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NEW YORK GLACIOGRAM

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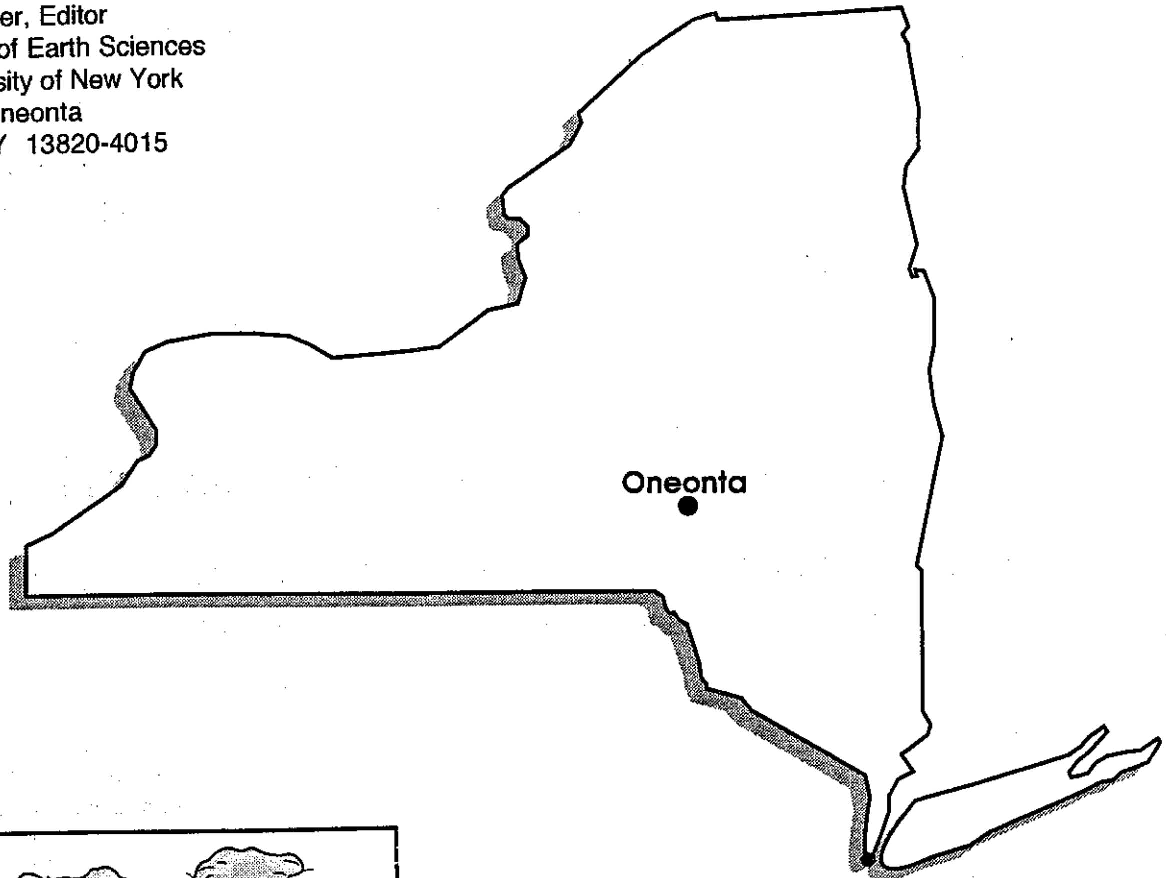
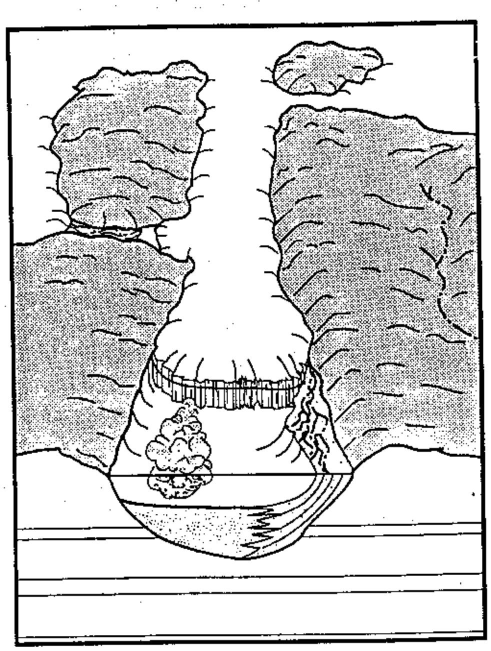
P. Jay Fleisher, Editor
Department of Earth Sciences
State University of New York
College at Oneonta
Oneonta, NY 13820-4015





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EDITORIAL POLICY

The **GLACIOGRAM** is intended to be a collection of informal notes concentrating on Quaternary work that relates to New York State either directly or indirectly. The **GLACIOGRAM** is not a formal publication and is not circulated to libraries, nor to individuals not engaged or interested in Quaternary research. The information included is often of a preliminary and tentative nature, and as such, should not be quoted without direct communication with the appropriate authors. It is suggested that reference to information in the **GLACIOGRAM** be identified merely as informal communication.

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INVITATION FROM THE EDITOR

As you may know, the **Glaciogram** contains volunteered notes and project summaries. As the title implies, past issues have contained entries weighted toward Glacial Geology. Perhaps it's time to expand the coverage to also include topics that may be closely related to glacial geology, such as limnology, palynology, soil science, ground water geology, environmental geology, etc., but to date have not yet been included. Should your area of interest fall within this broader realm, please consider having your work included in the spring edition by forwarding a brief (300-500 words or less) summary at your convenience. Easily duplicated, simple, line diagrams and map figures (sorry, no photos) may also be submitted. Please pass this invitation on to friends and colleagues who may wish to share their work or be placed on the mailing list.

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CONTRIBUTORS

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PRELIMINARY ANNOUNCEMENT

1999 NORTHEAST FRIENDS OF THE PLEISTOCENE TRIP

The 1999 Northeastern Friends of the Pleistocene trip will focus on the paleo-periglacial features and landscapes near the glacial margin in the Ridge and Valley, in central Pennsylvania.

It is scheduled for Saturday and Sunday, May 22 & 23, with introductory activities at Bucknell University on the evening of May 21.

The trip will begin at Lewisburg, Pennsylvania - near the center of the state at the intersection of I-80 and the West Branch of the Susquehanna River. The trip will be entirely beyond the Wisconsin limit, but repeatedly crossing the complex pre-Wisconsin limits.

We will

-- visit good examples of standard periglacial features - sorted patterned ground, boulder fields, debris fans and ancient fan fragments, dunes, loess, and shale chip colluvium;

-- examine some periglacial features not previously seen on a FOP trip - ground ice scars, wind-transverse nivation welts, and related thermokarst? features; and

-- review the relative positions of Pre-Wisconsin till bodies, outwash surfaces, stream derangements, and terraces. These features have been mapped carefully enough to make these assertions be about their temporal and spatial relationships; we can tentatively

> -- reconstruct large landscape units back to late Wisconsin times;
>
> -- understand the local circumstances - soil, drainage, slope, aspect - under which many different periglacial features developed, failed to develop, or were destroyed during deicing; and
>
> -- establish a relative chronology and show a sequence of events.

The first day's trip will travel west from the river into the high sandstone ridges to view the vigorously deformed slopes and upland valley floors. Then we'll go south into the broad lowlands to visit: high fan remnants, periglacially deformed pre-Wisconsin moraine and outwash features, boulder colluvium and shale-chip colluvium of Wisconsin and earlier age, and complex outwash and terrace surfaces. The briefer second day will follow the Susquehanna north, looking at aeolian sand and silt deposits, classic levels of Susquehanna terraces, and thick pre-Wisconsin tills including some punctured by karst.

For registration materials (to be sent in the Spring) or for more information contact:

Ben Marsh,
Department of Geography
Bucknell University
Lewisburg, PA 17837
(717) 524-1381 [which becomes 570-577-1381 after January 1st]
marsh@bucknell.edu

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Richard A. (Dick) Young, Department of Geological Sciences, SUNY Geneseo, Geneseo, NY 14454; 716-245-5296; fax 716-245-5288; Sec'y 716-245-5291; Young@uno.cc.geneseo.edu

Summer 1998 excavations at the middle Wisconsin "Regional Sand & Gravel" pit site in Livingston County have produced a wealth of wood samples, including trunks of spruce, as well as mammoth bones, teeth and tusks (Young and Sirkin, NYSGA Guidebook, 1994; NEGSA Abs. v. 28, No. 3, 1996). This corrects my earlier assumption that the rib fragment collected previously was from a mastodon. New exposures and specimens have shed additional light on the interesting glacial dynamics of the site. It is now clear that the basal "peat" till and surrounding outwash gravel represent a single contemporaneous advance-recession sequence, centered close to the H4 (Heinrich) event discussed in numerous recent papers in the journal, Nature (see Bond et al., 1993, Nature, v. 365, p. 143-147). The overridden peat belongs to the earlier warm interval, circa 46,000 BP.

Additional wood samples have been submitted to the Arizona AMS facility to improve and expand the site chronology. A larger NSF proposal is planned, and I am still interested in hearing from anyone who would like to collaborate in examination of the macro biota or insects, etc. preserved in the organic-rich layers. The uniqueness and stratigraphic diversity of this site indicates that it should be thoroughly documented, in view of its potential importance as a key marker for the glacial and climatic history of the eastern Great Lakes.

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Donald H. Cadwell, NYS Geological Survey, 3140 CEC, Albany, NY 12230; 518-486-2012; FAX 518-486-3696; dcadwell@mail.nysed.gov

My current work involves creating a database that will indicate the status of surficial mapping on all of the 7.5 minute quadrangles for the State. Specifically, all of the quadrangles that have surficial data, whether small portions or completed maps, will be indexed and able to be queried for content and author. When completed, we hope to make this available through our web page.

I am also working with Arcview to digitize all of the 7.5 minute surficial maps and make the data more readily available electronically.

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Eugene Domack, Professor of Geology, Hamilton College, Clinton New York 13323; 315 859-4711; edomack@hamilton.edu

Although most of our Quaternary work remains focused on the Antarctic program, we do have some local projects that may be of interest to folks in the Upstate area. Student BA thesis: "Evidence for the duration and extent of Glacial Lake Clinton", by Elizabeth Nastro, 1998, Hamilton College, Clinton New York.

Liz attacked a local exposure of laminated lake sediments that apparently developed while the Oriskany Valley was dammed by a retreating lobe of ice. A lobe which would later divide into the Mohawk and Ontario Lobes. Varves and storm surge laminae were counted in order to determine the duration of the lake system and to provide a basis for correlation to other exposures across the valley. An approximately 100 year record was recorded from the upper half of the exposure.

Two students in my geochronology class sampled and dated wood material from high-stand marl deposits at Deadman's Point (Green Lakes St. Park). We provided these 4000 year old ages to H. Mullins for part of his on-going study on lake level chronologies in the region.

We continue to upgrade our Quaternary lab facilities and recently replaced our old LECO furnace with a new LECO CR-412. We can now do total organic carbon and/or carbonate carbon on about 50 samples/day. This system compliments our grain size lab which runs on a Malvern Master Sizer (laser diffraction method). Any local investigators are welcome to use the lab for a minimal cost, just give us a call.

The one highlight for our group was the recovery of two drill sites during the Ocean Drilling Program Leg 178 to the Antarctic Peninsula. These sites recovered 50 m of continuously laminated sediment which are of Holocene age. Our correlations of this remarkable section to global records of Holocene climate variation will likely continue for many years. We are conducting this work in collaboration with Dr. Amy Leventer who is now just down the road at Colgate University.

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Robert Gilbert, Department of Geography, Queen's University, Kingston ON K7L 3N6 Canada; 613-545-6034; gilbertr@qsilver.queensu.ca

Glacial history and post-glacial evolution of eastern Lake Ontario

For the past decade I have been using acoustic subbottom profiling equipment to assess the bedrock and sediments under portions of northeastern Lake Ontario, the upper St. Lawrence River, and smaller lakes to the north (Gilbert, 1990; Gilbert and Shaw, 1992, 1994; Shaw and Gilbert, 1990; Gilbert, 1994). We propose that these lakes were created at least in part due to erosion by large floods of melt water beneath the Laurentide Ice Sheet. Ongoing work on the glacilacustrine sediments of the Oak Ridges Moraine in conjunction with the Geological Survey of Canada (Gilbert, 1997) is showing the relation of glacial processes in the last stages of glaciation to the origin of the Great Lakes. The postglacial sedimentary record of eastern Lake Ontario illustrates the effect of Holocene isostatic adjustment on the lake and its sediments, and on the modern sedimentary environment (Hartling and Gilbert, submitted). Studies of lake ice conditions on glacial Lake Iroquois (Gilbert et al., 1992) are related to ongoing work on ice on Lake Ontario (Gilbert and Glew, 1986; Gilbert, 1991a, b). Documentation of subglacial fluvial features on land nearby continues with the mapping of remarkable landforms, including a large pothole on a hill top near Kingston. Further information can be found at http://qsilver.queensu.ca/~gilbertr/

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Donald R. Coates, 11306 Olde Turnbury Court, Charlotte, NC 28277;
<drcoates@interpath.com>

Just returned from a three week overseas trip and your request for GLACIOGRAM news was in my big mail pack. This accounts for the tardiness in reply, although the following is certainly not related to New York glacial interests, and therefore inappropriate. However, I do want to announce to you, and others, I am still well and happy in the South (Charlotte, NC) and do continue an interest in Northeast glacial geology and geomorphology.

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Donald M. Thieme, 203 7th Street, Apt. 5, Honesdale, PA 18431; (717) 251-7939

I would definitely like to begin contributing tidbits of fieldwork to the Glaciogram. These will not be polished maps, sections, or interpretations, but do I see a lot of exposures while testing for deeply buried archaeological sites. The following are from Governor's Island in New York harbor and unfortunately I only have the enclosed "touristy" map here in Pennsylvania. The work was sponsored by the U. S. Coast Guard, the Public Archaeology Laboratory, Inc., and Geoarchaeology Research Associates.

The trench closest to Fort Jay, our MT-14, was excavated to a total depth of over 5 m. A wavy boundary ~140-160 cmbs defined the top of an ice-contact diamicton with clasts up to a meter in diameter in a matrix of yellowish brown sand and clay. Clasts included ripped-up marine(?) clay, granite, diabase, and other erratics. Coarse bouldery diamicton was interbedded with red (5YR5/4) coarse sand in cycles of ~50 cm to the total depth of the excavation.

The other trench, our MT-9, was downslope adjacent to the original shoreline of the island (our report tells this whole story in great detail). At a depth of ~180 cm we encountered a bed with cobbles of heavily patinated quartz, quartzite, and schist up to 10 cm in diameter in a matrix of coarse brown loamy sand. Meltwater probably played a larger role in this deposition.

Basal sediments on the remainder of the island were either landfill or massively bedded sheet sands so there appears to be some unique ice-contact feature (drumlin?) underlying the topography (~10 m of relief) on the western side of this island. We also encountered in place bedrock (Manhattan schist) in trench MT-3 on the southern end of the original shoreline. The Wisconsinan ice may have been temporarily lodged against the bedrock as it advanced to the Harbor Hill moraine.

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Paul Karrow, University of Waterloo, Department of Earth Sciences, Waterloo, ON, N2L 3G1 Canada; 519-885-1211 (Ext. 3231); FAX 519-746-7484; pfkarrow@sciborg.uwaterloo.ca

The summer was shot full of holes like the retina in my right eye. Shortly after my submission for the spring Glaciogram symptoms developed culminating in retinal detachment and surgery in mid-June and again in mid-July. Attendant recovery periods precluded field work and leftover time was squeezed out to prepare for teaching three courses this fall. Before that happened I had carried out the planned shoreline surveys at Lake Algonquin deltas at Iron Bridge and started work in the North Bay outlet area, which is to be continued next spring. I had also finished picking all the Fernbank samples and all picked fossils have been passed on to Jock McAndrews (plants), Barry Miller (molluscs), Kevin Seymour (bones), and Alan Morgan (insects -- really and truly this time). Selected molluscs have been sent by me and Barry Miller to June Mirecki for amino acid analysis comparisons of Fernbank, Woodbridge, and Don Brickyard. It is about 30 years since I sent the first molluscs from Toronto and Fernbank away for AAR analysis (they were similar then but the analyst never finalized his results for publication). Some things take a long time!

As time has allowed over the summer some progress was visible in paper writing as one on eastern Great Lakes time classification (with Aleksis Dreimanis and Peter Barnett) is about ready for submission, and another (with Darius Krzyszkowski) on Woodstock, Ontario, quarry exposures is also nearly ready for submission.

While the same four students continue writing M.Sc. theses, Abby Burt completed mapping an area near Winnipeg as a basis for her Ph.D. thesis and Steve Douglas had a productive summer mapping the urban geology of Fort Erie for his M.Sc. project in support of ongoing archeological work around the Peace Bridge construction. New Ph.D. student Andy Taylor plans to work on vertebrate paleontology in the Yukon cosupervized by Dick Harington of the National Museum in Ottawa.

When this heavy teaching term is over (Xmas) I return to six months sabbatical, at which time I will get back at languishing lab work and writing. Meanwhile this fall GSA is imminent and I will be helping with the Toronto field trip (run twice). I'll likely see some of you there.

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Duane Braun, Department of Geography & Earth Science, Bloomsburg University, 400 East Second Street, Bloomsburg, PA 17815; 717-389-4108; FAX 717-389-3028; dbraun@planetx.bloomu.edu

During the last 3 years we've been mapping the glacial deposits on the central Pocono Plateau of northeastern of PA. The overall pattern of deposits is thick till and ice-contact stratified-drift in the valleys separated by bedrock knobs with little till cover. Individual eskers run north to south across several 7.5' quads. over distances of 30 to 40 km. Glacial Lake Wallenpapauk (presently the site of a hydropower impoundment) had seven different outlets, each progressively lower to the north. The lake first discharged south-eastward to the Delaware River, then westward to the Susquehanna River, and then eastward again to the Delaware River.

During the next three years we will map thirty-two 7.5'-quads. in the northeastern most part of Pennsylvania adjacent to the New York state line. The area includes the Great Bend area along the North Branch Susquehanna River and 50 km of the Delaware valley southward from Hancock, NY. Both the past and future mapping of glacial deposits are available as Pennsylvania Geological Survey open file reports. A listing of the reports and ordering instructions are on the worldwide web at www.dcnr.state.pa.us/topogeo/. The mapping project has been supported by the USGS STATEMAP program for the last five years. Hopefully the mapping of the glacial deposits of northeastern Pennsylvania will be completed in the next seven years.

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Dr. David Franzi, Center for Earth and Environmental Science, SUNY College at Plattsburgh, Plattsburgh, NY 12901; 518-564-2028; FAX 518-564-3152; franzida@splava.Cc.Plattsburgh.Edu

My professional activity has progressed on two fronts; 1. the environmental geology at Altona Flat Rock and 2. the glacial, glaciolacustrine and glaciomarine stratigraphy in the Champlain Valley.

Ken Adams (forest ecologist) and I continue to develop the upper Little Chazy River watershed at Altona Flat Rock as a field laboratory for teaching undergraduate hydrogeology. (Much of the following discussion was taken from an abstract we prepared for the 1997 NEGSA meeting in Philadelphia).

Altona Flat Rock is the largest of a discontinuous 5km-wide belt of sandstone pavements that extend approximately 30km southeastward into the Champlain Valley from Covey Hill, PQ. These pavements were created by fluvial erosion associated with the catastrophic drainage of glacial lake Iroquois and younger post-Iroquois lakes in the St. Lawrence Valley. Altona Flat Rock is presently covered by jack pine barrens, a fire-dependent ecosystem that is adapted to the thin, nutrient-poor soils and seasonal moisture deficiency on the sandstone pavement. The site also contains the remains of a failed hydroelectric dam built by W.H. Miner between 1910 and 1915.

The site is used in geology and environmental science classes to illustrate the impact of glacial and post-glacial processes on landscape development and ecosystem-level processes. Watershed hydrology, the failure of Miner's hydroelectric dam and the pine barrens ecology provide the focus for problem-based laboratory and undergraduate research projects. The instrumentation at the site presently includes 3 stream gaging stations, 3 meteorological stations, a lake-level gage and 9 observation wells. I have also submitted a NSF proposal with Don Adams (no relation to Ken) to establish a greenhouse gas monitoring station in one of the wetlands on the site. I would be very interested to discuss future projects with any colleagues who may wish to conduct research or offer summer courses at Flat Rock.

I have recently renewed my work on the late-glacial stratigraphy of the Champlain Valley. Jack Ridge visited the area this summer and we collected cores and block samples of varved clay for his study of late-glacial paleomagnetic declination trends. Two of the sections we sampled contain a nearly complete record of the lacustrine phase (Lake Vermont) in the Champlain Valley. I have also been in contact with Pete Knuepfer at SUNY Binghamton about a joint project to study the post-glacial uplift of lacustrine shorelines in the Champlain Valley and Adirondacks. Pete may be sending John Rayburn (a SUNY Plattsburgh alumnus) to the area next year. I will keep you posted on the results of these efforts.

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Peter L.K. Knuepfer, Department of Geological Sciences, SUNY at Binghamton, Binghamton, NY 13902-6000; 607-777-2264; FAX 607-777-2288; knuepfr@binghamton.edu (yes, the last "e" really is missing)

Pete Knuepfer and Tim Lowenstein of Binghamton University led a field trip to examine some of the Finger Lakes gorges for the 70th Annual New York State Geological Association field conference, hosted at Binghamton October 3-4, 1998. With over 60 participants, this was far and away the most popular trip of the weekend. The origin of the Finger Lakes troughs themselves has been the source of debate for as long as geologists have ventured into upstate New York (as summarized by Mullins and others, 1989).

The recent geophysical studies by Mullins and his colleagues (Mullins and Eyles, 1996) have resolved much of this controversy, demonstrating that the modern troughs, at least, must have been formed by a combination of glacial scouring and the action of high-pressure sub-glacial meltwater. Seismic stratigraphic relationships suggest that the stratigraphic and morphologic record left behind by this event--including the Valley Heads Moraines (VHM) as well as much of the infill of the Finger Lakes troughs themselves--must have occurred between (and including) VHM time, around 14.9-14.4 ka 14C yr. B.P. (Muller and Calkin, 1993). Late-stage trough-fill sediments were deposited until 13.6 ka 14C yr. B.P. (Wellner and others, 1996), by which time ice had retreated north of the modern Finger Lakes. Our goals on this field trip were to consider the implications of this record for development of the modern Finger Lakes glens/gorges. Given the fact that base-level fall of the present-day gorges was initiated by falling levels of proglacial lakes during retreat from the Valley Heads position of the Laurentide Ice Sheet, and the evidence of base level provided by pro-glacial lake deltas that characterize all of the Finger Lakes gorges, we argued that the bulk of incision (if not retreat of the major waterfalls themselves) must have been rapid. Indeed, tying in to the seismic stratigraphy suggests that most of the incision and delta development may have occurred in little more than a few hundred years. The trip visited Taughannock Falls, Buttermilk Falls, and upper Enfield Glen, reviewing previous arguments for re-occupation of pre-latest glacial (called "interglacial" by previous workers) gorges and the obvious late- and post-glacial incision history that has created such spectacular gorges as upper Enfield Glen. We examined exposures of pro-glacial delta deposits near Taughannock Falls and Enfield Glen, as well as sediments associated with the Valley Heads moraine field near West Danby. We also posed the question as to why there should be such major difference sin the pattern of incision and waterfall retreat among these three gorges (which are representative of the broader population of Finger Lakes gorges) from a canyon-mouth waterfall at Buttermilk Falls (drainage area around 11 km≤) to the spectacular single-drop Taughannock Falls (drainage area around 90 km≤)--perhaps a function of basin area. We focused further discussion on the reasons why so much incision might have been accomplished during glacial retreat, whereas relatively little geomorphic work may have been accomplished in post-glacial time (as evidenced in part by the stratigraphic records in the lakes as well as the morphology of the delta-gorge systems). Finally, we considered the implications of well rounded, moderately sorted deposits in the Valley Heads moraines for the role of sub-glacial meltwater in the Finger Lakes troughs, as argued by Shaw and Mullins and co-workers. The trip offered few answers to such questions, but proved a fruitful forum for discussion of the implications of the recent Finger Lakes work. And at the least, it provided an opportunity for many participants to marvel at the erosive forces present during ice-sheet retreat.

John Rayburn, a new Ph.D. student at Binghamton working with Pete Knuepfer, is beginning a systematic re-examination of the Lake Champlain basin shorelines with the goal of better elucidating the isostatic rebound history in this part of New York State. The Champlain basin shorelines--from Lake Vermont to the Champlain Sea and to the modern lake--provide outstanding tiltmeters to measure the details of post-glacial rebound, but have been little investigated in the last few decades. We are particularly interested in testing Koteff's model for delayed isostatic rebound, deduced from the Lake Hitchcock shorelines to the east, as well as using this long north-south profile set (tied to Lake Iroquois to the north and Lake Albany to the south) to possibly place constraints on the nature of the southern lobes of the Laurentide Ice Sheet--thick or thin surges? This research is still in its formative stages, as John has just joined the Department this semester, but his experience working on Lake Agassiz in Canada as well as a life-long love affair with Champlain and the Adirondacks makes him ideally suited to tackling this problem. We'll be working closely with Dave Franzi at Plattsburgh and others who have mapped aspects of the Champlain system, coupled with modern location equipment and subsurface investigations, to maximize the precision of lake-level reconstructions.

I've got another student working in parts of the Susquehanna between Binghamton and your neck of the woods trying to update some of Allan Randall's work (or, rather, extending Allan's work farther upstream).

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Ernest H. Muller, 204 Heroy Geology Laboratory, Syracuse University, Syracuse, NY 13244-1060; ehmuller@ mailbox.syr.edu

Those who met in Montauk at last May's Friends of the Pleistocene (FOP) reunion, hosted by Les Sirkin, had opportunity to evaluate at first hand current views on the glacial geology of Long Island. For years (viz. NYSM Bull. 455, 1986) Sirkin has sought to replace Fullers classic interpretations (USGS PP 2, 1914). Most recently he has published his views on Long Island "Geology with Field Trips" in two volumes written for the general public and distributed by the Book and Tackle Shop in Watch Hill, RI.

At the end of May, the Midwest FOP Reunion faced complimentary problems involving interlobate relationships in north central Wisconsin. Though I have yet to identify one of my own, the hosts (John Attig, Nelson Hamm and Dave Mickelson) sold me on the concept of ice-walled lake plains (vestiges of sedimentation in glacial ponds preserved as flat elevated areas within a moraine).

Elsewhere in this Glaciogram, look for Ben Marsh's first announcement of plans for next Mays F.O.P.z reunion on periglacial features in North Central Pennsylvania.

June field work in the Bering Glacier region, Alaska with Jay Fleisher and Matt Lachniet developed long overlooked terrestrial evidence suggesting that in Late Wisconsinan time the Steller/Bering piedmont glacial apron coalesced with the expanded Martin River and Copper River Glaciers as a thousand-foot thick ice field along the Gulf of Alaska coast.

But back to New York where admittedly, in the past year, I have contributed to the slowdown in fundamental glacial mapping noted by an unkind critic in last Springs Glaciogram. (and incidentally a view that might be disproven if all involved in Quaternary research in New York and vicinity were to contribute more diligently to the Glaciogram).

Interest in the Tully Landslide (1994) continues. In addition to slide events marked by old scars near the base of Bare Mountain, Bill Kappel identifies a nearby clay bed as a mudflow deposit, partly because it overlies 10,000-year old organic matter that postdates proglacial impondment.... Supplementing Jager and Wieczorek(USGS Open-file release 94-615), Stefan Jager treats the Tully area as one of three cases in his dissertation "Fallstudien zur Bewertung von Massenbewegungen als Geomorphologische Naturgefahr", better understood as "Case Studies on Evaluation of Mass Movement as a Geomorphic Natural Hazard" at (Ruprecht-Karls-Universitet Heidelberg, Germany, 1997) ...Information on other studies related to the Tully Slide and recently published as USGS Fact Sheets can be visited on the WorldWide Web at http://ny.usgs.gov.

Thanks to Bill Hecht (Finger Lakes Land Trust), I was reintroduced to a site that offers much for student field trips. Furthermore, Michael Burt in charge at Saunders Quarry and Gravel Pit (2 miles W of Marcellus where Lime Ridge Road becomes Shepherd Road) proved to be a knowledgeable host. Exposed are minor folds in Elmwood to Onondaga Limestone overlain by 10 m of till lodged under changing depositional environment as the receding Late Wisconsinan ice margin abutted against the prominently drumlinized plateau margin. Proglacial deltaic outwash at the top of the section includes rafted shale blocks as large as 2 m in maximum dimension.

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Paul Woodell, Earth Sciences Department, SUNY-Oneonta, Oneonta, NY 13820-4015; 607-436-3068; FAX 607-436-3547; woodpa83@oneonta.edu

A portion of my thesis project involves the investigation of what the response of a karst setting is to continental glaciation in east-central New York. The study area is the northernmost portion of the Allegheny Plateau. Here, a mature karst aquifer is developed in Upper Silurian and Lower Devonian carbonates beneath the Helderberg Plateau where preglacial valleys were filled by sediment from the Laurentide Ice Sheet. Gravity and seismic surveys were used to characterize glacially buried topography, which controlled preglacial hydrology and, therefore, most of the major karst features. An example is the area surrounding Brown's Depression, 5.6 km northeast of Cobleskill, NY, where gravity surveys indicate that till and diamicton blocked a pre-glacial bedrock valley to a depth of 100 m (Milunich & Palmer, 1996). The buried valley trend is perpendicular to the direction of regional ice advance and forms a hydrologic boundary between two major karst drainage systems, influencing their drainage patterns (Mylroie, 1977, Dumont, 1995).

Recharge to the karst aquifer is by diffuse infiltration and confluent insurgences where surface streams, perched above the local water table, penetrate low-permeability till. Groundwater flows southward along bedding, fissures, and solution conduits, subparallel to regional dip, to resurge at a series of hanging springs above base-level creeks. Many of these springs were partially or completely blocked by sediment during glaciation. Hydrologic response to this obstruction includes development of artesian flow, clearing of the obstruction, or formation of underflow and overflow spring complexes. An interesting example is Bogardus Spring which flows vertically 10+ m (Schweyen, 1987) to resurge in the Coeymans Limestone; a point uncharacteristically high in the section. Presumably, this reflects an adjustment in groundwater flow patterns subsequent to complete occlusion of a paleo-spring beneath glaciolacustrine sediment.

Glacial landforms were correlated to sediment type using aerial photographs, soils maps, and water well logs. Underlying Quaternary stratigraphy was inferred by reconstructing depositional environments through the interpretation of landform assemblages. On this basis, it is unlikely that a glacial aquifer, capable of being a municipal water source, exists near the village of Gallupville, NY.

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P. Jay Fleisher, Earth Sciences Department, SUNY-Oneonta, Oneonta, NY 13820-4015; 607-436-3375; FAX 607-436-3547; fleishpj@oneonta.edu

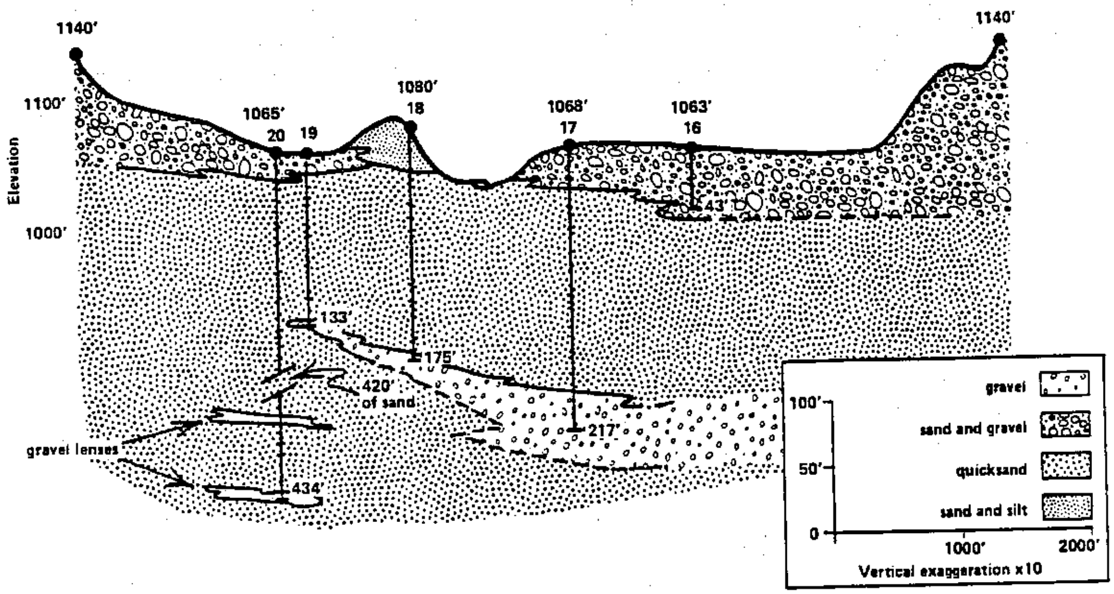
BERING GLACIER PARADIGM

Late-Pleistocene deglaciation in central New York State involved a unique combination of continental and alpine elements. As the temperate Laurentide Ice Sheet retreated (circa 14,000 yrs BP) it draped an irregular ice front across the relatively high-relief terrane of the dissected Appalachian Plateau, thereby forming ice tongues that extended as much as 20 km down broad valleys of the Susquehanna drainage system. Formed behind moraines and valley train dams, an extensive network of ice-contact and proglacial lakes received silt-rich subglacial meltwater. Rapid lacustrine sedimentation led to the accumulation of thick silt deposits that currently lie beneath the Holocene floodplain.

Conditions peripheral to Bering Glacier, Alaska, include all elements of ice-contact lake deposition that may be applied to comparable environments that existed during late glacial retreat in central New York State. As a large, warm-based glacier it simulates lobate retreat of the Laurentide Ice Sheet and embraces environments of deposition analogous to conditions of ice tongue retreat on the Appalachian Plateau.

Fed by a well-established subglacial conduit system, highly turbid meltwater (normally 2.0-2.5 g/L) discharges directly into two ice-contact lakes. Measurements of suspended sediment load and rates of sedimentation, using sediment traps and annual bathymetric changes, have been the focus of student investigations for nearly a decade, most recently by Mark Mucci and Scott Wickham. Brian Tormey, Penn State, and Don Cadwell, NYS Geological Survey, have contributed with GPS mapping projects to document changes to lake size and shape. The results provide a comprehensive data base for evaluating comparable conditions in the late Pleistocene glacial lakes of central New York State.

We have found that normal rates of ice-contact, proglacial lake sedimentation may reach 3 m per year, and as much as 15 m may accumulate in a single year during episodes of subglacial outbursts. Applying these rates of sedimentation to the lakes at the margin of the Laurentide Ice Sheet, suggests that rapid accumulation occurred during a brief window that lasted less than a century, and the Susquehanna lake chain was relatively short-lived.



Cross-sectional diagram of Glacial Lake Otego stratigraphy. The logs of five water wells along a general north-south azimuth approximately one mile (1.6 km) east of Otego indicate an exceptionally thick accumulation of quicksand. With a vertical exaggeration of X10, the log of well number 20 was compressed to illustrate a total depth of 434 ft. (132 m). Note that 420 ft. (128 m) of quicksand is represented in one break.

More Bering Glacier news with potential application to NYS

As Ernie Muller's message indicates, we made a significant break-through last summer, when striated and exotic cobbles and boulders where found in multiple locations on uplands in front of the Bering/Steller piedmont glacier. Many competent geologists have been misled for nearly a century by what appear to be foreland uplands free of drift. However, probing a previously overlooked topographic niche has yielded till and diamicton that Matt Lachniet (Syracuse University) is currently examining for microstructures.

The general lack of pre-Holocene moraines, from which glacial limits are normally identified, remains problematic, but will no longer hinder the interpretation of Bering Glacier history. We now have firm evidence of glaciogenic material from which the Pleistocene terrestrial limits and ice thickness of the Bering/Steller piedmont lobe may be determined. Our newly-recognized terrestrial evidence establishes for the first time a solid link between the Bering/Steller piedmont lobe and the Martin River glacial system, thereby verifying the existence of regional ice fields much larger and thicker than a single piedmont lobe.

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Henry T. Mullins, Department of Earth Sciences, Syracuse University, Syracuse, NY 13244-1070; 315-443-2672; FAX 315-443-3363

We presently have three active research projects in the Finger Lakes region of New York State. The first focuses on Green lakes State Park in Fayetteville and is designed to obtain a high-resolution (annual to decadal scale) paleoclimate record for NYS, utilizing the varved sediments found beneath meromictic Green lake. We have recovered a 30.5m drillcore north of Green Lake that extends from the late glacial through the Holocene, plus an 11m long core from the wetland between Green and Round Lakes that covers the entire Holocene. In addition, we have recovered a short (<1m) box core from Green Lake, plus cut slabs from nine trees felled during the Labor Day storm, in order to calibrate the stable isotopic record with historical atmospheric data. This research will be the basis of Mr. Matt Kirby's doctoral dissertation here at Syracuse.

Our second project is a very detailed study of the historical sediments (<200 years) beneath the Finger Lakes. Working with the DEC in Albany we now have box core sediment samples from all eleven Finger Lakes. The scientific objective of this study is to define and date recent environmental changes and determine whether they were induced by local or global anthropogenic activity. Of particular interest is an abrupt increase in calcite precipitation that started ~1940 A.D. in Cayuga Lake following about 3,500 years of non-carbonate sedimentation. Is this recent increase in calcite precipitation a product of cultural eutrophication (local nutrient loading) or the global increase of carbon dioxide in the atmosphere? This project is presently being carried out by Mr. Chris Lajewski for his M. S. thesis here at Syracuse.

Our final project is a revisitation of the seismic stratigraphy of the Finger Lakes. In 1986-87 we collected hundreds of kilometers of uniboom (~1 kHz) seismic reflection data from all eleven lakes which were published as GSA Special Paper #311 in 1996. Working with Dr. John Halfman at Hobart and William Smith Colleges we are now resurveying the lakes with a higher resolution (~7 kHz) EDGE-TECH seismic system in order to extract a more detailed picture of the last deglaciation and Holocene history of the lakes. Preliminary data from Seneca and Owasco Lakes reveal a much finer stratigraphy than that recorded in the late 1980s, including erosion and lake level changes.

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Andrew R. Fetterman, Earth Sciences Department, SUNY-Oneonta, Oneonta, NY 13820-4015; 607-436-3707; FAX 607-436-3547; fettera@oneonta.edu

For my Master's thesis, I have been doing preliminary analyses of surface and sub-surface, aqueous, geochemical inputs to Otsego Lake basin, Otsego County, New York. Otsego Lake occupies a glacially modified valley near the northern extent of the eastern Appalachian Plateau within Paleozoic bedrock. Recognized as a Pleistocene glacial through valley, Otsego Lake basin is a north to south trending, U-shaped valley underlain by gently southwest dipping Devonian limestones, siltstones, and shales. Pleistocene lacustrine clay overlying glacial sediments and bedrock serve as confining layers which retard and control vertical migration of groundwater. Geochemical analyses and monitoring of surface and groundwater in the northern lake basin indicate water is rick in dissolved calcite, dolomite, and gypsum.

Samples from tributaries including Cripple Creek, Hayden Creek, and Shadow Brook were tested for dissolved ion concentrations, and mineral equilibria for common carbonate minerals (calcite, aragonite, dolomite, gypsum) were calculated. local, high concentrations of sulfate (SO_4) and calcium, and summer temperatures in the range of 8°C can be used as indicators for groundwater influx to surface streams. Point source, sulfate-rich springs, occur along Lake Cooperstown strandlines in Cripple Creek and Shadow Brook. Springs in Cripple Creek maintain a mean summer temperature of 9.6°C with SO_4 concentrations exceeding 370 mg/l, whereas upstream concentrations average only 15 mg/l. Springs in Shadow Brook exceed 1000 mg/l SO_4 .

Aqueous geochemical modeling of water samples indicates multiple bedrock sources for dissolved ions and a saline, complex, regional groundwater system driven by disssolved gypsum and carbonate bedrock. Gypsum and carbonate-rich groundwater in Shadow Brook can dissolve 33 times more dolomite than that of gypsum-poor water. The process of dedolomitization is recognized and is a principal cause of solutional porosity in Karst systems. Dissolved gypsum interacts with dolomite by *incongruent dissolution* and the *common ion effect*. Water supersaturated with respect to calcite and dolomite can continue to dissolve dolomite while precipitating calcite.

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Bill Kappel - U. S. Geological Survey-WRD; 30 Brown Road, Ithaca, NY 14850-1248; 607-266-0217 ext. 3013; Fax : 607-266-0521; email: wkappel@usgs.gov

Following the April 27th, 1993 landslide (earthslump-mudflow) at the foot of Bear Mountain, Town of LaFayette, Onondaga County, New York several other (older) landslides were found just north of this area. Review of the Towns' 200-year history did not indicate any record of these former slides.

This past summer the USGS was conducting a snyoptic water quality survey of Onondaga Creek and a small toe slump along a streambank just north of the 1993 slide exposed an organic layer where logs and debris were oriented in a fashion indicative of a slide moving from the hillside toward the center of the valley. Samples from some of the larger wood fragments were collected and prepared at the USGS Reston office and sent for AMS (accelerator mass spectrometry) analysis and the date for the Onondaga #1 sample was 9,870 years +/- 40 years.

As this date did not seem to be that of a 'modern' slide the exposure was reinspected by Dr. Ernie Muller (Syracuse U.), Bill Kappel (USGS-Ithaca), and Don Pair (University of Dayton). A 5-foot stratigraphic sequence grading from coarse, calcitic gravel to a grey silt was capped by a thin, grassy layer, and finally covered with what appears to be a reworked clay (a flow clay similar to the 1993 slide). Samples from this upper organic layer are being 'picked' and will be sent for AMS dating in the near future.

Dayton student Moira Walker will be continuing this investigation as part of her B.S. thesis. She is focusing on relating the streambank exposure to the the slide morphology and associated surficial deposits.

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Donald Pair, Department of Geology, University of Dayton, Dayton, Ohio 45469-2364; 937-229-2936, FAX: 937-229-2889; email: pair@neelix.udayton.edu

Follow-up projects related to the Tully Valley mapping continued this past summer (See the contribution by Bill Kappel). In addition, USGS STATEMAP efforts focused on the surficial geology of the Jamesville and Marcellus 7.5' quads. As always, I'm happy to give informal trips to these far flung regions of Central New York State. UD's glacial geology class expects to be in the Finger Lakes region around Easter and quad mapping will hopefully resume again in May.

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Neal R. O'Brien, Department of Geology, SUNY Potsdam, Potsdam, NY 13676;
315-267-2287; FAX 315-267-2695; bullisjm@potsdam.edu

Neal R. O'Brien (SUNY Potsdam) and two of his students (Chris McMahon and David Shank) are conducting a mineralogical study of glacial samples (provided by P. Jay Fleisher, SUNY-Oneonta; Ernest Muller and Matthew Lachniet, Syracuse University; and Dorothy Peteet, Lamont Doherty Earth Observatory and NASA/GISS) associated with the Bering Glacier, Alaska. The research is determining the mineralogy of clay size (< 2 μm) recent lake sediment and bog-bottom upland samples suspected to be ground moraine. This information will be used by Jay, et al. to estimate the extent of Late Pleistocene glacier advance. The basic assumption of the investigation is that if the clay mineralogy of the clay size sediment being deposited in marginal lakes today is the same as that of bog and upland deposits, then the latter are of glacial origin associated with overriding by the Bering Glacier in the past. Initial results show a similarity of mineralogy (chlorite, illite, and minor amounts of hornblende) in all deposits suggesting that the glacier was indeed more extensive in the past.

Neal R. O'Brien (SUNY-Potsdam) and Sarah Pietaszek-Mattner (a former Potsdam student) have published a paper "Origin of the Fabric of laminated fine-grained glaciolacustrine deposits" in the Journal of Sedimentary Research (1998, vol. 68, no. 5. The study describes the origin of two Pleistocene glacial rhythmite (varved?) clays from Lake George and Geneseo, New York. Scanning electron microscope investigation indicates the clay settled in the flocculated state.

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P. Jay Fleisher, Editor
Department of Earth Sciences
State University of New York
College at Oneonta
Oneonta, NY 13820-4015