# New York Glaciogram

www.newpaltz.edu/glaciogram

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Vol. 45 (2)

## Editorial Policy

The *New York Glaciogram* is intended to be an annually compiled 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. Please contact individual contributors for permission to reprint any information published here.

## Invitation From The Editor

As the title implies, past issues of the *New York Glaciogram* have contained entries weighted toward Glacial Geology. My predecessor believed, as do I, that we should 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. Also, please check out the new *Help Wanted* section at the end of this year's volume. I will be collecting contributions for the next edition in the Fall of 2014. Deadline for next year's contributions will be Monday, December 8th, 2014. If you have any meetings, fieldtrips, or other announcements that you would like put on the Glaciogram website, please contact me.

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**(The Original FOP!)**

# PRELIMINARY ANNOUNCEMENT

## 2014 Northeastern Friends of The Pleistocene

Host: Andrew Kozlowski, Brian Bird –New York State Museum/Geological Survey

When: June 7th and 8th

Where: Auburn, NY

Description:

For the past four years the NYSGS geologic mapping program and Quaternary Research group has been actively working on numerous field projects associated with Cayuga County in the East/Central Finger Lakes Region. Cayuga County is a long north-south oriented county that spans from the southern end of the Finger Lakes to the Ontario Basin. Join us as we traverse a fascinating landscape from southern Cayuga County northward into the world famous Ontario Drumlin Field. Stops will focus on proglacial lake levels, meltwater routing, new mapping and identification from LIDAR data of glacial landforms, sediment-landform relationships, glacial dynamics, process models and glacial land systems, new chronologic data and regional correlations, subglacial landforms, Ice margins, glacial stratigraphy and sedimentology, mega-fauna and flora. Please join us, for more information and details please contact me. More information on registration, trip details and logistics will be posted on the NYSGS and NEFOP websites by Jan 30th. Happy Holidays to all.

Andrew

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**New York State Geological Association**
**http://www.nysga.net/**

## 86th ANNUAL MEETING, 2014

## Hosted by St. Lawrence University, Geology Department

The 86th NYSGA field conference will be hosted by St. Lawrence University and focus on the geology of the Adirondack Lowlands and St. Lawrence River region. Contact Jeff Chiarenzelli if you would like to contribute. Email: jciarenzelli@stlawu.edu.

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**Geological Association of Canada**
**http://www.gac.ca/**

On behalf of the Geological Association of Canada, the Mineralogical Association of Canada, the Atlantic Geoscience Society and the University of New Brunswick, the Fredericton 2014 Organizing Committee invites you to attend the Joint Annual Meeting, May 21-23 2014, on the Fredericton campus of the University of New Brunswick.

14th International Conference on Luminescence
and Electron Spin Resonance Dating
**7-11 July 2014, Montreal, Canada**

The Montréal luminescence laboratory at Université du Québec à Montréal is pleased to announce that we will host the 14th international reunion of specialists and "users" in the field of luminescence and ESR dating. As usual in these kinds of meetings, there is ample time to discuss the fundamentals of luminescence/ESR. However, given the recent increase of literature dealing with the application of these dating methods to Quaternary and Glacial geology as well as to Archaeology and Environmental sciences, several sessions will be devoted to applications. Geologists, geomorphologists and natural scientists alike may wish to attend and even present some dating results with more emphasis being into the general context rather than on the dating methodology itself. This is a rendez-vous in Montréal, July 7th to 11th, conveniently the week following the International Jazz Festival. Please visit:

http://www.led2014.uqam.ca/

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**New York State Geological Survey**

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2013 has been an exceptionally busy and productive year for glacial research activities for the New York Survey and State Museum. We have several current projects that include collaboration with the, USGS Water Resources, U.S. Fish & Wildlife, and NYDEC. We have been fortunate with both external and internal funding which remains consistent. There is an ever growing need and request for detailed mapping, stratigraphic and chronologic information pertaining to Quaternary Geology to address societal issues and we remain optimistic that programs and projects will continue hopefully at a more reasonable pace.

In September of 2012 we hired two new staff members as project geologists to take the lead on an industry backed research project sponsored by Transmissions Developers Inc. (TDI). In this instance industry approached us with a need for detailed glacial geologic mapping information and creation of a subsurface database along energy transmission corridors. Brandon Graham, an RPI graduate and a protégé of Dave De Simone originally came to work as an intern to assist with our STATEMAP Program but then stepped into the TDI project. He previously had some great experience with George Springston with the Vermont Geological Survey. Andrew Clift had just completed his MS degree at the South Dakota School of Mines when he came in to interview for an internship and left with a job! Brandon has a strong background in glacial geology, and a growing interest in ground penetrating radar applications to mapping and surficial geology. Andrew, has extensive field experience with geologic mapping and structural geology and has worked in India, Turkey and Wyoming. In December of 2013 Dr. Brian Bird a post-doc assisting with the STATEMAP program was selected as the final candidate for Museum Scientist 1 position within the State Museum and now serves as GIS specialist\cartographer and glacial geologic mapper under the direction of the geologic mapping program. Brian had previously been an adjunct at Skidmore and has extensive experience with glacial/surficial geology mapping, structural analysis of glacial deposits and subsurface drilling applications. I \Museum is exceptionally lucky to have obtained such an excellent and talented staff of geologists.

Our mapping team has been working broadly across New York State; a premier example of our recent work was mapping to address geologic hazards in the high peaks region of the Adirondacks, focusing on our drilling, mapping and stratigraphic analysis. The resulting efforts have produced a newly completed surficial geologic map of the Keene Valley Quadrangle. This map serves as a great example for the need and resulting benefit detailed geologic mapping can provide. Despite the absence of LIDAR elevation models, detailed field mapping and good old fashion foot work yielded the identification of an additional 22 large landslides in the quadrangle in addition to the 82 acre Keene Valley slide on Little Porter, mountain.

The Champlain Hudson Power Express (CHPE) is an ongoing energy investment project in New York State that plans to install a 1,000 megawatt high-voltage direct current (HVDC) power cable from the U.S.-Canada border to New York City for the purpose of delivering clean and renewable energy to the New York metropolitan area. The New York State Geological Survey (NYSGS), in cooperation with the project's developer, Transmission Developers Incorporated (TDI), has provided the basis for a comprehensive geologic assessment of the overland portion of the proposed HVDC cable route, which extends for approximately 210 kilometers (130 miles) in length. This project has allowed the NYSGS a unique opportunity to research the glacial history of the region of interest by initiating a large-scale digital compilation of data from various sources, including surficial and glacial unit data from 34 71/2-minute USGS quadrangle maps, subsurface data from over 8,400 borehole records, field data, and geologic hazard data provided by the USGS and FEMA. These peripheral materials, in congruence with a compilation of

existing LiDAR and digital elevation models (DEM), have been used to analyze geomorphic features such as drumlins and valleys, and aid in the recognition of landslides and flood zones. A combination of computer and field mapping methods has resulted in the highest resolution and most accurate surficial map to date for the region of interest that covers approximately 5000 km2 (~2000 mi2) of land. This map highlights a region primarily covered with Pleistocene sediments deposited by melting glaciers during the last ice age, including glacial till and lacustrine sand, silts and clay from proglacial Lake Albany/Vermont. The net result is an unparalleled, modern geologic framework to guide the planning and decision making process associated with major infrastructure projects in New York State.

In Central New York (CNY), we continue on two projects, one long term project investigating the groundwater and aggregate resources and chronology the cross-state meltwater channels in western and central upstate New York. In 2012 we began work near Lyons, NY have now tied three-dimensional mapping efforts there into our previous work with the Montezuma Wetlands Complex (MWC). Our strategy and efforts have combined near surface geophyscis, primarily GPR, with drilling and coring, our efforts have yielded more than 50 radiocarbon dates and a more detailed understanding of glacial stratigraphy and chronology of meltwater events and lake levels.

For our second project we have capitalized on the strong start associated with the MWC and have actively expanded our surficial mapping with the goal of completing a detailed Surficial geologic deposits map for all of Cayuga County in the next three years. Paramount to this effort has been the incorporation of LIDAR data that a has allowed us to identify and map subtle glacial landforms and target specific landform associations for intense coring efforts to improve stratigraphic relationships, recover potential plant macro fossils and improve resolution of glacial chronology for the region. Our efforts have been exhausting but rewarding and we cannot wait to share those results with you at NEGSA in March and the 2014 NEFOP meeting we are hosting June 7th, & 8th.
In previous submissions, in addition to more traditional Survey oriented activities I have talked about the NY State Museum Quaternary Research Group. This interdisciplinary group consists of Robert Feranec (Vertebrate Paleontologist NYSM), Jonathon Lothrop (Paleo Indian specialist NYSM).

We currently have several projects ongoing that range from Paleo- Indian studies to chronometric hygiene analyses where we are actively re-dating mega-faunal specimens within the museum with AMS dating to refine geographic distribution and chronology of these important specimens. We hope to continue work collaboratively on many sites within the Empire State. Please don’t hesitate to contact us at the Survey or Museum we are a resource and would love to hear from others in the community. Lastly, the mapping program has been providing paid internships to college students majoring in geology. We anticipate having a need for students in summer 2014, tell your star students it’s a great way to get some experience.

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# Vermont Geological Survey

**http://www.anr.state.vt.us/DEC/GEO/vgs.htm**

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**Vermont Geological Survey (VGS), December 2013**

Surficial geologic mapping continues in the South Mountain 7.5 Minute Quadrangle contiguous with the Bristol Quad. Both mapping projects are led by George Springston of Norwich University in cooperation with the VGS. The Town of Bristol is a VGS partner looking to apply the framework mapping to the review of proposed developments including the Act 250 land use process, groundwater source protection, siting of wastewater treatment, gravel extraction, and hazard mitigation review along with bedrock mapping concurrently conducted by Jon Kim of the VGS.

Recently posted maps at the VGS Publications web site:
http://www.anr.state.vt.us/dec/geo/ofreps.htm

In 2013:
VG13-2 Springston, G., and Kim, J., 2013, Surficial Geologic Map of the Bristol Quadrangle, Vermont: Vermont Geological Survey Open File Report VG13-2.

In 2012:
VG12-1 Wright, S., 2012, VG12-1 Wright, S., 2012, Surficial Geologic Map of the Pico Peak, Vermont Quadrangle: Vermont Geological Survey Open File Report VG12-1
VG12-4 Larsen, F., 2012, Surficial Geology of the Northfield Quadrangle, Vermont, scale 1:24,000 (older work recently digitized)

In a recently published Geological Society of America volume, the following special paper appears authored by the State Geologists of Vermont, Maine, Connecticut and Massachusetts and the Executive Director and GIS Specialist from the Northeastern States Emergency Consortium:

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Becker, L.R., Patriarco, S.P., Marvinney, R.G., Thomas, M.A., Mabee, S.B., and Fratto, E.S., 2012, Improving seismic hazard assessment in New England through the use of surficial geologic maps and expert analysis, in Cox, R.T., Tuttle, M.P., Boyd, O.S., and Locat, J., eds., Recent Advances in North American Paleoseismology and Neotectonics East of the Rockies: Geological Society of America Special Paper 493, p. 221-242, doi:10.1130/2012.2493(11).

Lidar and surficial geologic maps are integral to a "Protocol for the Identification of Areas Sensitive to Landslide Hazards in Vermont" that is included in the State's Hazard Mitigation Plan. The VGS received a nationally competitive grant that funded the development of the Protocol. Hazard maps were developed for six areas in Chittenden County with the protocol intended to be next applied in other areas of the State. For VGS, Anne Clift, a contractor, and George Springston of Norwich University developed the document and maps.

Surficial geologic maps developed by Stephen Wright of the University of Vermont (UVM) are integral to a "Seismic Hazard Map for the Burlington and Colchester, Vermont USGS 7-1/2 Minute Quadrangles" with a focus on the potential for earthquake wave amplification. A FEMA Earthquake Hazard Reduction State Assistance Grant funded the project in cooperation with UVM Engineering and Norwich University. The report and maps are at the VGS web site:

Lens, J., DeWoolkar, M., Springston, G., and Becker, L., 2013, Seismic hazard for the Burlington and Colchester, Vermont USGS 7-1/2 minute quadrangles: Vermont Geological Survey Open File Report VG13-3. Text (6 pages) and map.

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**New Hampshire Geological Survey**
http://des.nh.gov/organization/commissioner/gsu/index.htm

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**New Surficial Geology maps of NH**
The NH Geological Survey recently completed its 2013 field mapping season. Five 1:24000 scale Surficial Geology maps of NH were field mapped.

1. The **Andover Quadrangle** (Geo-121-024000-SMOF) by John Cotton and Anita Cotton.
2. The **Plymouth Quadrangle** by John Brooks and John Tinkham.
3. The **Franconia** and **Lincoln Quadrangles** by Brian Fowler.
4. The **Waterville Valley Quadrangle** by Carol Hildreth.

**Glacial Geology Field Trip**
The Geological Society of New Hampshire (GSNH) ran its summer 2013 field trip in June. This trip, led by Dan Tinkham and John Brooks, included stops and discussions of both the bedrock and surficial geology of the Lakes Region of Central New Hampshire. Bedrock stops focused on a description of the Belknap Range Intrusive Complex, which includes a unique variety of igneous rock types in close proximity.
Surficial geologic discussions included the transition from Glacial Lake New Durham to present day Lake Winnipesaukee, descriptions of small scale glaciolacustrine deposits laid down in ice dammed glacial lakes, ice contact deposits, glacial outwash settings, and post glacial fan construction.

**NE-GSA at Bretton Woods NH in 2015**
It looks like after a very successful 2013 Section Meeting, the 2015 NE-GSA Meeting will again be held at Bretton Woods, NH. Watch the GSA Meeting site for upcoming details. http://www.geosociety.org/meetings/

**New Hampshire's Old Man of the Mountain**
This famous post glacial profile and State symbol has been honored through the creation of the Old Man Profile Plaza and museum at Profile Lake in Franconia Notch New Hampshire. http://www.cannonmt.com/oldman.html If you are in the area it is well worth a visit.

**NH Geological Survey Publications**
A list of NH Geological Survey Publications can be viewed at: http://des.nh.gov/organization/commissioner/pip/publications/geologic/index.htm These publications can be obtained by contacting the NH Department of Environmental Services Public Information Center, at info@des.nh.gov; NHDES- PIC, PO Box 95, Concord, NH 03302-0095; (603) 271-8876

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*Key Concepts in Geomorphology*, a new NSF-supported textbook for Introductory Geomorphology and Physical Geography classes is finished and will be available in late December 2013 for use in spring semester, 2014. The book is full color with more than 100 new figures and several hundred photographs. Published by WH Freeman, all chapters in the book have been extensively reviewed both by generalists who teach geomorphology and by specialists. The book is accompanied on the web by more than peer-reviewed 250 case studies, available free of charge from http://serc.carleton.edu/vignettes. With NSF support, we have also compiled a searchable archive containing thousands of photographs useful for teaching Geomorphology.

See the images at: http://www.uvm.edu/~geomorph/gallery/

To learn more about the book see:

http://whfreeman.com/Catalog/product/keyconceptsingeomorphology-bierman

or contact us directly.

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3-D Quaternary Mapping on the Niagara Peninsula

The Ontario Geological Survey (OGS) has initiated a new 3-D mapping project encompassing approximately 5000 km2 of the Niagara Peninsula (bounded by Lake Ontario to the north, the Niagara River to the east and Lake Erie to the south) extending west and north to join with the boundaries of the Brantford-Woodstock 3-D project area.

The goal of the Niagara Peninsula project is to build an interactive 3-D model of Quaternary deposits that form both regional and local aquifers and aquitards. Key objectives are 1) reconstruction of the regional Quaternary history, 2) development of a 3-D model of Quaternary sediments, and 3) characterization of the properties of the modelled sediment packages. The model will be based on the interpretation of natural and man-made exposures, existing subsurface records (water wells, geotechnical records, etc.) and new drilling and geophysical data.

Reconnaissance field operations were conducted during the summer of 2013 and targeted portions of the study area where stratigraphic information required to develop a 3-D model could be obtained. The sediments were described, photographed and sampled for pollen (peat), radiocarbon dating (wood and detrital organics from peat and stratified sediments) particle size analysis (diamicton and stratified sediments) and carbonate content, heavy mineral analysis and pebble counts (diamicton). A ground gravity geophysical survey was conducted in the fall of 2013 to investigate the bedrock surface in areas with known or predicted buried bedrock valleys extending south from the Onondaga and Niagara escarpments, as well as search for outlets of major buried valley systems below the Niagara Escarpment. This survey will aid in the selection of drill targets and inform the 3-D model in areas not drilled.

Continuous coring of the overburden and upper 3 m of bedrock will take place during the 2014 and 2015 field seasons. It is anticipated that monitoring wells will be installed by project partners and other agencies at sites of greatest hydrogeologic interest.
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**G. Gordon Connally**
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In 2011 I had identified the Ontario Lobe Grounding Line Moraine (OLGLM). It stretched 100 miles (100 km) from the shore of Lake Erie to the west bank of Little Buffalo Creek. There are five morainal segments interrupted by small gaps eroded by creeks. The OLGLM was emplaced beneath the waters of Glacial Lake Warren II. A second moraine paralleled the OLGLM a short distance to the north that was deposited when the water level dropped from Lake Warren III to Lake Lund. During the summer and fall of 2013 I was able to extend the moraine farther east.
**********

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My teaching has been very rewarding the past 2 terms. At The College of Saint Rose, I taught Hydrogeology to a delightful group of 6 students. The College is a wonderful place to teach with excellent support staff and a truly dedicated geosciences department. Their collective presence at GSA in NH in March was a demonstration of the students enthusiasm. One of our students took on an internship with Koz and Brandon at the NY Survey over the summer and into the fall.

The fall term has me at a 2nd gig...Visiting Prof at Bennington College. I'm filling in for Tim Schroeder while Tim is on leave in Germany. The College is only 10 minutes' drive from home for me and the faculty and staff there have been so friendly and supportive that I wish I'd known more about this place that is on my doorstep. It's so nice to have students call you by your first name and get to know you better than at some other places I have taught. My class of 4 students for Geomorphology gave me a chance to experiment and teach this as a tutorial with no lectures and all in the field. Plus, it was pitched at an intro level and this gave me more opportunity to play with how to make students who will not go on in geology appreciate and understand landforms. With their feedback, I hope to put this fresh knowledge to work in the spring term.

The coming spring term has me teaching at both of these colleges. At Saint Rose, I'm teaching Geomorphology and expect a solid group of majors in the environmental and geosciences to explore landform evolution in a more traditional classroom and laboratory setting. For those (few?) of us who are not happy with Ritter's Process Geomorphology text, I wish there were more choices than I've come across lately. In addition, I'm teaching Environmental Geology to about a dozen students in the spring at Bennington College. I'm already thinking of ways to improve upon this course I last taught at RPI several years ago. Please feel free to offer suggestions.

My consulting work continues and 2013 has been a very productive year. A project in Troy, NY, has entered a new phase and I was able to evaluate several archaeological trenches there over the summer. A full recovery of this PreContact site is anticipated in 2014. Previously, we employed both traditional archaeological techniques of shovel test pits and trenches to discover and assess a new PreContact site along the Wynants Kill. What made the project especially rewarding was the decision to use hollow stem augering to delineate the extent of the site and determine the stratigraphy and geomorphic evolution of the locale. We made this decision due to the thick metallic fill overlying fluvial terraces that contained the site. The field analysis of the cores we retrieved enabled me to recognize several buried Wynants Kill terraces and a buried channel beneath the thick fill wedge. In addition, I could discern a buried ridge of

Pleistocene lake silt-clay that "defended" the site and allowed for aggradation of terraces upstream of the silt-clay ridge. It was beautiful to be able to infer the history along this small reach of the Wynants Kill and see that the terraces contained evidence of human occupation from at least the mid-Holocene through to Contact times with the Dutch. Hope I get back there in 2014.

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Greetings from Oneonta! Once again, many kudos to John Rayburn for keeping this newsletter circulating.

I like to describe this past year as an expedition from the Marcellus to Mars. We have continued to work on water and rock geochemistry in Otsego County and nearby environs. My students and I have been building a fairly substantive data set now, which is available online through the Catskill Headwaters Research Institute (http://www.oneonta.edu/academics/chresi/). We anticipate adding data from another 80 wells or so that is currently being analyzed by Community Science Institute (funded by Otsego County Conservation Association). We hope to have it online this next spring or summer. In addition, we have added a couple of Google Fusion Tables (geodatabases linked to Google Maps) for bedrock and surficial geology of New York, and data from USGS water geochemistry surveys, and I encourage educators to take advantage of the online access. You should be able to filter for any of the columns of data in the database, and then map or graph the filtered output. For instance, if you want to find the black shales in New York, you can filter the data for that attribute in very short order, and view it immediately. You can also filter on rock age, chemical constituent, etc. My students, Leland Cohen, Joe Spaulding and Alayna Fuess, are envisioning an online clickable geologic map with pop-up windows at key geologic sites with pictures and more information. It's not hard to get data into the Fusion Table. It's shareable and clickable, and it's free. It might be a project for the geologic community to pursue jointly. I welcome your feedback on this effort.

Last year I started a lake sediment coring operation with Christoph Geiss at Trinity College. It was my first experience pulling core up through the ice. We successfully pulled nearly 6 m of core from Otsego Lake. The excitement of coring was intensified as our corer slipped out of our hands and down the hole in the ice and into several meters of water. Fortunately, Paul Lord and scuba crew were dreaming of this kind of opportunity where they could dive through the ice. They easily retrieved the Livingstone corer, with

had settled like a spear in upright position. We are planning another expedition this winter, if the lake freezes hard enough. Christoph got an age from a hemlock cone a few meters down which placed that section in the early Holocene. Our goal is to use a variety of proxies for climate and environment, and hopefully extend the record back to the late Pleistocene and a deglacial setting. Those proxies will include magnetic properties, grain size and shape, diatom abundance, and mineralogic properties.

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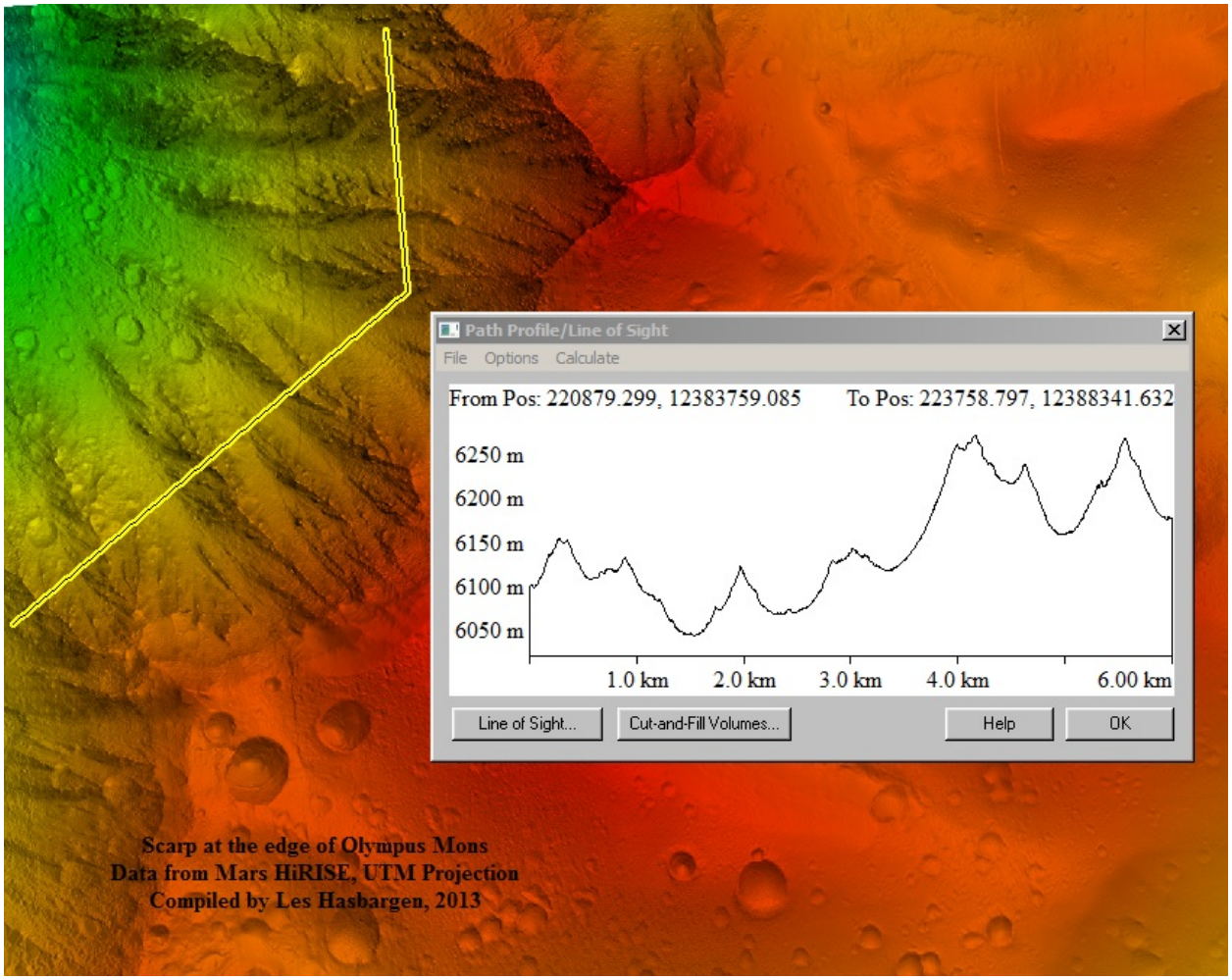
Oh, I almost forgot about the Mars part of the introduction. I have continued to explore the phenomenal data available through OpenTopo, the USGS, Google Earth and the expanding State LiDAR elevation data sets. I have a student who really wanted to study Mars (Sophie Kolankowski), so we have started to search the online data provided by NASA, mostly from the HiRISE mission, which captures high resolution aerial images, and which NASA scientists have been converting to elevation data sets of near LiDAR quality and resolution. We have started looking at gully properties in crater walls. I suspect we'll encounter a glacier there soon…




Gullies, cratered, and showing a fair amount of relief (50-100 m or so) across slope. Dare I say that they are U-shaped? I know—it is just convergence of form regardless of process, but thought-provoking at least.

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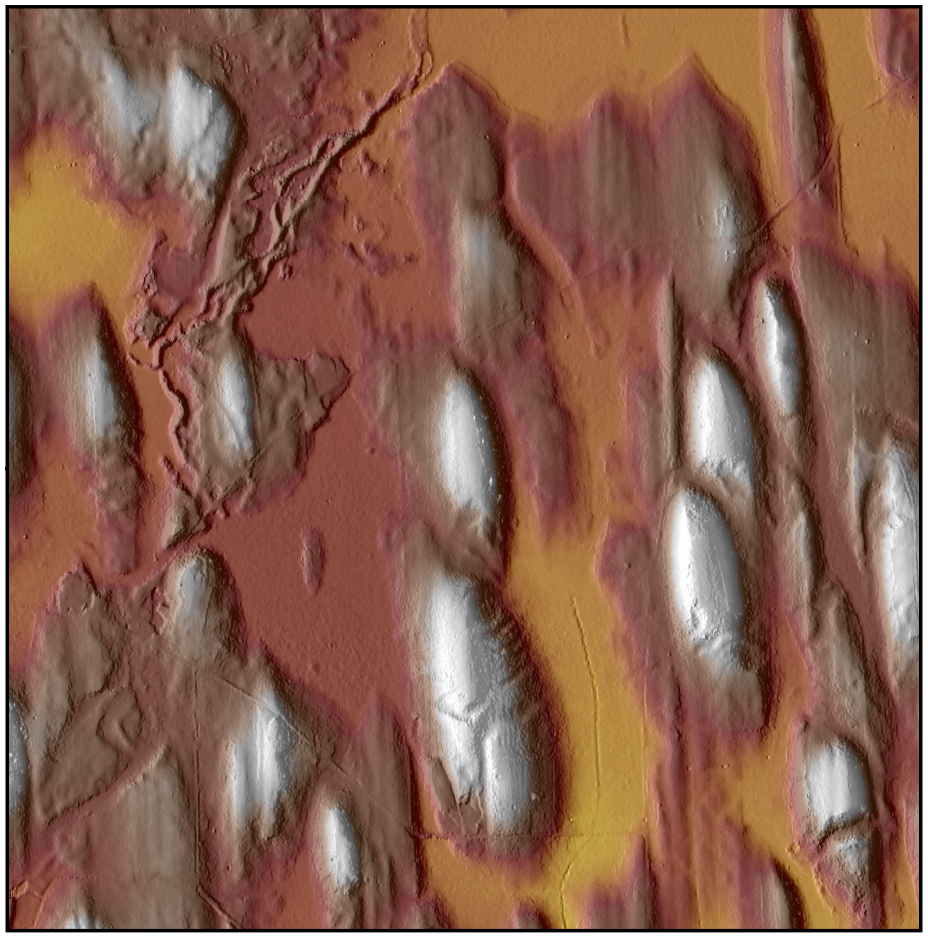
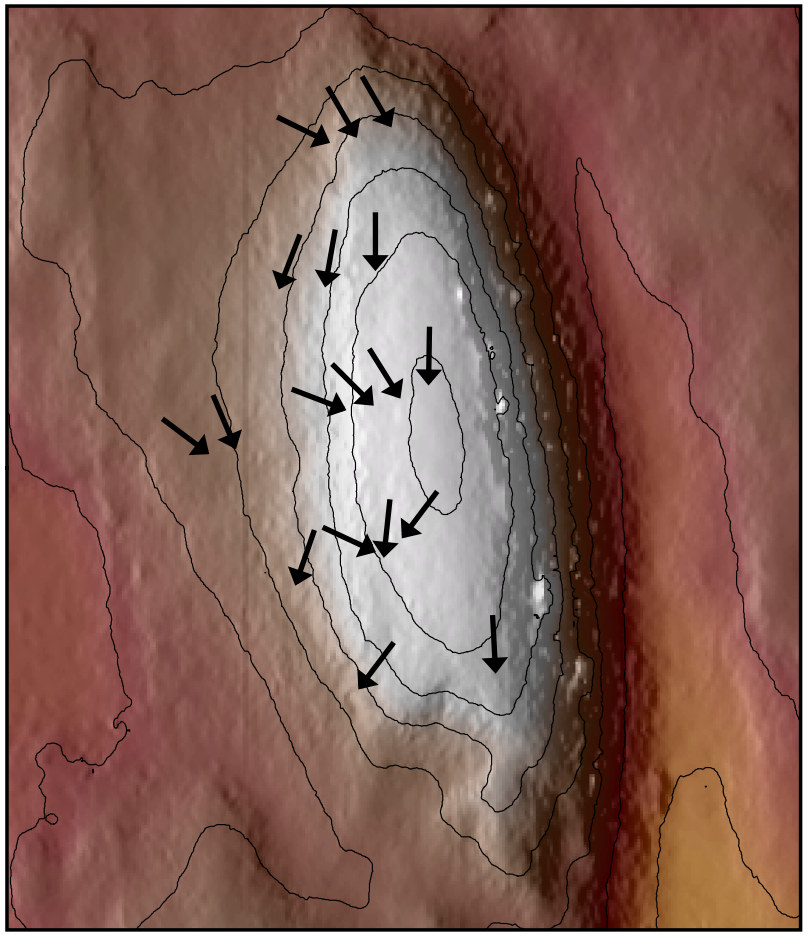
Our investigations into magnetic till fabrics and the origins of drumlins in the Weedsport Drumlin Field continue. We are using anisotropy of magnetic susceptibility (AMS) to measure the fabric of microscopic, elongate, ferromagnetic grains within the till. We sampled one drumlin and its adjacent interdrumlin low in the summer of 2012, and are finalizing analysis and prepping for publication. The resulting fabrics (see the attached figure) have generated some interesting results we will be presenting at the NE GSA meeting in Lancaster. In brief, drumlin fabrics are typically strong (alignment values greater than 0.85), with the mean fabric plunging north and parallel to the drumlin long axis. Spatial patterns show divergence at the up-ice end of the drumlin, parallel to convergent flow along drumlin flanks, and downslope flow at the tail of the glacier. Interdrumlin fabrics are typically weaker (alignment values less than 0.8) and roughly parallel drumlin long axis. Both fabric strength and anisotropy increase with elevation, with peak values occurring at the drumlin crest. The relationship between drumlin fabric and form that we have observed we interpret to be supportive of an accretionary model for drumlin genesis. For more, come see our presentation in Lancaster.

Looking forward, we are beginning to apply our techniques abroad. In September, we spent three weeks in an RV investigating and sampling Swedish tills. Analysis is only in its early stages; however, we see promising results! Additionally, our research on rock glaciers in the Andes of Argentina is ongoing. Additional field work is planned for January 2014. Satellite interferometric synthetic aperture radar (InSAR) analysis is underway at Lehigh in our investigation of rock glacier kinematics and sediment transport, and some preliminary results and questions were presented at the national GSA meeting in Denver.





Left: Lidar map of sampling locality southeast of Cato, NY, centered on study drumlin.
Right: Study drumlin showing paleo-ice flow directions interpreted from 18 magnetic susceptibility till fabrics.

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First, to update information supplied by me in the 2012 Glaciogram, the second paper on glacial lake features of the Bruce Peninsula appeared in the Journal of Great Lakes Research 39, 100-109 (20123), with the title "Postglacial lake shoreline surveys and lacustrine paleobiotic records in northern Bruce and Grey counties, Ontario", and was coauthored by G. L. Mackie.

Plans to apply amino acid mollusc analysis to five sub-till organic sites were delayed due to loss of funding for the intended laboratory. However, negotiations have been successful with another lab in the UK to carry on the work.

Samples of near-surface clay and sand deposits from Ft. Erie, Ontario, are undergoing recovery of microvertebrates, plants, molluscs, and ostracodes for paleoenvironmental study, part of the reactivation of M. Sc. work by Stephen Douglas (2003). As part of the history of the Niagara area, it interfingers with the history of the Niagara River and Falls, which received a lot of attention in the nineteenth and twentieth centuries. Even so, the history of the area continues to evolve.

The Fort Erie work was undertaken in association with extensive archeological work at the twinning of the Peace Bridge, joining Fort Erie, Ontario, and Buffalo, New York. A blanket of archeologically rich material spanning the last 4000 years has been repeatedly encountered in the downtown area of Fort Erie over the past half century. The location at the outlet of Lake Erie matches that of similarly rich archeological material at the site of the twinning of the Blue Water Bridge at Port Huron-Sarnia at the outlet of Lake Huron. Both were important crossing places in the Great Lakes region, although the Fort Erie area was also important for its rich chert resources in the Onondaga Escarpment.

While reviewing some of the large literature on Niagara, Several questions caught my attention on which I'd like to comment. Others may have further comment or can provide supplementary information.

As far as is known, the oldest surviving sediments in the Niagara River valley are found in the St. Davids Valley. It was recognized very early as a former course of an ancestral Niagara River. Spencer (1907) reported the identification of a piece of white spruce wood from a boring by the GSC into the valley fill, but the Redpath Museum, McGill University, does not have that piece of wood, although it has other plant remains identified by Penhallow from the Toronto interglacial Don Formation. Hobson and Terasmae (1969) reported a 14C date on GSC borehole 5 as 22,800 +-450 years (GSC-816). Of their 9 holes drilled, only logs for holes 5 and 8 were published in Hobson and Terasame (1969). The other logs are not extant. P.J. Barnett reported another date on

wood from an OGS borehole (personal communication, 2013) as 24,790=-190 (TO-1595). Neither of the dated pieces of wood was identified. Further work in the Niagara Peninsula is underway by the OGS.

An early question was, when was the St. Davids Valley eroded? The dated wood provides a mid-Wisconsin minimum age. Opinions have varied as to whether it was eroded in preglacial time (Spencer, 1907) or in the last interglacial (Taylor, 1913). A last interglacial age has long been favored. Where were the Falls when the valley erosion reached its southern limit? Johnston (1928) proposed the head of the Whirlpool Rapids as that location, based on railway bridge borings in that vicinity. A following question then was, if last interglacial, why was that gorge so much shorter than the present interglacial gorge? ---- and the present lengthening shows no sign of ending. The answer may be in the history of the Laurentian buried valley (the early drainage link between the upper Great Lakes and the Lake Ontario basin). Stratigraphic work near Toronto suggests that the upper Great Lakes continued to drain along the Laurentian Valley at least as late as the last interglacial (Don and Scarborough formations) and perhaps even the mid-Wisconsin (Thorncliffe Fm.). Late Wisconsin glaciation established the present blockage of the Laurentian Valley while forming the Oak Ridges moraine. Of course, there could have been several blockages and breakthroughs in earlier time, but there is an explanation of reduced Erie outflow during the last interglacial because of the continued diversion of the upper Great Lakes along the Laurentian Valley. As often discussed, reduced Erie outflow likely showed falls retreat.

Speaking of which, the 2012 Glaciogram carried a submission by Lewis and King, alluding to the dry climate in the early postglacial as lowering Lake Erie level below its outlet sill for a time span of about 6,000 years. Of course, such a condition would reduce the flow of the Niagara River to a small fraction (maybe even dry) of its already reduced flow because of the diversion of the Upper Great Lakes drainage through the deglaciated North Bay outlet. That may have halted or at least greatly slowed falls retreat. The story is still unfolding, so stay tuned!

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The Cosmogenic Nuclide Preparation Lab at SUNY Geneseo is processing dozens of samples every year for cosmogenic $^{10}$Be exposure dating of Quaternary deposits and landforms. The lab is involved studies of glacial deposits in the Great Basin and Rocky Mountain regions of the western U.S., in addition to other applications in geomorphology.

Jeff Munroe (Middlebury College) and I published a few papers this year about Pleistocene glacial and paleolake records in the Great Basin; these are in GSA Bulletin, EPSL, and the Journal of Quaternary Science. Eric Leonard (Colorado College) and I chaired a session on Pleistocene climate records at the GSA meeting in Denver, in which several of our students presented new cosmogenic $^{10}$Be exposure ages of glacial deposits in the Lewis Range (Montana) and temperature and precipitation limits for the Pinedale maximum in the southern Rockies. Joe Licciardi (University of New Hampshire) presented records of glaciation during marine oxygen-isotope stage six in the western U.S., including some new cosmogenic $^{10}$Be exposure ages of stage six moraines in the Great Basin, which we will combine into an invited review for Quaternary Science Reviews in the upcoming year.

As noted in previous glaciograms, I am always interested in developing new, collaborative research involving my cosmogenic nuclide lab, especially in New York State. If you are interested, please let me know!
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I continue to examine the sedimentary record of historic and prehistoric flooding in the upper Susquehanna River watershed. With a group of my undergraduate students (ably assisted by John Rayburn and Amie Staley – SUNY New Paltz) we have recovered a set of shallow cores from an abandoned river meander along the Chenango River near Greene, NY. Preliminary analysis indicates that, subsequent to channel abandonment, a marsh and oxbow lake have persisted at the site with a few influxes of coarse sediment indicating flood events. We expect to obtain a few radiocarbon dates to constrain the chronology at the site in order to interpret whether we have recorded only historic events or additional prehistoric flood events. The project will ultimately include other floodplain sites from the upper Susquehanna and its tributaries in an effort to construct a regional flood-frequency history of large events, optimally for the last few thousand years.
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I have been mostly focusing on tree ring research over the last few years with the help of David Barclay (SUNY Cortland), Carol Griggs (Cornell), and Neil Pederson (LDEO).

More to come on those efforts in the future, however there has been a published result of a cool cross-over I would like to share with you. For several years I have been experimenting with treating varves like tree rings. I finally took it from using standard dendro software for varve analysis to writing original software and methods with Frederick Vollemer (SUNY New Paltz). We announced the effort at the 2013 NE-GSA with the official introduction of ANTEVS (Automatic Numerical Time-series Evaluation of Varve Sequences). The manuscript is now published and ANTEVS is available for your use too.

Rayburn, J.A., Vollmer, F.W., 2013. ANTEVS: A Quantitative Varve Sequence Cross-Correlation Technique with Examples from the Northeastern United States. GFF – Journal of the Geological Society of Sweden 135, 282-292.

http://www.frederickvollmer.com/antevs/

(It also works with tree rings, or any other numerical time-series you may have.) If you try it, please let us know what you think.

In other news, David De Simone and I have finished revising the surficial map of the Phoenicia, NY Quad in the Catskills with the help of our REU students. Former New Paltz student Amie Staley presented the results at Map Blast at NE-GSA. David and I have been discussing continued mapping in both the Catskills and the northern Hudson Valley over the next year.

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Our book *The Hudson Valley in the Ice Age: A Geological History & Tour* was published in October, 2012 by Black Dome Press. The book was written to be an easy read, introducing the basics of the Hudson Valley's ice age history to a wide variety of readers. It has been well received and, so far, several thousand copies have been sold. The book has piqued a great deal of interest and attention among the general reading public for which it was written. As a result, we have been invited to speak before all sorts of cultural and civic groups in the Catskills, and up and down the Hudson Valley. So far, in 2013, we have been invited to make almost 40 personal appearances at a wide variety of locations. We have appeared at numerous libraries, museums, state parks, a national park, bookstores, historical societies, environmental preserves, colleges, a bird watcher's club and at one municipal event. We have visited several hiking, mineralogy and outdoors clubs. We have done keynote addresses at several annual meetings. We have led hikes to various ice age sites. Typically our appearances attract many more people than

our hosts had anticipated. We have been interviewed by regional radio and television stations, and also by several newspapers and magazines. We filmed a video for the National Park Service. Notable venues for our appearances include the Wallace Center at the Roosevelt Library, in Hyde Park; the Albany Institute of History and Art, in Albany; Olana the Frederic Church National Historic Site; The Beacon Institute; and the Hudson Valley Ramble. Currently, one of us (Robert) is being auctioned off by the Hartwick College United Way campaign. The winner will be taken on a tour of the ice age history of North/South Lake State Park. Our book has received numerous favorable reviews in various journals and from many, many individual readers.

We also continue to write weekly, monthly, and quarterly columns for a total of six newspapers and one magazine. We have a potential readership of at least 30,000 people and probably many more than that. One recent series of columns, worth noting, was a nine piece sequence in the *Woodstock Times* that related sites on the Hudson River School Art Trail to their ice age histories. The Art Trail was established by Cedar Grove, the Thomas Cole Historical Site. It takes people to locations where the great 19th Century artists painted their landscapes. Our thesis is that an ice age heritage overhangs each of these locations. These columns take readers who are quite likely mostly interested in art, and introduces them to the Ice Age. Another Woodstock Times series explored the ice age history of North/South Lake State Park. With this series we attracted readers who are likely most interested in hiking and scenery and, again, introduced them to the Ice Age. We have thus been widening interest in the geological sciences. We believe that this is what popular science is supposed to do.

We are, indeed, primarily popular science writers, committed to explaining the ice age and general geological history of our region to the broadest possible audience of readers. We believe that our efforts have helped the residents of the Catskills and Hudson Valley to come to better understand the geological heritages that created and shaped their scenic landscapes. In short, we are committed to breaking down the walls that lie between science and the general public. All this has been a very rewarding endeavor. You can keep up with our work by joining our Facebook site “The Catskill Geologist.”

Our books and columns are not aimed at the readers of this newsletter. The book might, however, make a good gift for your friends and relatives who wish an introduction to this science. We do promote, as often as possible, the works of professional geologists. We try to introduce them to our readers and explain their studies to the same audience. Let us know what you are doing.

We also write columns for the Geological Society of America’s Science and Society Division. These columns are aimed at encouraging larger numbers of professional geologists to make efforts similar to ours. Your science of the Ice Age is well suited for popular science writing. It is rich in imagery that is highly appealing to the general public. We ask “What have you done, where you live, to promote an understanding of this, your science?”

Our book has been published, but we will not consider it to have been completed until a second, revised edition comes out, probably several years from now. If you are aware of any content problems in any of our writings, we encourage your input, please let us know.

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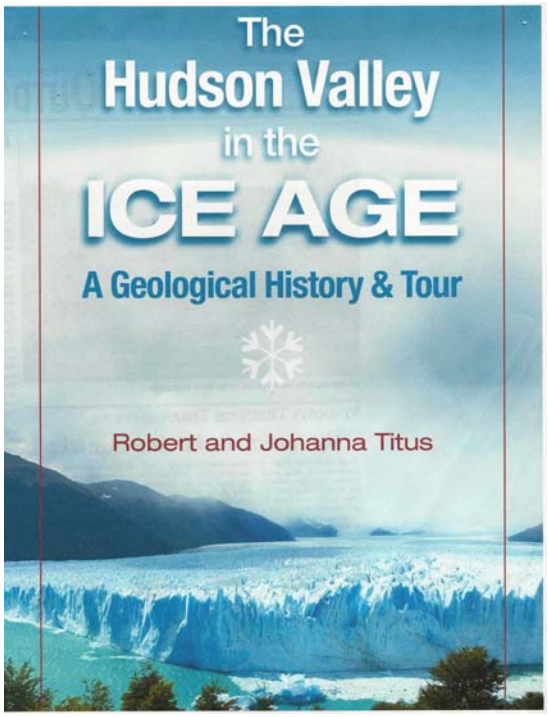


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**New Book on the Geology of the White Mountains**

Durand Press in Lyme, NH has published a book titled "The Geology of New Hampshire's White Mountains". There is a large body of scientific literature on the White Mountains written during the past 200 years, but this book is the first since the 1800s to provide a broad treatment of the region's bedrock and surficial geology, as well as archaeology.

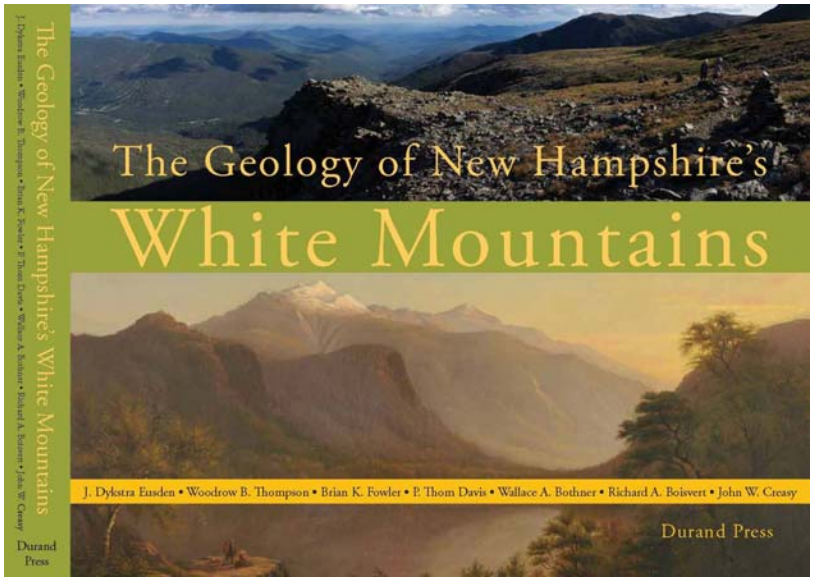
The project originated at a 1993 Mount Washington Observatory symposium on the glaciation of the White Mountains. Co-authors *Woody Thompson* (Maine Geological Survey), *Brian Fowler* (Mt. Washington Observatory), and *Thom Davis* (Bentley College) started working on it, eventually writing chapters on continental and alpine glaciation, and landscape evolution during the Holocene.

*Dyk Eusden* and *John Creasy* (Bates College) joined the team, along with *Wally Bothner* from the University of New Hampshire. These authors covered the bedrock geology of the White Mountains, while *Richard Boisvert* (N.H. State Archaeologist) summarized recent work on Paleoindian sites. Dyk used his sabattical at Bates College to complete the bedrock chapters and assemble the book for publication. It "hit the streets" just in time for its debut at last spring's meeting of the Northeast Section of GSA.

This book was written for the general public, but it also summarizes recent research that will interest the professional. Many famous geologic features in the White Mountains are described and illustrated in the book. They include sites you may have visited during NEIGC or Friends of the Pleistocene field trips, as well as lesser-known localities. Color graphics are used throughout to help explain everything from plate tectonic history to Holocene climate change.

Pleistocene topics covered in the book range from cirques on the Presidential Range to ice-dammed glacial lakes that occupied river basins. Both old and new controversies are discussed, showing that our knowledge of glaciation in the White Mountains continues to be a dynamic work-in-progress! The authors discuss research that has refined the deglaciation chronology and its relation to climate events. Cosmogenic nuclide exposure dating and correlation with the North American Varve Chronology are key elements of this ongoing work.

The Pleistocene sections are followed by a chapter on postglacial developments including periglacial features in the alpine zone, waterfalls, landslides, and vegetation changes. The book concludes with a chapter on Paleoindian settlement of the region in latest Pleistocene time, for which much evidence has been discovered in recent years.




The 175-page book also includes a glossary and extensive reference lists. It can be purchased from Durand Press via their website: http://www.durandpress.com/books.htm