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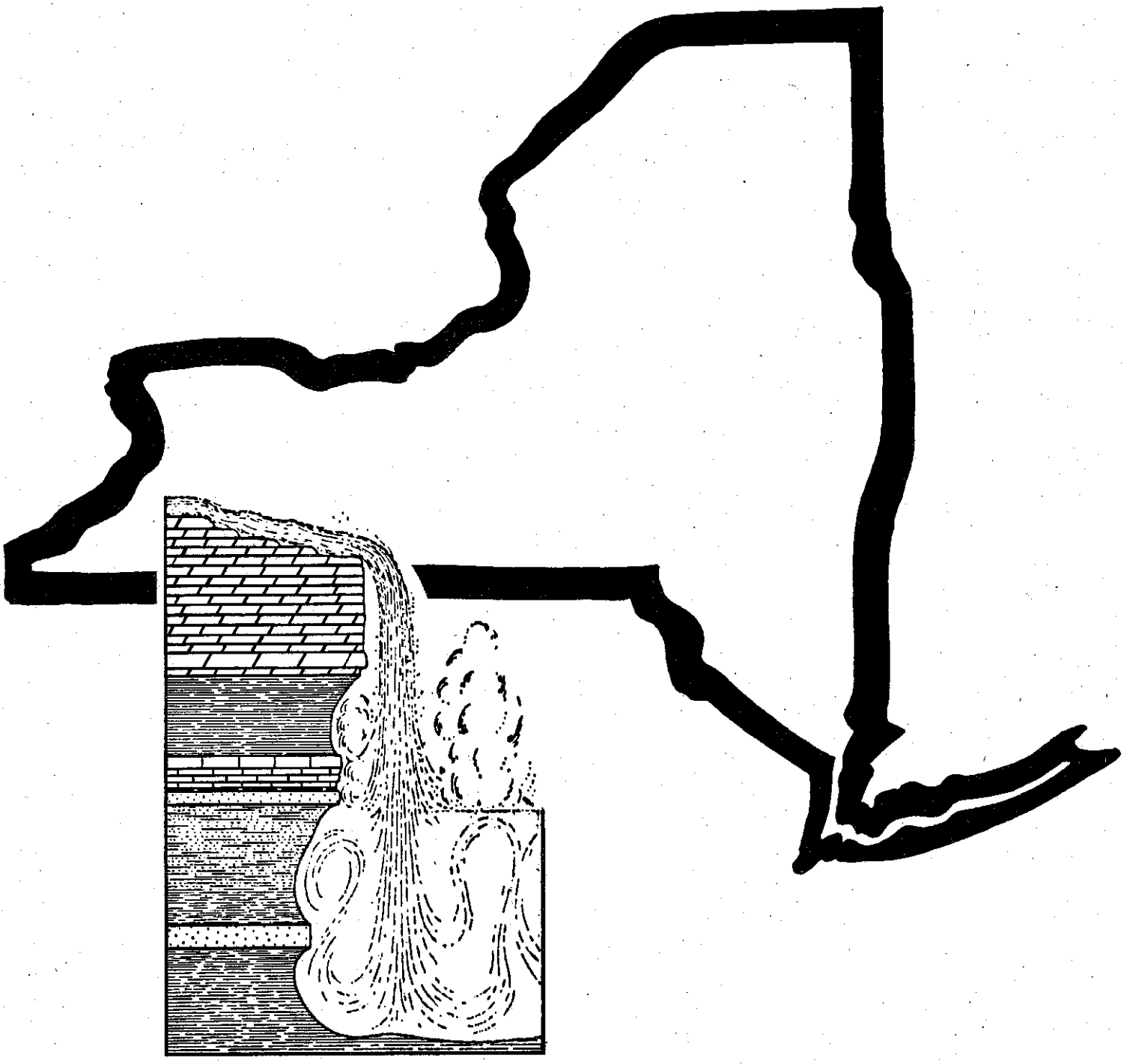
NEW YORK GLACIOGRAM



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EDITORIAL POLICY

The GLACIOGRAM is intended to be a collection of informal notes concentrated on Quaternary work relating to New York either directly or indirectly. It is not a formal publication and is not circulated to libraries nor to individuals not engaged in Quaternary research. The information included is often of a preliminary and tentative nature and as such should not be quoted and certainly not without communication with appropriate authors. One of the charter contributors (Muller, v. 6(1)) has suggested that reference to information in the GLACIOGRAM be identified merely as informal communication.

Parker E. Calkin

EDITORIAL

THE CONTRIBUTIONS ENCLOSED WERE MAILED TO THE GLACIOGRAM IN MAY.

I must apologize to all of you researchers who rushed to get your contributions in on time last May or who did not send them because they were not ready in May. I am aware that many of you would like to up-date your contributions and/or have new contributions for the Fall. Some of you went to INQUA in England and must have some insights on New York, others certainly have some summer studies or problems to include. Nevertheless, considering the time of year, I have decided to skip the Fall Issue and organize a large Glaciogram issue for the Spring. I will send reminders. Again my apologies.

Parker

Parker E. Calkin
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Stephen Averill - Chemistry/Earth Science, Fairleigh-Dickinson University

Two C-14 dates have been obtained from two levels in peat. The peat clearly postdates the draining of glacial Lake Hackensack. A complete pollen examination of the 2 meters of peat has just been run. The two dates are 12,870±200 B.P. (QC-297) on the basal peat and 12,125±210 B.P. (QC-296) from a level approx. 10 cm. higher.

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Thomas Berg - Pennsylvania Geological Survey

I'm still working on the revised state geologic map, but hope to have it finished by this fall. I expect to get back onto Pike Co. with Sevon after the state map is done.

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Art Bloom - Geological Sciences, Cornell University

The below paragraphs have been abstracted by me from a Water Resources (N.Y.S. Cooperative Extension, USDA) synopsis of work by Richard W. Scully (his M.S. thesis, Cornell, 1977) and Richard Arnold carried out to determine if soil properties can be identified which could serve as useful indicators of flooding history. Copies of the complete report may be obtained from the Center for Environmental Research, 468 Hollister Hall, Cornell University, Ithaca, New York 14853.

. . .

In the relatively young, glaciated landscapes in the Northeast, the older alluvial and Late Pliestocene glaciofluvial deposits have not been distinguished on the basis of soil properties related to age. This study concentrates on the alluvial surfaces that receive enough deposition to affect the development of soil profiles.

Two study sites were selected in Chenango County, New York. One on the Unadilla River is 5-1/2 km north of the confluence of the Unadilla and Susquehanna Rivers and about 48 km northeast of Binghamton, New York. The second site, on the Susquehanna River is 4-1/2 km downstream from the same confluence.

Both sites are located in glacially scoured "through" valleys with truncated spurs and steep valley walls. There is 15 to 75 plus meters of glacial drift filling the valley bottoms from the Late Wisconsin Glaciation (about 16,650 ± 1,800 years B.P.).

Results: Unadilla River Site

A large part of the valley floor is occupied by glacial deposits which show evidence of having been eroded by a river during or immediately after the glacial period. The ancient channels are visible on aerial photographs. Two levels of terraces were produced that lie below the glacial terraces which form the surface of the main valley. The terraces are capped by sand and silt.

The underlying gravel and sand strata of the oldest of the recent lower terraces ("Rockdale" Terrace) are alluvium with indications of a lake or slack water origin. It is topographically distinct in that it lies appreciably below the older main valley terraces and is higher than the younger, more recent bottom terraces. A radiocarbon date from the lower part of the alluvial sediments is dated about 9,700 years ago. Modern sedimentation has little, if any, effect on its soil development.

The lowest most recently formed terraces were identified as the "high" and "low" bottom terraces.

The high bottom terrace has a greater thickness of silty surface sediment than any of the other alluvial surfaces except the Rockdale Terrace. These are thought to be overbank deposits. The high bottom has a riverward ridge and a swale adjacent to the higher terrace. Wood from the sand-gravel contact is dated 9,705 $\pm$ 130 years old, which is probably the maximum age for the initiation of high bottom deposition.

The early low bottom has a mantle of silty sediment, thicker in the swales, and is composed mostly of sand sediments on the flat interswale rises. A buried log in the low bottom is dated 1,120 $\pm$ 80 years B.P. (before present). The next swale toward the river has wood that dates 505 $\pm$ years B.P. This swale is the most distinct and active on the low bottom and has probably been scoured and filled. The next swale towards the river contains wood that is dated 615 $\pm$ 80 years B.P. This is probably a more representative minimum age for the deposits of the early low bottom. The age of the dated swale wood increases away from the river in order 275, 615,505 and 1,120 years B.P.

Between the low bottom ridge and the river is modern unaltered alluvium. Wood from the underlying sand-gravel contact is dated at 275 $\pm$ 80 years B.P. The area is presently wooded with silver maples, some nearly one meter in diameter, indicating that the surface has been relatively stable for perhaps 100 years. The surface sediment of the modern alluvium contains medium sand indicating that overbank flows here have

higher velocities and/or greater sediment loads than most other parts of the low bottom.

Results: Susquehanna River Site

The northern part of the main valley floor is occupied by glacial deposits. A terrace on the south side consists of well-sorted silt and very fine sand more than 2.5 m thick. It probably is of lake origin.

In the Susquehanna River Valley, from at least 5 km south of Bainbridge, NY and upstream to the Delaware County line at Sidney, NY, are soils normally found in materials of lake origin. On the valley flat across the river from Bainbridge is a deposit of gray-brown silts with reddish clayey seams. A lake was formed behind an ice or glacial drift plug downstream in the Town of Afton, and the long terrace of well-sorted sediment is thought to be part of that system.

Three terraces were identified - the high "Rockdale", and "high" and "low" bottom terraces nearer the river.

The high Rockdale Terrace has a ridge and swale structure. Adjacent to the Rockdale Terrace is the high bottom terrace, divided by a long, deep, swale. Parts of the high bottom have elevations equal to those of the Rockdale Terrace. A log from the sand-gravel contact below the high bottom ridge nearest the Rockdale Terrace is dated 7,220 $\pm$ 120 years B.P. An older date might be expected closer to the Rockdale Terrace. Because of the variation in elevations, it is not known with certainty whether or not the high bottom represents a terrace below the Rockdale Terrace. The presence of organic-rich strata on the high bottom and not the Rockdale Terrace indicate that the high bottom has attained a height equal to the Rockdale Terrace only recently. Another hypothesis is that the two formed during the same period and the high bottom terrace is simply a younger formation produced by channel migration at the same level.

An abandoned meander is dated 280 $\pm$ 125 years B.P. Floodwaters overtopping the meander wall have deposited thick overbank sediments on the high bottom terrace. Except for the highest ridges the high bottom has been covered with at least 1.2 m of overbank deposits. Charcoal and sediment in the minor high bottom swale are dated 235 $\pm$ 80 years B.P. As little as 235 years B.P. the high bottom surface would have appeared appreciably below the Rockdale Terrace.

The low bottom terrace has a typical ridge and swale structure. Wood from the sand-gravel contact in the swale is dated 880 ± 130 years B.P.

Modern alluvium occurs in the major high bottom swale near the abandoned meander, in the abandoned meander, as levee deposits at the river edge forming a subdued ridge (levee) and swale and as a veneer covering the high and low bottoms.

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Ian Brookes - Geography, York University

Ian Brookes (Geography Department) spent a highly rewarding six weeks in Newfoundland in 1976 reconnoitering plateaus in his usual stomping ground in the western highlands for evidence of multiple glaciation. Weathering and soils information collected gives a preliminary indication of three weathering zones (à la Baffin?!). The highest bears no evidence of actively erosive (or transportive) ice. The middle zone bears evidence of pre-late-Wisconsin glacial scouring and erratic boulder dispersion. The lowest zone was strongly scoured by late-Wisconsin ice. If the highest and middle zones were ice-free duing two and one pre-late-Wisconsin glaciations respectively, as suggested by weathering data, the interpretation returns to that of Coleman (1926) from Flint's and MacClintock's 1940 view (complete late-Wisconsin ice cover), and it looks like bearing fruit for the eminently-revivable thesis of biological refugia propounded by Fernald for plants in the 1920's and by Lindroth for beetles in the 1960's.

Jock McAndrews (Geology, Royal Ontario Museum) participated in the work by raising mud cores from three lakes on these west Newfoundland plateaus. Pollen diagrams are completed. Jock is astonished at pollen abundance (over 1.3 million per ml in one level, due,he says to low, low sedimentation rate). Results will be combined for a paper Brookes hopes to deliver at INQUA '77. Funds are being sought to continue and expand the work.

Ian Brookes also spent a month in northwest Iran in the summer of 1975, joining an archeological team from the Royal Ontario Museum in the first year of an investigation of man-

environment relations since the inception of agriculture (ca. 9000 years B.P.). The work necessitated establishment of a Holocene alluvial chronology from a study of cut-bank sections within a 50km radius of the provincial capital of Kermanshah. Several alluvial units were identified, separated by erosional breaks and/or soils. Freshwater molluscs were collected from alluvial units and some samples have been submitted for 14C-dating. Potsherds and animal bone fragments are found with shells in a channel-floor flood gravel underlain and overlain by muddy alluvia with intercalated soil profiles. The gravel is recognized over a large enough area to be interpreted as a regionally significant catastrophic event. Though not directly dated yet, potsherds from the gravel suggest an early-to-late-Medaeval age (600-1250 A.D.), and some of the follow-up work must decide if the end of the 'Little Optimum' or Genghiz Khan and friends (or both) were responsible for the brief, sudden, and devastating change in landscape regimen. Since 2-3m of muddy alluvium overlies this Mediaeval gravel over a wide area, it is obvious that village mounds, more than 1500 of which dot these riverine plains, lie not 'on' but 'in' the land surface and at least as many more might not be showing at all. Implications for archeological site-survey are far-reaching and for paleo-ecological reconstruction somewhat uncomfortable, to say the least. A longer return visit will be made with the team in 1978.

(written Jan. 1977 Ed.)

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Parker Calkin - Geology, SUNY at Buffalo

The past Spring has been a busy one trying to round out the Sea Grant study of the Ontario shoreline. Sandy Brennan will finish her thesis on the stratigraphy and stability of the south shore of Lake Ontario in New York this summer. Gary Weir has just finished his thesis on inlet stability and wave overwash processes at North Sandy Pond. Tom Drexhage is continuing his measurement of coastal recession on Lake Ontario in New York using photographs and maps.

I am also almost ready to leave for the Brooks Range in Alaska where I will look at "Past and Present Hydrologid Regimes in a Permafrost Environment, Atigun Pass, Brooks Range, Alaska" with graduate student Jim Ellis and with Larry Onesti and assistant from Indiana University.

A side project has involved looking at some wet basements in the town of Clarence where it appears that the rise of the groundwater table to its normal level has caused problems.

For 52 years the watertable was drawn down by pumping of the National Gypsum Mines.

P.S. October 3 - Basements are full again. With reference to Richard Young's note (this issue) about wet climatic periods in New York, marl should be actively forming now based on the moisture around Buffalo. In a more serious vein, I have lake deposits yet unexplained, from near Colden, W. Branch Cazenovia Creek which date about 9700 B.P. Can these be related to Dick's wet period or the flooding in the Unadilla River Site (See Bloom this issue)?

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Donald R. Coates - Geology, SUNY at Binghamton

I have just finished a wetlands report for the New York State Department of Transportation that involved among other variables the stratigraphy of glacial sediments in the Chenango valley. I believe that Glacial Friends will play an increasingly important role as the new New York State Freshwater Wetlands Act becomes more firmly entrenched in land-use decisions.

Several years ago Jack Oliver requested information from this group on Pleistocene or Holocene faulting. I would like to renew that request and am interested in locations, magnitudes and types of movements of sediments that are not associated with ordinary depositional, slumping, or meltout events.

A second matter I am looking into concerns popups. I would like to be able to make a map of their distribution, occurrence, and characteristics. For those who cooperate, I will be happy to share ideas and give copies of any maps and materials that result from such a survey.

A third request is for illustrations of the environmental geology book I am currently writing. Most people have 5 or 6 favorite photos or illustrations, and hopefully some might be willing to share. If used I would of course give complete credit, and can return the originals whenever requested. Many books have the same standard type or photos and use the usual government sources. I thought it would be refreshing to use a different range of source materials so am counting on some of you to freshen up the book.

This summer I will be directing 2 Ph.D. and 4 M.A. students on their glacial dissertations and theses:

Robb Gillespie - Elmira region, stratigraphy

Richard Caprio - western Catskills, stratigraphy

Amy Altman - quantitative aspects of glacial erosion

Kevin Phelan - anomalous upland landforms of southern NY

Peter Michael - umlaufbergs and sluiceways

Carol Terrana - deformed structures in glacial sediments

Robb Gillespie completed his M.A. thesis on a comparison of two highly deformed glacial deposits in the St. Lawrence Lowlands. Although earthquake activity cannot be 100 percent ruled out as a mechanism for the sediment deformities, it is shown that there are probably other and more plausable causes for their disturbance.

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Kernan W. Davis - N.Y.S. Dept. of Environmental Conservation

The drilling and sampling program for a landfill in the valley of the West Branch of the Delaware, upstream from Walton (which I mentioned in the December issue) was performed during very difficult weather conditions, against a pressing timetable. I now have the logs and samples in my office, should any researcher of that area wish to see them. The landfill site was designed and is operating within the control limits set forth by our Department, based on the geological realities discovered by the program. Thus, we have another detached pocket of information. At another landfill site, in Steuben County, borings and wells showed bedrock to be 125, 87, and "more than 25" feet below land surface. The engineers were convinced that bedrock would not be a factor in the design of the landfill. But, looking over the plane, I was reminded of Don Coates' paper on "till shadows" and requested additional drilling in a certain sector of the site. Sure enough, bedrock was so close to the surface that that sector had to be excluded from the fill plan: another example of a practical (even though latent,) payoff from an academic study. Perhaps our practical study might have some academic payoff.

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Robert J. Dineen - N.Y.S. Geological Survey

I have just finished mapping the surficial geology of the Albany 15' quad. I have good evidence from test borings and a few exposures for a readvance from Round Lake to Delmar (12 miles) into Lake Albany or Lake Quaker Springs. Drill holes show till and/or gravel over lake clay. The till is overlain by lacustrine silt and sand. The till/gravel is at an elevation of about +240', decreasing in elevation to the south. Ice-

push ridges are developed in lake silt and clay near Delmar. These ridges are probably the southern limit of the readvance. Eric Hansen of R.P.I. has seen exposures of till interbedded with lake clay and silt in the area between Round Lake and the Mohawk River.

I am also finishing up the Colonie Channel project. Roger Waller of the U.S.G.S. and I had twenty-two test borings drilled along the buried Colonie Channel from Saratoga Lake to South Bethlehem. We gamma and electrically logged and sampled each well. The Lake Albany sediments show good correlations in the gamma ray logs. The gamma ray "units" seem to be controlled by permeable zones (coarse silts to gravels) that might be wide-spread turbidites. One gamma ray "unit" can be traced over 26.4 miles. The gamma ray units show a shingled effect, with several older units disappearing from south to north. The area of disappearance is in the vicinity of the Albany Airport, on the buried extension of the Loudonville Esker.

I am presently writing up the reports on the two projects. Roger Waller is developing a report on the hydrogeology of the Colonie Channel.

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Aleksis Dreimanis - Geology, University of Western Ontario

Since having published a paper on "Late Wisconsin Glacial Retreat in the Great Lakes Region, North America" in the Amerinds volume 288 of the Annals of the New York Academy of Sciences (1977), I have been waiting for the reaction of the Pleistocene geologists and geomorphologists: corrections of outdated data, objections to my interpretations, additional supporting evidence, etc. I was fortunate to meet George Crowl end of April, while visiting the Ohio State University, and we discussed his findings and opinions about the area marked by question marks in Pennsylvania. This summer will be spent trying to write up some overdue reports, and travelling westward and eastward. Hope to see a good number of other N.Y. Glaciogram 'members' at the INQUA Congress!

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Rhodes Fairbridge - Geology, Columbia University

Rhodes Fairbridge, after a sabbatical in Europe, returned to these shores in May. In December 1976 he joined an INQUA-IGCP group, looking at late Quaternary shore features in Senegal. In February 1977 he was awarded the Alexander von Humboldt Prize

in Germany for his work on paleoclimatic cycles, and in March attended the 500th Anniversary Conference of the Uppsala University, a symposium on the Geological history of the Baltic, North Sea and Irish, an INQUA shorelines commission organized gathering.

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Richard P. Goldthwait - Geology & Mineralogy, Ohio State University

OSU has four new glacial parties in the field this summer and late last summer. Drew Selby is doing Darke County, and Bob Larson (Wright State) is doing Miami to solve the overlapping tills of Miami lobe. This may seem far from New York but it should enable us to verify Ansel Gooding's scheme northward (with new names) and to correlate across northeast Ohio and Pennsylvania to that crucial Olean reentrant in New York (new Quaternary map of Ohio).

The other two are doing fundamental sedimentation studies in Glacier Bay, Alaska on glacio-lacustrine (Bob Goodwin) and glacio-marine (Ross Powell) deposits. Both Garry McKenzie and I will be out as supervisory helpers!

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Carl Koteff - U.S.G.S.

The New Hampshire work is now all wrapped up and I will be starting a 3-year project to compile a new state map for Connecticut. Hopefully, the chronology of Wisconsinan ice retreat will become apparent during the compilation. I hope not to make too many of the previous workers unhappy in trying to integrate all their observations. At the same time, others are to compile Rhode Island and Massachusetts, so that at the end of three years, all of southern New England will be shown on 1:250,000 and 1:125,000 - scale maps.

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Ernest H. Muller - Geology, Syracuse University

The past term has seemed to afford even less opportunity for progress on the projects I mentioned in the previous GLACIOGRAM. The result is a pocketfull of projects that I have been aching to get to, most of which deserve attention now that commencement is past.

During the past term, Mike Grieco defended his M.S. thesis

on origins of drumlins as interpreted from till fabric analyses. In this regard, I enjoyed Jim Carl's paper relating drumlins to ribbon moraine in N.Y., as reported at the Northeast Section, G.S.A. in Binghamton. All thoughts on origins of drumlins or new lines of approach to their study and interpretation are gratefully received.

For this summer, my New York field season is short. The thrust of my fieldwork will be primarily in the area around Texas and Mexico (near Oswego, that is), but I hope also for opportunity to fill out parts of the Finger Lakes 1:250,000 sheet and to work further on the New York 1:1,000,000 compilation. The Niagara Sheet completed last year is still in the hands of the printer.

At the end of June, I plan to head for several weeks of travel in Germany, Scandinavia and the British Isles before attending the INQUA Congress in Birmingham. If all goes well, I hope also to participate in Geoff Boulton's pre-congress excursion in Iceland.

The Friends of the Pleistocene held their 40th Annual Reunion May 20-22 in the Ossipee Lake Quadrangle, New Hampshire, hosted by Robert Newton of Brock University and Joe Hartshorn of U. Mass. On the probability that neither of them will have responded to the GLACIOGRAM, I report in brief that the weather, scenery, hospitality and geology were all excellent. The absence of Dick Flint was sensed by many, but Joe did a good job of furthering the non-traditions of this non-organization.

For next year Joe announced three invitations: a) from Dennis Merchand in the mid-Susquehanna Valley of northern Pennsylvania, b) from Jaan Terasmae in the Petawawa Delta and Chalk River areas of the Ottawa Valley, and from Jess Craft in the High Peaks area of the Adirondacks. Each of the invitations affords particular benefits and complications for some potentially interested Friends. The decision ought to be made early enough so that the host can use as much of this season as necessary to put the final touches on his work. However, until decision is reached, I expect that Joe will welcome such expressions of interest or preferences as Friends may wish to send him.

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Walter Newman - Earth and Environmental Sciences, Queens College, New York

This past March saw the publication of the volume edited by Bert Salwen and myself entitled "Amerinds and their Paleo-environments in northeastern North America". The 570-page book

includes 43 articles, many of which have New York State as their central theme. The book is volume 288 of the Annals series of the New York Academy of Sciences. The cost is $35 and copies may be obtained directly from the Academy at 2 East 63rd Street, New York, NY 10021.

Along with my colleagues Richie Pardi, Les Marcus, Leonard Cinquemani, Joe Paccione and Steve Tomacek, preparation of two papers for the Neotectonics Conference in Stockholm this coming summer has, thanks to computer data storage, reached the writing stage. Analyses of more than 800 data points of C-14 dated sea level elevations from many areas of our world within the interval 1000-6000 years B.P. suggests that most published sea level curves are indeed apparently correct when pertaining to particular regional sectors of the earth's surface. However, it seems likely that Mörner's suggestion that the geoid is constantly deforming is valid. For example, while sea level in the southern hemisphere has been at about its present level for the past 6000 C-14 years, most stations in the northern hemisphere have been in a transgressive mode during this same time interval. Synthesis of all our data points for the past 6000 years indicate that the so-called "Fairbridge" sea level curve is a good first approximation of our curve. Our amplitude for this time interval is two meters rather than the six meters proposed by Rhodes Fairbridge. We have unexpectedly found evidence for these later Holocene fluctuations along the East Coast of the United States.

Our second Stockholm paper concerns Holocene sea level and neotectonics along the East Coast of the United States. While offering no startling changes from already published data, our 30 points for the lower Hudson Valley-New York City sector do not conform to Art Bloom's hydroisostasy model. The New York curve trajectory doesn't deviate much from about 2.0 meters per millenium for the past 12,000 years. For some of this time interval, sea level rise just about kept pace with crustal uplift. It seems obvious to us that the resolution of the sea level dilemma involves more than simple isostasy and eustasy. We're working on it.

If marine mammals were in the upper Great Lakes some 13,000 years B.P. as implied by C.R. Harington's data (National Museums of Canada), they must have migrated through a Champlain Sea strait probably following the route of the Ottawa River. Therefore, a separate ice cap must have existed in eastern New York State and upper New England for a short time subsequent to about 13,000 years B.P. I'm stunned by the argument and wish somebody would set me straight.

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Richard Pardi - Radiocarbon Laboratory, Queens College

A mammoth from Ardsley, New York has been dated by us, in three separate analyses, at 8325 ± 150, 9130 ± 200 and 8590 ± 120 C^{14} years B.P., for a weighted average of 8635 ± 160.

The mammoth was collected by a conscientious contractor (to the annoyance of the property owners) from peat during an excavation in 1972. Samples were provided to us by Earl Manning, Vertebrate Paleontology, American Museum of Natural History.

Two things were distinctive about this mammoth - 1. its small size. Earl has identified it as a dwarf and not a juvenile; 2. its state of preservation. Almost all the inorganics had been leached from the bones which are now almost pure collagen.

Jan Miller of Q.C. has separated some pollen from inside a rib which Walter Newman identifies as possible A zone but with more than 50% NAP. Hence, the mammoth should have dated close to 12,000 B.P., and we must hold the dates suspect. We intend to work on them some more including preparing them according to the procedures developed by Leslie Marcus of the Biology Department. Also, Ingrid Olson has agreed to date them as well. Amino acid analyses are planned and I'm trying to line up an amino acid date on the beast as well.

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William Sevon - Pennsylvania Geological Survey

My time has been spent working on the new state bedrock map and compiling (or is creating a better word) a surficial map for the state. The surficial map is now complete and includes 27 different surface units ranging from "spoil" to "mixed rock types with landslide susceptibility". The project was interesting and I now appreciate how little information we have on the surficial geology of Pennsylvania. The survey will probably publish the map at 1:500,000.

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Jaan Terasmae - Geological Sciences, Brock University

At the moment I am putting together the next issue of our "Quaternary Newsletter".

This summer I am planning to continue my Pleistocene studies in the Niagara Peninsula and southern Ontario (Tillsonburg - Simcoe area), relating to chronology of glacial lakes' shorelines.

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George W. White - Geology, University of Illinois

The map and text of glacial geology of Ashland County, Ohio are now at the printers and should appear in a few weeks. Four other county maps with texts by White and Totten are going through the editoral mill at the Ohio Survey. A summary map of the glacial geology of all of northeastern Ohio compiled from the county maps is approaching completion.

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Richard Young - Geological Sciences, SUNY College at Geneseo, New York

Extensive drilling for the new interstate highway route in the Genesee/Canaseraga Valley has shown that the transition from a lake environment (clay) to a marsh (peat) is recorded over much of the Canaseraga Valley at a consistent depth of 31 to 32 feet below the surface of the modern floodplain. Samples from the upper lake clays and the basal peat zone have been submitted for radiocarbon dating in connection with the ongoing USGS Genesee River Basin studies described in the last issue of the Glaciogram.

Dating of marl beds near Caledonia, NY has shown that the oldest marl was forming contemporaneously with the Cockburn readvance (8000±) in Canada. This supports Terlecky's interpretation (U of R thesis, 1969) that the marls represent cooler(?), wetter periods. Additional dates in this same section should establish whether all marl horizons can be correlated with recognized Holocene intervals of glacial expansion. I would appreciate any comments on this problem from anyone having dates on marls in NY or adjacent regions. It is obvious from the recent literature that precise extrapolation of climatic data over broad regions is risky at best.

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