposed absence of marine fossils in the Hudson Valley is doubtless due to the freshening of the waters by the copious glacial and land drainage. Until the episode of the Second Iroquois the flood of glacial waters of the St. Lawrence basin was poured into the Hudson inlet at Schenectady. During the Second Iroquois the glacial flood was merely shifted to the north, and during all the long life of the Hudson-Champlain inlet all the fresh waters were forced south. However, marine fossils are abundant in the Champlain Valley and are found at altitudes the planes of which carry over the Fort Edward divide into the Hudson portion of the great valley.

The detrital deposits formed in the marine waters are large in volume and area. Up the Hudson as far as Catskill the terraces of clay and sand are very conspicuous and afford the materials for brick manufacture on an immense scale. North of Catskill, in the widening valley, the summit sandplains lie back from the river, though lower terraces may yet be seen. While much of the deeper deposits and those in the middle of the valley or beneath the present waters are of glacial origin, the heavy visible deposits are chiefly the deltas of tributary land streams, the greatest being that of the Iromohawk at Schenectady-Albany.

From Troy to Glens Falls the borders of the lower valley are buried in a deluge of sand, sloping down in terraces toward the axis of the valley. Saratoga lies in the midst of a vast area of detrital marine accumulations. The slow lifting of the valley out of the waters gave the latter an excellent chance to produce level stretches and conspicuous terraces, the latter being more prominent as the steeper slopes approach the middle of the valley. The Champlain portion of the great valley also holds vast sandplains, especially on the larger rivers, as the Ausable, Saranac and Big Chazy.

EPEIROGENIC MOVEMENT. DIASTROPHISM

The great changes in altitude of the surface of the state, both before and since the glacial occupation, has already been noted. The relation of the land movement to the burden of the ice cap should be briefly discussed. If the earth's crust is sensitive to long-continued pressures, then the thickness and weight of the ice body becomes an important matter.

Again our lack of knowledge of the duration and diastrophic effects of the Prewisconsin ice caps limits our discussion to the effects of the Laurentian ice body.

At its maximum the thickness of the ice cap over the Adirondacks and the Champlain Valley was probably not less than 10,000 feet. This is equal in weight to over 3,000 feet of rock. Southward the ice decreased in thickness and weight to zero in the region of New York Bay. The amount of postglacial uplift increases from zero in the district of New York Bay to over 750 feet on the north boundary of the state. The correspondence between the thickness of the ice cap and the amount of postglacial uplift of the land is very striking and significant. All about the Laurentian basin the tilted shores of the extinct glacial lakes afford us evidence of the differential uplift of the glaciated territory.

The average northward uplift or tilt of the marine plane in the Hudson and Champlain Valley appears to be about two and one fourth feet per mile, but some higher and as yet uncorrelated shore features in the Champlain Valley suggest a deeper submergence there and a larger rate of uplift. It seems quite certain that the increase of the gradient northward that is apparent west of the Adirondacks must also occur on the east of that mountain mass. The differential uplift between the Iroquois plane at Rome (460 feet) and at Covey Gulf, on the Canadian boundary (1,025? feet), is about 565 in a distance of 149 miles in a direction 33° east of north, giving a slant of 3.8 feet per mile. The grade from Richland to East Watertown is toward 6 feet per mile.

In east and west direction there is small deformation. The Iroquois plane at Hamilton, Ont., is given as 363 feet. At Rome it is 460 feet, which makes an eastward uplift of 100 feet in 225 miles, 0.4 foot per mile.

The steadiness or uniformity of the tilted marine plane in the Hudson and southern part of the Champlain valleys is somewhat surprising. It does not seem probable that all land uplifting was deferred until the ice was removed from a stretch of 200 miles and that the rise and tilting was that of a rigid mass. It would seem more likely that as the weight of the ice sheet was slowly removed it was followed by a progressive wave of land uplift. However, the final result of an epeirogenic wave-like uplift might be a fairly uniform plane, simulating that produced by tilting of a rigid surface.

Postglacial Erosion

Land erosion since the ice sheet disappeared is exhibited in wave cutting by the lakes and canyon cutting by diverted streams. In postglacial ravines New York state excels. We may recall Niagara, the three ravines in the course of the Genesee, the Ausable chasm, Watkins glen. But there are great numbers of glens or steep-walled rock gorges throughout the state which are quite as interesting and instructive as these, even if smaller and unadvertised.

When applied to the effects of erosion in New York the term "postglacial" needs explanation, for much canyon cutting was effected while the ice sheet still lingered on territory of the state. For example, the Portage ravine of the Genesee began cutting while the ice front was not far away on the north. The Mount Morris ravine, the "High Banks," was in the making while the ice covered Rochester. And the upper (south) section of the Rochester canyon was largely cut while Lake Iroquois waters prevented the excavation of the lower part of the gorge. Certainly a large part of the erosional work in central and western New York and the Hudson Valley occurred while the glacier still covered the northern lowlands of the state, including the Champlain Valley.

Glacial Time

The first question commonly asked by the non-geologist is, "how long ago?" We have to admit ignorance of any precise measure of geologic time. Geologists have learned to think in millions of years, and they are not greatly concerned with the precise duration of so short a period as the glacial or postglacial episode. However, precise knowledge is desirable and a yard-stick of geologic time must be sought. All attempts to use the present rate of canyon cutting or cataract recession as an index of time have failed, and no data yet discovered have much value.

The history of the ice-front recession with its long succession of lakes and welldeveloped river channels compels the extension of our estimates of the length of glacial time, and all studies on glacial geology have the same result.

If we take 10,000 years as a moderate estimate of the life of Lake Ontario, then we must add an equal, and perhaps much greater, time for the lifting of the basin out of the marine waters. Then we must allow at least another 10,000 years for the duration of Lake Iroquois; and the 30,000 years carries us back only to the time when the ice sheet was removed from the western part of the state. This appears to be but a minor portion of the time covered by the waning of the glacier, judging from the maps and the known history preceding the initiation of Lake Iroquois.

If we assume 75,000 years as the time in the waning of the ice sheet, then we seem compelled to add an equal time for the invasion of the ice, with some time in addition for the pause at the terminal moraine. Most glacialists will probably agree that 150,000 years for the length of the latest or Wisconsin ice epoch is a fair estimate. And back of this we have the earlier and much longer glacial and interglacial epochs. The estimates of those best qualified to judge of the length of Pleistocene time are from 500,000 to 1,500,000 years.

WORK OF THE STATE SURVEY

The Pleistocene phenomena of the state have been the subject of casual observation and publication for over half a century, and a bibliography would be too large to present here. But the glacial and Pleistocene is the youngest member of the geologic branches of study, and only in recent years has the New York State Museum financed the glacial study as a distinct line of field-work and publication. This assistance, however, has been generous and effective, as the numerous papers and handsome maps published since 1900, and especially since 1905, will bear witness. The only elaborate and expensive maps and text published under other auspices than the State Museum is the U. S. Geological Survey Folio 169, already cited above. A description of the Moravia quadrangle by Carney was published in 1909 by Denison University, with a sketch map in black and white.

The more important Pleistocene publications of the State Museum are Bulletins 48, 83, 84 by Woodworth; 154 by Stoller, and 106, 111, 127, 145 (in part) and 160 by Fairchild. Earlier papers by the writer are contained in the 20th Annual Report of the State Geologist, 1902, 21st Report, 1903, and the 22d Report, 1904. Previous papers by the writer on the Pleistocene features of the state were published in the *Bulletin* of this society, beginning in 1895, and in other scientific journals.

For effective future work it is desirable that some scheme or far-sighted plan should bring all the glacial studies of the state into harmonious cooperation for the large result. And also that a cartographic scheme should be adopted that will secure maps as uniform in convention and color as possible.

Two important subjects requiring systematic study are the moraines and the drift-buried valleys. The state should undertake the mapping of the buried valleys. It should employ a well-boring outfit to secure data for accurate profiles of the hard-rock surfaces beneath the drift north of the Finger lakes, and wherever the Preglacial valleys of scientific interest are obscured. This would be a unique and popular work for the State Museum. The expense of such exploration would not be large, while the scientific and educational value would be great.

Another duty of the state is the preservation intact of the Jamesville and Blue lakes cataract features. These splendid evidences of an ancient glacial drainage, antedating Niagara and corresponding in function, should be made state property and preserved for the people. They are scenic features of as much beauty and of much more educational value than Watkins Glen and some other state parks.

HERMAN L. FAIRCHILD
UNIVERSITY OF ROCHESTER

THE DIVISION OF EDUCATIONAL INQUIRY UNDER THE CARNEGIE FOUNDATION

MR. ANDREW CARNEGIE has given $1,250,000 to the Carnegie Foundation for the Advancement of Teaching. The gift was announced on the eleventh, at a meeting of the executive committee at its offices, 576 Fifth Avenue. The gift is in the form of 4 per cent. bonds and the income is to be set aside for special investigation relative to the purposes of the original foundation of pensioning college professors.

The announcement of the executive committee states that the money is to be devoted to the endowment of a Division of Educational Enquiry and makes permanent provision for studies hitherto conducted by the foundation out of its general fund. It is the plan of the trustees to proceed with the new endowment to make other studies similar to those already published concerning medical education and in particular to study legal education in its relation to the supply of lawyers and the cost of legal process.

Mr. Carnegie's letter to the trustees is as follows:

CARNEGIE CORPORATION OF NEW YORK,
January 31, 1913.

TO THE TRUSTEES OF THE CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING.

Gentlemen:—Appreciating the valuable results of the educational studies of the Foundation and being of opinion that it is desirable that a fund be established to secure such results and conduct such investigations as may aid you in your work and realizing that sufficient income may not now be available for that purpose, I hereby offer to the foundation the sum of one million and a quarter dollars four (4) per cent. bonds, to be held and used by the foundation upon the following terms:

I. There shall be organized in the foundation an agency for the study of education and educational institutions, to be designated the Division of Educational Enquiry.

II. Any endowment or funds conveyed to the foundation for the use of such division shall constitute and be held as a special fund and the income alone be used and shall be accounted for separately from the general funds of the foundation and shall be devoted to the purposes hereinafter named.

III. It shall be the function of the Division of Educational Enquiry to conduct studies and to make investigations concerning universities, colleges, professional schools, and systems of education generally, to investigate problems of education affecting the improvement of educational methods, the advancement of teaching, or betterment of educational standards, and in general to investigate and to report upon those educational agencies which undertake to deal with the intellectual, social and moral progress of mankind and to publish such results as the trustees may consider of value.

IV. The income of the Division of Educational Enquiry shall be used in the expenses incident to the performance of the work of the Division of Educational Enquiry as hereinbefore set forth, as may from time to time be undertaken and published by the foundation, but no part of the income of the fund or funds specifically given for the use of this division shall be used in the payment of pensions.

It is my purpose to aid the trustees of the foundation to conduct their work upon broad lines and to enable them to obtain such information as will make the whole endowment of the Foundation of the greatest possible service to mankind.

Yours truly,
(Signed) ANDREW CARNEGIE,
President.

THE MILWAUKEE MEETING OF THE AMERICAN CHEMICAL SOCIETY

THE forty-seventh annual meeting of the American Chemical Society will be held in Milwaukee, Wisconsin, March 25 to 28, inclusive. A meeting of the council will be held on March 24, at the Hotel Pfister, which is the hotel headquarters. The meetings will be held at Marquette University, Grand Ave. and 11th