THE GREEN MOUNTAIN GEOLOGIST

QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

VGS Website: www.uvm.org/vtgeologicalsociety/

WINTER 2008	VOLUME 35	NUMBER 1

The Vermont Geological Society
Winter Meeting
March 1, 2008, 9:20 AM
Cabot Science Building, Room 085
Norwich University, Northfield, Vermont

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12:10PM	EXECUTIVE COMMITTEE MEETING

ABSTRACTS

CLIMATE IMPACTS, RESOURCE MANAGEMENT AND DECISION-MAKING: THE ROLE OF THE DEPARTMENT OF THE INTERIOR

ARMSTRONG, Thomas, R., Senior Advisor for Global Change Programs, U.S. Geological Survey, 104 National Center, Reston, VA 20192; tarmstrong@usgs.gov

The Nation's lands and waters provide many goods and services including ecological, economic, water, wildlife habitat, forage, open space and scenic beauty, resources and human habitation. The USGS Global Change Program focuses on providing critical science, monitoring and predictive modeling of information related to our changing climate and its effects. The science that results from this program helps policymakers, resource managers, and citizens make informed decisions about the management of the landscapes for which they have responsibility and on which they live.

In the next 10 years, the U.S. and other nations will need to make management and policy-level decisions and develop adaptation and mitigation strategies that anticipate the effects of a changing climate on the complex interdependencies between environmental processes and human affairs. Accurate, relevant scientific information will be essential for developing and validating adaptation and mitigation strategies. Current climate models and scenarios do not provide information at the spatial scales that most stakeholders require for effective resource or hazard management, and they do not provide information in ways that are accessible to the managers that need that information to effect sound decisions related to the resources to which they are entrusted.

USGS has begun development of an approach toward a better scientific understanding of the Nation's most sensitive lands, to link and truly integrate comprehensive information, geologic, biologic,

hydrologic, and geographic, across national, regional, and local contexts through time. To accomplish this, the USGS Global Change Program utilizes the well-established 1997 Committee on Environment and Natural Resources (CENR) conceptual framework for integrating monitoring and research. This framework combines data collection and analysis at three broad scales and methodologies—local, regional and national—to integrate across different temporal (extreme events to chronic conditions) and spatial scales.

Given the unique USGS capabilities in monitoring and research from broad-scale, orbital platforms down to detailed in-situ measurements, this approach provides an integrated scientific framework for essential scientific research, for climate-scenario testing, for the development, validation, and cost-effective modification of mitigation and adaptation strategies, and for the assessment of risk to communities. By determining the key processes controlling the effects of climate warming in multi-disciplinary studies of specific vulnerable landscapes and waters, assessing the complex interactive effect of climate warming and land use on ecosystem vulnerability, and modeling ways in which multiple stressors affect those inter-relationships, intensively-studied watersheds will provide foundation understanding needed to explicitly relate ecosystem dynamics to macro-indicators that can be monitored at large spatial scales. The primary benefit of this integrated cross-scale approach is that the results and outcomes are not only applicable to the intensively-studied watersheds themselves, but can also be applied to understand the effects of climate at the regional, national and even global scales.

LIFE AND TIMES OF THE HINESBURG THRUST IN WILLISTON, VERMONT: CONNECTIONS BETWEEN PALEOZOIC TECTONICS AND GROUNDWATER

KIM, Jonathan[1], GALE, Marjorie H.[1], DERMAN, Karen M.[2], and KLEPEIS, Keith A.[2], (1) Vermont Geological Survey, Waterbury, VT 05671; Jon.Kim@state.vt.us, Marjorie.Gale@state.vt.us; (2) Department of Geology, University of Vermont, Burlington, VT 05405; Karen.Derman@uvm.edu, Keith.Klepeis@uvm.edu

In 2007, the Vermont Geological Survey constructed a bedrock geologic map of the Town of Williston in order to address groundwater quantity and quality issues. The town is underlain by metamorphosed Late Proterozoic-Cambrian rift to drift stage clastic rocks of the Green Mountains on the east side that structurally overly Lower Cambrian–Middle Ordovician carbonate and clastic continental shelf sedimentary rocks of the Champlain Valley on the west side. These sections were juxtaposed by the west-directed Hinesburg Thrust (HT) during the Ordovician Taconian Orogeny. Recent logs for domestic groundwater wells demonstrate that this thrust can be penetrated at depths ranging from ~100-1000 feet depending on where the well is drilled relative to the thrust front; these wells frequently have high yields.

Rocks in the upper plate of the Hinesburg Thrust underwent four phases of ductile deformation. The dominant foliation (Sd) in these rocks is a NNE-trending gently east-dipping S1/S2 composite spaced cleavage formed by two generations of isoclinal folds. Asymmetric shear bands also locally define S2. Bedding is only preserved in S1 microlithons. Sd was deformed by NNE-trending, tight, asymmetric, gently plunging, and west-verging F3 folds with an axial planar crenulation/fracture cleavage. Whereas F3 folds can be identified conclusively in lower plate rocks, S1 and S2 cannot be consistently correlated across the HT boundary. Open F4 folds with steeply dipping E-W trending axial surfaces warp all earlier structures. Frequency-azimuth fracture plots show multiple statistical peaks with ~E-W trending fractures being dominant.

Pronounced linear topographic patterns observed on slope maps generated from LIDAR data are consistent with the orientations of ductile and brittle structures in the bedrock. Cross sections that were drawn across Williston and Hinesburg from well and structural data demonstrate that the HT surface is

irregular. Ongoing analysis seeks to correlate the HT subsurface morphology with elements of its complex structural history.

TERRAIN ANALYSIS USING LIDAR TOPOGRAPHIC DATA: A CASE HISTORY FROM WILLISTON, NORTHWEST VERMONT

SPRINGSTON, George E., Department of Geology, Norwich University, Northfield, VT 05663; gsprings@norwich.edu

Surficial geologic mapping for the Vermont Geological Survey was greatly facilitated by the use of LIDAR (LIght Detection And Ranging), a form of airborne laser scanning. Williston, on the eastern side of the Champlain Valley, was an ideal test site due to the varied topography.

Lidar data obtained from the Vermont Mapping Program had already been processed to remove the effects of vegetation and buildings and was available as a grid of elevation points with 3.2 m spacing. Using ArcGIS™ software, an 8 m raster digital elevation model (DEM) was created and contour lines, percent slope map, profile curvature map, and shaded relief (SR) map were derived from it. Tests of slope maps derived from 4, 8, 16, and 32 m DEMs showed that the 16 and 32 m DEMs were inadequate for 1:24,000 mapping due to lack of detail.

The slope map dramatically reveals the fine texture of the landscape, with subtle changes in slope being shown through continuous shading from light to dark. By this means, many features having less than one meter of topographic relief are clearly shown. This allows field mappers to rapidly discern meander scrolls in the floodplains, lacustrine and fluvial terraces, gullies eroded into the terraces, till shadows, hummocky till, and many bedrock outcrops, whether in open or forested areas. Bedrock-controlled lineaments show up clearly. Wave-washed till slopes within the Upper and Lower Fort Ann stages of glacial Lake Vermont reveal subtle, contour-parallel “bathtub rings” that appear to represent down-stepping shorelines. The map is also effective for discerning contacts between surficial deposits, such as between a lacustrine terrace and a till slope.

The curvature map can also be a highly effective tool for revealing landforms. This map shows the rate of change of slope on a scale that runs from negative values (convex down) through neutral values (constant slopes) to positive values (convex up). Negative values accentuate bases of slopes while positive values reveal terrace edges and tops of features.

Although SR maps are widely used for portraying terrain, they are more cumbersome for detailed terrain analysis because multiple illumination directions are commonly needed. This is because the maps accentuate slopes facing away from the illumination source at the expense of illuminated slopes. SR maps were produced with illumination from azimuths 045°, 135°, 225°, and 315°. No one of these could show all of the features revealed by the slope map.

The slope and curvature maps can portray much of the subtle terrain texture that was formerly only available from stereoscopic interpretation of aerial photos. Combined with digital orthophotos and other high-resolution GIS information, they are highly effective tools for mapping surficial deposits and landforms.

THE SHATTUCK MOUNTAIN CHANNELS AND POTHOLES: EVIDENCE FOR HIGH-VELOCITY SUBGLACIAL STREAMFLOW IN THE NORTHERN GREEN MOUNTAINS, VERMONT

WRIGHT, Stephen F., Department of Geology, University of Vermont, Burlington, VT 05405; swright@uvm.edu

A system of deep bedrock channels, large-scale potholes, and fluvially scoured and fluted bedrock surfaces occurs across Shattuck Mountain in the Green Mountains of northern Vermont. These large-scale products of stream erosion are developed for ~4 km on either side of the drainage divide (320 m asl) between a northwest-flowing tributary to the Mississquoi River (The Branch) and a southeast-flowing tributary to the Lamoille River (Streeter Brook) in Waterville, Vermont. The pronounced bedrock erosional features are best developed at the drainage divide. The channel network across the top of the divide in places bifurcates as it cuts through schist and greenstone that is completely devoid of till. Potholes within the channels are 5 to 8 m in diameter and often extend up the entire ~15 m height of the deepest channels. Where the channels are shallow (1–2 m deep), the potholes are also 5 to 8 m in diameter. The channels appear structurally to be a product of coalesced potholes. A small ephemeral stream enters and drains southeast through a portion of the channel network, but otherwise the channels do not host any moving water.

The channel network is the product of high-velocity stream flow both up and over the drainage divide. It is unlikely that this channel network developed as an outlet to Glacial Lake Winooski, the large glacial lake that occupied the Winooski and Lamoille river valleys when ice in the Champlain valley blocked the outlets to these valleys. While the drainage divide where the channel network is developed lies below the local elevation of Glacial Lake Winooski (~330 m asl), reconstruction of the Laurentide ice sheet in the Champlain valley indicates that during the entire history of Lake Winooski, the ice sheet at the latitude of the channels was thick enough to flow across the drainage divide. Furthermore, the local NW to SE hydraulic gradient within the ice sheet would have prevented lake water from draining across the divide to the northwest.

A more likely explanation that accounts for the channel system and potholes developed on both sides of the drainage divide is that the channels developed in a subglacial (confined) drainage system similar to that responsible for the Labyrinth in Antarctica. The large scale of the potholes suggests that very high velocity water moved through this system, possibly during a single catastrophic drainage event possibly initiated by drainage of a supraglacial lake.

PRESIDENT'S LETTER

Hello all!

This is an exciting time to be a geologist. I can't think of another time in my life when Earth Science has been so steadily in the news. People all over the world are discussing "peak oil," ice core records, El Nino episodes, and even the K-T and Permo-Triassic extinction events. From every part of the media we hear about "global warming" and "climate change." I believe we geologists have an important role to play in helping politicians, lay people, and other scientists understand these environmental issues.

Although few of us here in Vermont are working on studies of the climate record over the past few hundred years, and I don't know any of us Vermonters who are involved in direct modeling of the future climate, the great majority of us have been deeply involved with studying some part or other of the Earth system, with all the attendant fragmentary records, multiple interpretations, and difficulties of discerning cause and effect. In brief, we are used to dealing with partial evidence and making the best of it.

It's all too common to hear someone say that the latest big hurricane (or snowstorm or drought or heat wave) is evidence of a long-term shift in the climate of the planet. That may, of course, be correct, but the systems are very complex and the search for cycles and chaotic patterns in the data is a long and difficult one. We probably really won't know if that hurricane was "caused by" global warming until many years later, if ever. That said, it's becoming increasingly clear that we do indeed live in a time of unprecedented climate shifts. We need to keep up to date on the wealth of new climate change research and help the public to interpret these studies so that good decisions can be made.

If you want to read a very concise summary of the state of our knowledge of climate change, I highly recommend the recent position statement on "Human Impacts on Climate" adopted by the American Geophysical Union Council (Eos, January 29, 2008, p. 41, and on the AGU website at *www.agu.org/sci_soc/policy/sci_pol.html*). I'll simply quote the first sentence and urge you all to take a look at the rest: "The Earth's climate is now clearly out of balance and is warming." That is a statement that merits our attention.

At the upcoming Winter Meeting we'll have the great opportunity to hear Thomas Armstrong from the USGS give us an update on climate change research at the Survey. See the program on page 2 in this issue for details. I hope you'll all make the effort to attend.

Sincerely,
George Springston, President

ANNUAL MEETING MINUTES & ELECTIONS

The meeting of the Executive Committee followed a successful Fall Meeting field trip led by Dave West of Middlebury College on Saturday, October 20, 2007. President Rick Dunn called the meeting to order and a total of six people were in attendance. The Treasurer's report was read and it was reported that the financial condition of the Society remains sound. The Advancement of Science Committee report was read and it was reported that three student research grants were recently funded totaling $1,190.00.

At the request of the Publications/Editorial Committee, the Executive Committee discussed the possibility of an entirely (or nearly entirely) electronic newsletter. The Executive Committee recognizes the greater cost and workload associated with printing and mailing hard copy versions of the *Green Mountain Geologist* (GMG). However, the Committee also respects the needs of libraries that still require hardcopies and the needs of members who do not have easy access to a computer. The Committee suggested that in future membership statements the "default choice" be that members receive the GMG electronically. In other words, in order to receive a hard copy of the GMG, members would have to specifically request it. It is hoped that by making the "default choice" the electronic receipt of the GMG, rather than the other way around, that this will further encourage members to go electronic. The Executive Committee does not want to lose membership over this issue.

The Committee briefly discussed plans for the Winter Meeting. The meeting will be held at Norwich University and a Saturday in late February or early March is currently being considered. The theme of "Holocene Climate Change" was reaffirmed and efforts are being made to secure a prominent keynote speaker for this meeting. The exact date of the meeting will be based on availability of facilities at Norwich and on the availability of possible keynote speakers. It was suggested that Saturday, March 8, 2008 be the latest possible date for the Winter Meeting in order to provide sufficient separation from the Northeast GSA meeting (late March) and the VGS Spring Meeting (late April).

It was reported that Jon Kim, the VGS Lecturer, has received numerous requests for presentations and currently has eight talks scheduled over the next several months. The Executive Committee commends Jon on his hard work and requests that he remain the VGS Lecturer until demand for his services diminishes.

Marjie Gale reported that Earth Science Week in Vermont was a huge success this year. The OMYA Quarry in Middlebury reported over 1,000 visitors for their Open House and they had nearly 100 volunteers help out. OMYA also sponsored the student poster contest again this year (including providing prizes). The North Branch Nature Center held a field trip and also provided opportunities for rock and mineral identification. The Vermont Geological Survey provided "Geologist in the Park" and several Vermont Geological Society members volunteered their services to various Earth Science Week activities around the state.

The Committee confirmed the unanimous election of the following VGS officers for the 2007-2008 year:

President	George Springston
Vice-President	John Van Hoesen
Secretary	Dave West
Treasurer	Steve Howe

The Committee then commended outgoing President Rick Dunn on his service to the Society over the past two years. The meeting was adjourned.

Respectfully Submitted,
Dave West, Secretary

TREASURER'S REPORT

The financial condition of the Society continues to be very strong. As of February 9, 2008, the Society's checking account balance was $6,070.87. As indicated in the Advancement of Science Committee report, three Research Grants totaling $1,190.00 were awarded during the latest round of review. I expect to be able to support the Research Grant Program at a similar level for the foreseeable future, given the relatively stable income derived from membership dues, additional research grant contributions, and publications sales. To my knowledge, there are no outstanding bills.

The following member has been approved for membership in the Society since the last report: John D. Thoren, Saint Albans, Vermont.

The 2008 membership renewal and directory information form was mailed to all members before December 31, 2007. The deadline for renewal was January 31, 2008. Many members have already returned their forms with their payments, including a number with additional contributions to the Research Grant Program, but there are still quite a few members who have not yet returned their forms. Please help the Society keep expenses to a minimum by renewing your membership promptly.

Despite the impending increase in postal service rates, I will recommend that dues remain at the same level as last year. I would like to express my appreciation to all of members who have chosen to receive the *Green Mountain Geologist* electronically as a .pdf file, so as to help keep the Society's publication

and mailing costs low, which will, in turn, allow us to keep membership in the VGS the bargain that it already is.

Respectfully submitted,
Stephen S. Howe, Treasurer

ADVANCEMENT OF SCIENCE COMMITTEE REPORT

The Committee has been busy with several projects since its last report, including reviewing applications to the Research Grant Program, upgrading the content on the Society's website, reprinting volume 6 of *Vermont Geology*, and soliciting abstracts for the Winter Meeting.

Three applications to the Research Grant Program were received by the October 1, 2007 deadline. The Committee was impressed with the quality and timeliness of these proposals and all three received at least partial financial support. The proposals were:

> "Ophiolite Sequences Associated with the Appalachian Orogeny: An Anomalous Graphite Deposit at Belvidere Mountain, Vermont" by Danielle Kerper, Harvard University.
>
> "The Geochemistry of Lamprophyre Dikes in Williston, Vermont" by Melissa Whitehead, Middlebury College.
>
> "Examining the Kinematics and Mechanics of Large Thrust Sheets in Northern Vermont and Southern Quebec" by Robert Zimmermann, University of Vermont.

All issues of the *Green Mountain Geologist* from 1994 through 2006 have been archived as .pdf files on the Society's website and we are in the process of scanning the remaining issues published during the twenty years following the Society's inception in 1974.

The upcoming Winter Meeting will have the theme "Holocene Climate Change." Thomas R. Armstrong, Senior Advisor for Global Change Programs at the U.S. Geological Survey, will be our keynote speaker.

Respectfully submitted,
Stephen S. Howe, Chair

VERMONT STATE GEOLOGIST'S REPORT

New Release Maps and Digital Data
The surficial materials digital data from a number of the Vermont Geological Survey open file reports (1992–present) have been packaged as a single file and may be downloaded directly from the Vermont Center for Geographic Information at *www.vcgi.org/dataware/*. The file contains only the materials data and people are still referred to the full open file reports for cross-sections, isopach maps, and more detailed unit descriptions. The Vermont Geological Survey produces surficial and bedrock geologic maps to address issues such as groundwater recharge potential, materials for infrastructure, radioactivity in groundwater and to mitigate rockfall and landslide hazard. The maps are available as paper copy open file reports and as images on the website. The digital data, however, were in a variety of formats and in various stages of completion/editing. The VGS, working with Erik Engstom (ANR GIS), edited the

existing files, wrote metadata, compiled the data into a single file and posted the digital materials data for 18 projects with VCGI on January 8th.

Maps recently released as open file reports and images recently posted at the Vermont Geological Survey website at *www.anr.state.vt.us/dec/geo/vgs.htm* include:

VG94-4 Westerman, D. S., 1994, Bedrock geology of the Northfield quadrangle, Vermont, 1 plate plus text, scale 1:24,000.

VG07-4 Kim, J., Gale, M., Thompson, P. J., and Derman, K., 2007, Bedrock geologic map of the town of Williston, Vermont, 1 color plate, scale 1:24,000.

VG07-5 Springston, G. and De Simone, D., 2007, Surficial geologic map of the town of Williston, Vermont, 1 color plate, scale 1:24,000.

Thanks to Marjorie Gale for pulling the digital data release and postings together for the Vermont Geological Survey.

Respectfully submitted,
Laurence R. Becker, State Geologist

CALL FOR STUDENT ABSTRACTS

SPRING MEETING OF THE VERMONT GEOLOGICAL SOCIETY
SATURDAY, APRIL 26, 2008

The Vermont Geological Society will hold its Spring 2008 Meeting in Bicentennial Hall at Middlebury College in Middlebury, Vermont. The meeting is dedicated to students conducting research in the geological sciences. Undergraduate and graduate students are encouraged to submit abstracts outlining the results of their research. Abstracts covering all aspects of the geological sciences are welcome and will be published in the Spring issue of the *Green Mountain Geologist*. The Charles Doll Award for the outstanding undergraduate paper will be presented. Cash awards for the top three papers will also be presented based on quality of the research, the abstract, and the presentation of the paper.

Abstracts should be prepared using the style employed for abstracts submitted to Geological Society of America meetings (maximum of 2,000 characters without spaces). We strongly encourage speakers to send their abstracts electronically as a Word file attachment to an e-mail message sent to Kathleen Howe at khowe@uvm.edu

If electronic submission is not possible, please mail your abstract well in advance of the deadline to:

Kathleen D. Howe
University of Vermont
Office of Health Promotion Research
1 South Prospect Street, Room 4428A
Burlington, VT 05401

Oral presentations will be limited to 15 minutes with 5 additional minutes for questions. A computer projection system for PowerPoint presentations will be available as well as slide and overhead projectors.

Deadline for abstracts: Monday, April 7, 2008 at noon

For additional information regarding capabilities for presentations at the meeting, contact David West at (802) 443-3476 or dwest@middlebury.edu

ANNOUNCEMENTS

STUDENT RESEARCH GRANT APPLICATIONS DUE APRIL 1, 2008

Students and secondary school teachers are encouraged to apply to the VGS Research Grant Program by April 1, 2008. Downloadable Research Grant Program applications are available from the Society's website at *www.uvm.org/vtgeologicalsociety/*. For those without Internet access, forms may be obtained by writing to Stephen S. Howe at the Dept. of Earth and Atmospheric Sciences, University at Albany, ES-351, 1400 Washington Avenue, Albany, NY 12222-0001. Telephone: (518) 442-5053; e-mail: showe@albany.edu

NEWS FROM THE VERMONT GEOLOGICAL SURVEY

Marjorie Gale has sent along the following item:

Digital data for the 1961 Centennial Geologic Map of Vermont may be downloaded through the U.S. Geological Survey at *pubs.usgs.gov/of/2006/1272/#VT*.

Larry Becker has updated his contact information:

Laurence R. Becker
Vermont State Geologist and Director
Vermont Geological Survey/Division of Geology and Mineral Resources
Vermont Dept. of Environmental Conservation
103 South Main Street
Waterbury, VT 05671-2420
Phone: (802) 241-3496
Fax: (802) 241-4585
E-mail: laurence.becker@state.vt.us
Website: www.anr.state.vt.us/dec/geo/vgs.htm

VERMONT GEOLOGICAL SOCIETY CALENDAR

April 1: Student Research Grant Program applications due

April 7: Student abstracts for Spring Meeting due

April 8: Executive Committee reports due

April 26: Spring Meeting, Bicentennial Hall, Middlebury College

The **Vermont Geological Society** is a non-profit educational corporation.
The **Executive Committee** of the Society is comprised of the Officers, the Board of Directors, and the Chairs of the Permanent Committees.

Officers

President	George Springston	(802) 485-2734	gsprings@norwich.edu
Vice President	John Van Hoesen	(802) 287-8387	vanhoesenj@greenmtn.edu
Secretary	David West	(802) 443-3476	dwest@middlebury.edu
Treasurer	Stephen Howe	(518) 442-5053	showe@albany.edu

Board of Directors

Richard Dunn	(802) 485-2304	rdunn@norwich.edu
Les Kanat	(802) 635-1327	les.kanat@jsc.edu
Jon Kim	(802) 241-3469	jon.kim@state.vt.us

Chairs of the Permanent Committees

Advancement of Science	Stephen Howe
Geological Education	Christine Massey
Membership	Stephen Wright
Public Issues	Laurence Becker
Publications/Editorial	Stephen Howe

Vermont Geological Society
P.O. Box 1224
Saint Albans, VT 05478-1224

ADDRESS CHANGE?
Please send it to the Treasurer at the above address

Vermont Geological Society
Winter Meeting
March 1, 2008, 9:20 AM
Cabot Science Building, Room 085
Norwich University, Northfield, Vermont

Directions to Norwich University:

Norwich University is located on Vermont Route 12, one mile south of the center of Northfield. It can be reached from I-89 by taking Exit 5 and following Vermont Route 64 west to Route 12, and then north to the University. The Geology Department is located in Cabot Science Building, the southeastern most brick building on campus, just west of Route 12. The entrance is near the northeast corner of the very large white Kreitzburg Library, which can't be missed. The easiest parking for the meeting will be in the commuter lot opposite the Science/Engineering complex on the east side of Route 12.

THE GREEN MOUNTAIN GEOLOGIST

QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

VGS Website: www.uvm.org/vtgeologicalsociety/

SPRING 2008	VOLUME 35	NUMBER 2

The Vermont Geological Society
Spring Meeting
April 26, 2008, 8:30 AM
McCardell Bicentennial Hall, Room 220
Middlebury College, Middlebury, Vermont

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9:30AM Johnathon L. Miller: THE MAIDSTONE PLUTON: A COMPOSITE INTRUSION ON THE EASTERN MARGIN OF THE NORTHEAST KINGDOM BATHOLITH, VERMONT

9:45AM Ethan Lake: PETROLOGY AND GEOCHEMISTRY OF A METAMORPHOSED ANORTHOSITE–DIORITE INTRUSIVE SUITE NEAR DRESDEN, NEW YORK

10:00AM Evan Ellenberger: BEDROCK GEOLOGY OF THE NORTHERN HALF OF THE PURGATORY 7.5' QUADRANGLE, SOUTHWESTERN MAINE

10:15AM Julie A. Rumrill: ANALYSIS OF SPATIAL AND TEMPORAL VARIATIONS IN LONGITUDINAL STRAIN RATES NEAR SWISS CAMP, GREENLAND

10:30AM BREAK

10:45AM Allison Klein: ANALYSIS OF BIOGENIC SILICA FROM MARINE SEDIMENT IN MAXWELL BAY, ANTARCTICA: A LOOK AT HOLOCENE CLIMATE HISTORY

11:00AM Kristen Poehling: USE OF AUTONOMOUS UNDERWATER VEHICLES (AUV) AND THEIR EFFECTIVENESS IN MAPPING HYDRODYNAMIC VARIABILITY IN LAKE CHAMPLAIN

11:15AM Emily Dawson: BROAD CLIMATE VARIABILITY BASED ON SEISMIC STRATIGRAPHY AND SEDIMENT CORES FROM WILLSBORO BAY, LAKE CHAMPLAIN

11:30AM Andrew Peters: A MULTIPLE PROXY STUDY OF LAKE SEDIMENT FROM MARSHALL LAKE, UTAH: INFERENCES ON PERIODS OF ENHANCED SEDIMENT TRANSPORTATION

11:45AM Lawrence J. Mastera: AN ANALYSIS OF ARSENIC, URANIUM AND MANGANESE CONCENTRATIONS IN WESTERN BANGLADESH'S DRINKING WATER

12:00PM Tyler George-Minetti: IDENTIFYING UNKNOWN MINERAL AND INVESTIGATING POSSIBLE CAUSES FOR ITS FORMATION AT THE PIKE HILL MINE IN CENTRAL VERMONT

Danielle Kerper: ANOMALOUS GRAPHITE AT THE BELVIDERE MOUNTAIN SERPENTINITE, VERMONT *[no presentation to be given due to varsity athletics conflict]*

12:15PM JUDGING and AWARDS PRESENTATIONS

12:45PM EXECUTIVE COMMITTEE MEETING

ABSTRACTS

GEOCHEMISTRY OF LAMPROPHYRE DIKES OF WILLISTON, VERMONT

Melissa Whitehead, Geology Department, Middlebury College, Middlebury, VT 05753

Lamprophyres are relatively uncommon alkaline, silica-undersaturated, small volume ultrapotassic, igneous rocks often found as dikes or small intrusions. In New England, lamprophyres are most abundant in the New England–Quebec magma series found in parts of northern Vermont and southern Quebec. Here, they are relatively uncommon mafic to ultramafic magmas that are thought to have intruded sometime during the Mesozoic era. This study focuses on the lamprophyre dikes found in Williston, Vermont.

Thirty-seven samples were collected, seventeen were made into thin sections to understand mineralogical and petrographic characteristics, and twenty-nine samples were analyzed for major and trace element using ICAP. A subset of ten samples was analyzed for rare earth elements. Radiometric argon-argon ages were detemined on two samples.

Petrographically, lamprophyres are strongly porphyritic in mafic minerals and are dominant in biotite, amphiboles and pyroxene. Feldspar usually occurs in small amounts and is confined to the ground mass. From the petrographic and chemical analyses, the samples are characterized into one of four types based on the minerals present and the silica content of the lamprophyres. The lamprophyre rock types found in Williston include: diabasic, spessarite, camptonite, monchiquite. Argon-argon age-date for the whole rock was found to be 113 Ma with the total fusion age of the biotite flakes as 134 +/- 0.7 Ma.

Whole rock major, trace and rare earth chemistries of the rocks are used to classify and interpret the formation of the Williston lamprophyres. Harker plots and ternary diagrams have grouped the dikes as within plate basalts possibly forming as a result of partial melting of a peridotite source in the upper mantle. After their formation in the crust, the magmas moved along the weaknesses in the crust where they finally crystallized forming intrusive dikes. The formation of the dikes represents a period of rifting and continental extension between Newfoundland and the Iberian Peninsula.

GEOCHEMISTRY AND PETROGRAPHY OF GRANITIC BODIES IN WOODBURY AND HARDWICK, VERMONT

Ryder Musselman, Geology Department, Middlebury College, Middlebury, VT 05753

Konig's 1961 Bedrock map of the Plainfield Quadrangle in the Northeast Kingdom displays a number of small igneous intrusions collectively known as the Woodbury granites. The rocks are referred to in this study as the Woodbury granitic bodies, and intrude the Waits River and Cram Hill formations between Woodbury and Hardwick, Vermont. Despite intense quarrying in the area, no detailed petrography or geochemistry has been performed on these bodies. In the summer and fall of 2007, 35 samples were collected from quarries and natural outcrops. Petrography, whole rock chemistry, and individual mineral compositions were obtained for some of the samples, and these data were used to classify the Woodbury granitic bodies and to compare them with other post-kinematic granitoids in Vermont and New Hampshire.

The Woodbury granitic bodies are composed of medium- to coarse-grained two-feldspar, two-mica granitoids with 65%-75% SiO_2 contents. Modal classification ranges from granite to granodiorite. The rocks are subalkaline and weakly peraluminous, and are light rare earth enriched, with no Eu anomalies. Ta-Nb anomalies indicate a subduction zone signature, and negative P and Ti anomalies are also present. The Woodbury granitic bodies are likely a hybrid of I and S-type granites with a significant crustal component. This is supported by Yb-Ta and Yb+Ta-Rb ratios. The Woodbury granitic bodies are chemically similar to the Northeast Kingdom Batholith, particularly the Echo Pond and Derby granodiorites (Arth & Ayuso, 1991). They are also similar to the Concord granites of New Hampshire (Dorais & Paige, 2000). Intrusion of the post-collisional Woodbury granitic bodies occurred with crustal stacking and anatexis, lithospheric delamination, or subducting slab break-off as possible sources of magmatism.

THE MAIDSTONE PLUTON: A COMPOSITE INTRUSION ON THE EASTERN MARGIN OF THE NORTHEAST KINGDOM BATHOLITH, VERMONT

Johnathon L. Miller, Department of Geology and Environmental Science, Norwich University, Northfield, VT 05663

The Maidstone pluton is located within the Lunenburg–Brunswick–Guildhall and Burke 7.5-minute quadrangles and is on the eastern margin of the Northeast Kingdom batholith that occurs primarily within the Siluro-Devonian-aged Connecticut Valley–Gaspé Trough. The Maidstone is elliptical to circular in shape at the surface and is approximately eight miles across from west to east. It intruded the Silurian-Devonian Gile Mountain Formation west of the Monroe Fault and the upper-middle Ordovician Albee Formation east of the fault.

Twenty-four rock samples were collected from bedrock outcrops. Petrographic analyses were conducted on twenty-two thin sections with discrimination staining for feldspars. Whole rock major and trace element analyses were performed on twenty-one samples using an inductively coupled argon plasma spectrometer. Initial field examination of the Maidstone suggested the presence of two units, diorite and granite. Detailed petrographic and geochemical analyses, however, revealed that the Maidstone consists of four separate compositional zones: 1. biotite-amphibole quartz diorite; 2. biotite tonalite; 3. biotite leuco-monzogranite; and 4. Ti-depleted,

biotite leuco-monzogranite. Whole-rock major element analyses show overlapping silica content with heterogeneity in other major element abundances.

Spatial isolation and geochemical characteristics of the four compositional zones indicate that their distinguishing characteristics developed prior to emplacement, rather than by *in situ* fractionation. A fractionation model of a single alkali-silica-poor, Fe-Mg-rich source at depth, to an alkali-quartz-enriched and Fe-Mg-Ti-depleted source, with sequential magma emplacement through multiple pulses, is explored.

PETROLOGY AND GEOCHEMISTRY OF A METAMORPHOSED ANORTHOSITE–DIORITE INTRUSIVE SUITE NEAR DRESDEN, NEW YORK

Ethan Lake, Geology Department, Middlebury College, Middlebury, VT 05753

Massive type anorthosite suites are complex large-scale igneous bodies consisting primarily of plagioclase-rich anorthosites and some residual mafic Fe-Ti bearing diorites. These bodies formed during the early- to mid-Proterozoic, some 2500 to 1000 million years ago and are relatively common throughout the Adirondacks. This study involves the mapping and sampling of a small deformed and metamorphosed anorthosite suite near Dresden, New York. The site was mapped during a week of field days and 30 samples were collected for petrographic analysis, whole rock geochemical analysis using an ICP-AES, and rare earth analysis using an ICP-MS. Much of the field area contains significant high-grade metamorphic overprinting from the late stages of the Grenville Orogeny (around 1080 Ma). Field mapping revealed the presence of a gradient of plagioclase-bearing rocks ranging from mafic ferro-diorites to more plagioclase-rich gabbroic anorthosites. Petrographic analyses confirmed the subdivision of the field area into three lithologies based on plagioclase modal compositions as well as identified younger mafic intrusions into the anorthosite suite. Rare earth element analysis indicated that the suite likely differentiated from a single plagioclase-rich magma source. Both the rare earth analysis and whole rock geochemistry linked the anorthosite suite at Dresden to the broader Adirondack Proterozoic anorthosite event and indicated that the Dresden suite likely comprised a small, mafic off-shoot of that regional event.

BEDROCK GEOLOGY OF THE NORTHERN HALF OF THE PURGATORY 7.5' QUADRANGLE, SOUTHWESTERN MAINE

Evan Ellenberger, Geology Department, Middlebury College, Middlebury, VT 05753

The Purgatory 7.5' quadrangle in southwestern Maine is underlain by the stratified rocks of the Central Maine sequence. Detailed 1:24,000 scale bedrock mapping of 70 km^2 in the northern half of the quadrangle reveals the geology is dominated by a sequence of deformed Silurian metasedimentary rocks that have been intruded by several different types of igneous rocks. The metasedimentary rocks include mappable units of pelitic schist, rusty weathering sulfidic schist, marble, and various types of granofels.

The stratified rocks have been deformed into a series of upright isoclinal folds whose axes trend northeast. In addition to this folding, three northeast-trending faults are interpreted to be present

based on offsets in rock units. Petrographic analysis of mineral assemblages in a variety of bulk compositions indicates the rocks were metamorphosed under amphibolite facies conditions. Both the deformation and metamorphism are interpreted to have occurred in the Devonian in association with the Acadian Orogeny.

In addition to these deformed and metamorphosed stratified rocks, several mappable igneous intrusions are present in the field area. These can be divided into two general types: (1) Devonian granitic rocks, and (2) a poorly exposed alkaline syenite pluton. Relatively small granitic rock intrusions can be found at many localities, but are geochemically similar, and are likely part of the same intrusive event. Whole rock geochemical analyses of the alkaline syenite reveal a composition unique to the field area and the region. Specifically, the rocks are characterized by intermediate SiO_2 contents (58-65 wt. %) and extremely high alkali concentrations ($K_2O + Na_2O$ = 12-14 wt. %) A new $^{40}Ar/^{39}Ar$ biotite total gas age of 239 ± 1.1 Ma has been obtained from this syenite, providing a minimum age for the intrusion of this unusual magma. Collectively, the rocks in the study area represent a period of Silurian sediment deposition followed by Devonian ductile deformation, high-grade metamorphism and igneous intrusion.

ANALYSIS OF SPATIAL AND TEMPORAL VARIATIONS IN LONGITUDINAL STRAIN RATES NEAR SWISS CAMP, GREENLAND

Julie A. Rumrill[1], Thomas A. Neumann[1], and Ginny A. Catania[2]; (1) Geology Department, University of Vermont, Burlington, VT 05405; (2) Institute for Geophysics, University of Texas at Austin, Austin, TX 78712

We investigate the evolution of the longitudinal strain regime over the melt season by using data collected at 15 second resolution from ten GPS receivers installed along a flowline through Swiss Camp, Greenland. Network baseline solutions are used to calculate strain rates throughout the 2006 and 2007 melt seasons. Analyses of 2006 data show that the strain rate over a 36-km longitudinal baseline has a background rate of ~ -1.1×10^{-3} a^{-1} but becomes variable shortly after the onset of melt around day 200, changing by as much as 1.5×10^{-3} a^{-1} within a span of 24 hours. Longitudinal strain rate reversals occur intermittently over short-lived intervals of one to three days, with rates returning to background magnitudes around day 240, coinciding with the decline of seasonal melt, suggesting a hydrologic link. The phasing of strain rates along the flow line are analyzed and used to determine the locus of initiation and the spatial extent of strain related to each event. During the 2006 season, we focus on two time periods of interest. The first event was initiated in the ablation zone, and the second was initiated in the accumulation zone, suggesting that short-term altered stress conditions are not confined to the ablation zone. Associated longitudinal strain rate changes spanned more than 35 km. The geometry of the GPS array was rearranged for the 2007 season to improve our ability to resolve phasing of strain and location of strain initiation. Preliminary results show a background strain rate of -0.7×10^{-3} a^{-1} for a 37-km longitudinal baseline which becomes variable as the melt season progresses. Strain rate analysis is focused on one time period of interest around decimal day 190. This event is initiated in the equilibrium zone, and phasing of strain is evident ~15 km up flow and ~18 km down flow from the initiation site. Strain changes are most consistent with short-term changes in basal stress conditions likely due to increased basal water pressure at the ice-bedrock interface.

Results from this study may be useful in making broader inferences regarding the response of grounded portions of the ice sheet to seasonal changes in stress.

ANALYSIS OF BIOGENIC SILICA FROM MARINE SEDIMENT IN MAXWELL BAY, ANTARCTICA: A LOOK AT HOLOCENE CLIMATE HISTORY

Allison Klein, Geology Department, Middlebury College, Middlebury, VT 05753

The Shallow Water Drilling project (SHALDRIL) retrieved a 108-meter core in 2005 from Maxwell Bay, a fjord in the South Shetland Islands of the Antarctic Peninsula. Electric resistivity (ER), magnetic susceptibility (MS), mean grain size, weight percent biogenic content using XRD analysis and other physical properties of the core were determined (Michalchuk, 2006). The goal of this study is to perform a Holocene climate reconstruction using biogenic silica (BSi) and analyze it with respect to other climate proxies.

This study determined BSi content at 50-cm intervals downcore using a NaOH leaching analysis procedure (DeMaster, 1981). Duplicates were done at random intervals having accuracy predominantly within 1.1% with a few having a slightly higher difference than the original values.

Salient results are: 1) The difference between BSi values in the lower and upper sections of the core is consistent around 2.3%, distinguishing between the Mid-Holocene Climatic Optimum and the colder period before. Climate stages previously outlined by Domack et al. (2003) and confirmed by Michalchuk (2006) suggest the delineation between these two stages to occur approximately 9000 years BP while the significant change in BSi spans a later time period from approximately 8,100–7,100 years BP. 2) There is an extreme difference between the biogenic content determined from XRD and BSi from the NaOH leach in not only magnitude, but also overall trend. The most likely reason for this is that the volcaniclastic material that makes up the Antarctic Peninsula Group, which dominates this region, is not picked up by the XRD as one of the key minerals due to its lack of crystalline structure and is therefore attributed to biogenic content. Using XRD as a proxy to determine biogenic content, although possible in other environments, has to be approached with caution as it clearly is not appropriate to use in an environment with volcanic and volcaniclastic rocks.

USE OF AUTONOMOUS UNDERWATER VEHICLES (AUV) AND THEIR EFFECTIVENESS IN MAPPING HYDRODYNAMIC VARIABILITY IN LAKE CHAMPLAIN

Kristen Poehling, Geology Department, Middlebury College, Middlebury, VT 05753

The evolving technology of autonomous underwater vehicles (AUVs) is an exciting new advancement in the field of marine science. Old methods to study the water column can be labor, equipment and time intensive in order to gain accurate data. Old methods included the use of ROVs (unmanned underwater vehicles controlled from the surface), manned underwater vehicles and shipboard hydrographic surveys typically taken with CTDs (conductivity/temperature/depth) sensors. AUVs, on the other hand, can provide massive

amounts of data with a minimum of user intervention while at the same time surveying spatial and temporal domains that would be dangerous or impossible. For example, dynamic changes in the water column occur during extreme wind events. Fortunately, the size and cost of these instruments are continually being reduced. Additionally, the software that controls the AUVs, as well as the sensors installed on them, are presently being tested and improved to better map ocean and lacustrine environments. As part of a pilot program with the U.S. Navy, Tom Manley (Geology Department) will be using two new AUVs (model Iver2 from OceanServer Technology, Inc.) to test the accuracy of these devices in Lake Champlain. As a basis to compare the AUV results to, a two-ship (UVM's *Melosira* and Middlebury College's *R/V Baldwin*), 106-station CTD survey will be taken each day for 4 days (starting July 29th) in the Thompsons Point–Split Rock Gap region (~4 km^2). Concurrently, the AUVs will be deployed while each CTD survey is underway. AUV and CTD daily data sets will be three-dimensionally modeled and characterized using earthVisons4® (Dynamic Graphics, Inc) software. Statistical comparison of the AUV and CTD final 3-D grids of the various parameters (temperature, fluorescence, and turbidity) will provide information as to the reliability and accuracy of the AUV data in a complex hydrodynamic regime. Additionally, representatives from the U.S. Navy, YSI (providing the sensors), DGI (earthVisons4®), and OceanServor will be on site for validation purposes as well as looking at the ability to acquire, model, characterize, and display information in a real-time environment.

BROAD CLIMATE VARIABILITY BASED ON SEISMIC STRATIGRAPHY AND SEDIMENT CORES FROM WILLSBORO BAY, LAKE CHAMPLAIN

Emily Dawson, Geology Department, Middlebury College, Middlebury, VT 05753

Seismic profiles and sediment cores provide researchers with abundant information about climate history. Seismic profiling generates subsurface images of stratigraphy that reveals large-scale changes in sediment type as well as events in depositional history. Sediment cores can be analyzed with various proxies in order to determine the sedimentological record of a particular region. This study focuses on integrating 14 seismic profiles and 4 piston cores collected in Willsboro Bay, a finger-like bay on the western edge of Lake Champlain.

Seismic profiles were collected using a swept frequency CHIRP sonar. The profiles were analyzed and digitized using SonarWizMap technology. A sedimentological record of Willsboro Bay was constructed using magnetic susceptibility, electric resistivity, grain size, spectral analysis, physical properties (saturated bulk density, porosity, and water content), ^{210}Pb-dating, and microfossil analysis of the sediment cores. Correlation of seismic stratigraphy and sediment cores confirm the presence of Lake Champlain's three main sediment units (Lake Champlain Sediments, Champlain Sea Sediments, and Lake Vermont Sediments) in Willsboro Bay. Specific shifts in physical properties indicate local climate swings that may be correlated with broad climate events.

A MULTIPLE PROXY STUDY OF LAKE SEDIMENT FROM MARSHALL LAKE, UTAH: INFERENCES ON PERIODS OF ENHANCED SEDIMENT TRANSPORTATION

Andrew Peters, Geology Department, Middlebury College, Middlebury, VT 05753

In the arid climate of the western United States, understanding paleoclimate is crucial for managing freshwater resources. Lake sediment, once dated, can provide a complete climatic timeline that reveals the magnitude of past paleoclimate variations, including drought. This study investigated the paleoclimate history of the southwestern Uinta Mountains from the sedimentary record in Marshall Lake, Utah.

X-ray diffraction (XRD), inductively coupled argon plasma mass spectrometry (ICP), grain size analysis (GS), and rare earth element analysis (REE) and loss on ignition (LOI) analyzed at 1- or 2-cm intervals were combined in a multi-proxy study of past sedimentation in this lake. AMS dating of organic matter indicates that the sediment matter in the core starts at roughly 13,000 yrs BP and provides a continuous record through 1000 yrs BP. Particular attention was given to intervals of the sediment that were apparently influenced by sources beyond the watershed. The presence of exotic materials in the lake could indicate enhanced transport of clay-sized particles as dust from the low elevation basin floors up to the lake.

Results suggest a correlation between the LOI, XRD, ICP and GS in particular intervals. XRD analysis, which measures relative amounts of minerals throughout the core, indicates variance in the ratio between clay and the locally derived feldspars. ICP elemental analysis also suggests that the geochemistry of the sediment changed through time. GSA shows an increase in clay size particles (<2 μm) in section of the core that also contains high levels of clay and low organic matter. The balance of results indicates that conditions have varied over time in the lake. In particular, an event between 5000 to 4000 yrs BP appears to have returned the lake to conditions that prevailed during the latest Pleistocene, ca. 11,000 BP.

AN ANALYSIS OF ARSENIC, URANIUM AND MANGANESE CONCENTRATIONS IN WESTERN BANGLADESH'S DRINKING WATER

Lawrence J. Mastera, Department of Geology and Environmental Science, Norwich University, Northfield, VT 05663

Contour maps of contaminant concentration and graphs of depth vs. concentration have been prepared for groundwater (drinking water) samples from four neighborhoods in western Bangladesh (Bualda, Fulbaria, Jamjami, and Komlapur) collected over the past decade by the Bangladesh Association for Needy Peoples Improvement. To the extent possible, the sampled tubewells in each neighborhood were distributed at 500-meter intervals along perpendicular axes that radiated in 4 equal lengths from the center. Each neighborhood had 17 sampling locations: 4 north, 4 east, 4 south, 4 west, and 1 in the center. Each sample was analyzed for arsenic (As), uranium (U), manganese (Mn), nickel (Ni), antimony (Sb), lead (Pb), chromium (Cr), iron (Fe), pH, boron (B), barium (Ba), molybdenum (Mo), selenium (Se), and zinc (Zn). In this study, As, U, Mn, Ni, Sb, Pb, and Cr were found above WHO health-based drinking water guidelines in 33%, 48%, 75%, 3%, 3%, 1%, and 1% of these tubewells, respectively. Conversely, B, Ba, and Mo were not found above these guidelines.

Analyses of the 3-D spatial distribution of As and U identified relationships between these toxins, with U content increasing and As content decreasing with depth at two of the four sites. In these villages medium- to coarse-grained sandy channel deposits at depth may be under oxidizing conditions where the sediment is withholding As and the U is being mobilized in groundwater. In wells high in As, whether shallow or deep, organic-rich peat and clay of floodplain origin may occur near the level of tubewell completion where reducing conditions associated with organic-rich sediments may be withholding U while As is mobilized in the groundwater. This work allows speculation on what types of toxins would be found if new tubewells are drilled.

IDENTIFYING UNKNOWN MINERAL AND INVESTIGATING POSSIBLE CAUSES FOR ITS FORMATION AT THE PIKE HILL MINE IN CENTRAL VERMONT

Tyler George-Minetti and Gregory K. Druschel, Geology Department, University of Vermont, Burlington, VT 05405

The Pike Hill Mine is an abandoned copper mine located within massive Besshi-type sulfide deposits (Piatak et al, 2006). These deposits contain massive ores of Silurian-Devonian age and a carbonate-rich host rock that is unlike the siliciclastic host rock of the nearby Ely and Elizabeth mines (Piatak et al, 2006). Located in Corinth, VT, the first copper mining took place in 1847 and continued off and on until 1919 (www.scorecard.com, 2005). Talus slopes consisting of a brownish-orange sediment rich in metals and large rock piles fill the mine shafts. At the base of these slopes lay small basins rich with an unidentified blue-green mineral that appears immediately under the surface of the water. Rocks and surrounding sediment just upslope from the basin are also stained with this blue mineral and are presumed to have once been in direct contact with the water. Because Cu is an important element of interest for acid mine drainage remediation, mineral changes which affect Cu mobility are important to investigate in these settings. Mineral and water samples collected at the Pike Hill Mine were analyzed using a number of different techniques including XRD analysis, electron microscopy/energy-dispersive X-ray analysis, ICP-OES analysis, and reflectance microscopy. Results indicate that the mineral is an alumino-silicate, with the principal chemical constituents being Al, Si, Au, Cu, and Fe. Under reflective light microscopy, the mineral appears almost the exact same color as it does to the naked eye, with little change to this color under crossed nicols and with no pleochroism. Results from a series of experiments to precipitate the mineral in the laboratory in the hopes of achieving a better understanding of how the mine environment influences the equilibrium conditions that control mineral stability and how this environment can possibly control Cu concentrations in water will be presented.

ANOMALOUS GRAPHITE AT THE BELVIDERE MOUNTAIN SERPENTINITE, VERMONT

Danielle Kerper and Mark R. Van Baalen, Department of Earth and Planetary Sciences, Harvard University, Cambridge, MA 02138

The Belvidere Mountain serpentinite is part of a chain of Taconic-age ophiolites that stretches from the southern Appalachians to Newfoundland. Asbestos-bearing rocks in the serpentinite

have been quarried here for over a century. On the north wall of the C-area quarry there is a fault zone containing anomalous graphite-bearing rocks (Van Baalen et al., 1999). This zone is about 15 feet wide and extends to the top of the quarry wall, about 90 feet, and has a strike of 5° and a dip of 85°W. Graphitic rocks within the fault zone are bounded on the east side by the asbestos-bearing serpentinite and on the west side by massive, gray-weathering antigorite. As far as we know, this occurrence is unique in the quarry. However, extensive quarrying activity has not only wiped out evidence of its original extent, but may have destroyed evidence of similar occurrences within the quarry. The foliated rock from the graphitic zone is dark gray and has a greasy luster. In thin section, we estimated 20% opaques finely disseminated, but also concentrated in submillimeter veins.

Geochemical studies will help to determine the origin of this graphite. We first separated the graphite from the serpentinite host rock using a combination of dilute HNO_3 and concentrated HF. The graphite remained as an insoluble residue. X-ray powder diffraction revealed a broad, weak X-ray peak near the known graphite peak at 26.38° 2θ. This could be explained by poorly crystallized graphite that does not diffract strongly. An exploratory study using mass spectrometry was then undertaken. The mean $\delta^{13}C$ value attained from this study was –16.77 +/- 0.1 per mil, implying that there is a significant organic carbon component in the graphite.

The graphite may have been precipitated from C-O-H fluids moving along a fault zone from a carbonaceous source in the underlying Hazen's Notch or overlying Ottauquechee Formations (Gale, 1980). For example, the Cambrian Ottauquechee Formation is characterized by black graphitic quartz-sericite phyllite and schist and by massive beds of dark-gray quartzite (Albee, 1957). This mechanism could possibly be similar to that for New Hampshire graphite veins described by Rumble and Hoering (1986). Further work to test this theory is currently in progress.

PRESIDENT'S LETTER

[not available at press time]

WINTER MEETING MINUTES

The Executive Committee of the Vermont Geological Society met following the Winter Meeting held at Norwich University on March 1, 2008. Neither Dave West nor Steve Howe was able to make the Winter Meeting. Although minutes were taken by George Springston, they were not available at press time. I have summarized a report I sent to George immediately prior to the Winter Meeting, and I have also included some information concerning the Executive Committee's meeting provided to me by Jon Kim during his recent trip to Albany in his capacity as VGS Lecturer for 2008.

Steve Howe, as Treasurer, reported that the financial condition of the Society is extremely strong. As of February 29, 2008, the checking account balance was $6,934.47. Three Research Grants totaling $1,190.00 were awarded during the latest round of review. As indicated below,

one student recipient will not be able to complete his research and has returned the entire award of $460.00 to the Society, per our Bylaws. Steve noted at the time that the Society had 111 dues-paying members (106 individual or family memberships and 5 institutions). Although most members had paid their dues, membership renewal forms were still coming in, even though the deadline for renewal was January 31, 2008. He said that reminder notices would be sent shortly by e-mail and postal mail. Tax-deductible contributions to the Research Grant Program totaled $555.00, approximately equal to last year's level at a comparable point in the renewal cycle.

Steve Howe, as Chair of the Advancement of Science Committee, reported that three students were awarded research grants following the October 1, 2007 application deadline: Danielle Kerper, Harvard University; Melissa Whitehead, Middlebury College; and Robert Zimmermann, University of Vermont. Recent telephone and e-mail exchanges between Steve and Keith Klepeis, Robert Zimmermann's advisor, have indicated that Robert will not be able to complete his research before he enters the College of Education in late May to pursue his teaching certification. Robert felt it was appropriate that he return the entire amount of funds awarded back to the Society, and Steve and Keith concurred. Steve noted that the deadline for the next round of applications to the Research Grant Program is April 1, 2008, as indicated on the calendar page of the Society's website. Steve alerted the Committee that all issues of the *Green Mountain Geologist* (GMG) from 1994 through Winter 2007 had been archived as .pdf files on the Society's website and that remaining issues published since 1974 were in the process of being scanned.

Steve Howe, as Chair of the Publishing Committee, reported with enthusiasm that members appear to have strongly embraced the electronic GMG delivery option. Of the 106 non-institutional members, 85 have elected to receive the GMG electronically, while 21 have opted to receive a paper copy mailed to them. He remarked that there is room for additional members to elect to receive the GMG electronically as at least 94 members have an e-mail address. Steve noted that the publication of the GMG continues to proceed smoothly with editing, formatting, layout, and .pdf file creation and mailing being handled by Steve and Kathy Howe, while photocopying and postal mailing of paper copies is handled by Dave West. Reduction in the number of paper copies produced and mailed should particularly benefit Dave. Steve reported that Volume 6 of *Vermont Geology* has been reprinted. Orders for partial and complete sets of *Vermont Geology* continue to trickle in, with the most recent being a request for Volume 4.

Steve Howe relayed information from John Van Hoesen, who was in Italy at the time of the meeting, about the new VGS ListServ administered by Green Mountain College. An announcement about its availability will be made to the membership of the Society at a later date.

Steve reminded everyone that the Spring Meeting will be held on April 26, 2008 at Middlebury College and that the deadline for submission of student abstracts is April 7, 2008.

Jon Kim volunteered to lead the Society's Summer Field Trip, likely either to the Hinesburg, Vermont area or to the Worcester Mountains. A date for the trip and additional details will be determined at the Executive Committee Meeting after the Spring Meeting's student presentations.

Steve reported that Jon Kim is scheduled to present two talks at the University at Albany on April 2nd and 3rd in his capacity as the VGS Lecturer for 2008. The Department of Atmospheric and Environmental Sciences will pay for the cost of Jon's overnight lodging, but his mileage and meal costs will be borne by the Society. Jon remarked that Stephen Wright volunteered to serve as the VGS Lecturer for 2009.

Respectfully submitted,
Stephen S. Howe

TREASURER'S REPORT

The financial condition of the Society is extremely strong. As of March 28, 2008, the Society's checking account balance was $7,094.47. To my knowledge, there is one outstanding bill of $180.42 to be paid to Jon Kim to reimburse him for travel-related expenses incurred during a recent trip to Albany, New York in his capacity as the Society's Lecturer for 2008, and one modest outstanding bill to be submitted to me shortly by George Springston to reimburse him for the refreshments served at the Winter 2008 meeting.

Robert Zimmermann of the University of Vermont, one of three students awarded a Research Grant last fall, has decided to leave the Department of Geology and pursue his teaching certification in the College of Education. As he will not be able to complete his research, Rob has returned his entire award of $460.00 back to the Society.

The following member has rejoined the Society since the last report: James Ashley, Danville, Vermont.

Respectfully submitted,
Stephen S. Howe, Treasurer

ADVANCEMENT OF SCIENCE COMMITTEE REPORT

The Society's Winter Meeting, with the theme "Holocene Climate Change," was well attended despite less than optimal weather. Our Keynote speaker was Tom Armstrong, Senior Advisor for Global Change Programs at the U.S. Geological Survey, who spoke about the role of the Department of the Interior in climate-change research and decision-making. Tom was followed by Jon Kim, who discussed the Hinesburg Thrust in Williston, Vermont, and George Springston, who covered terrain analysis in Williston using LIDAR. The meeting concluded with Stephen Wright's talk on the channels and potholes of Shattuck Mountain in northern Vermont. As always, members are encouraged to contact me with any suggestions they may have for topics or presenters for next year's meeting.

Robert Zimmermann of the University of Vermont, one of three students awarded a Research Grant last fall, has decided to leave the Department of Geology and pursue his teaching

certification in the College of Education. As he will not be able to complete his research, Rob has returned his entire award of $460.00 back to the Society, as is required by our Bylaws.

The Committee received no applications to the Society's Research Grant Program by the deadline of April 1, 2008. Applications for the second round are due October 1, 2008. Please see the Society's website for details.

The Committee gratefully acknowledges the contributions to the Society's Research Grant Program by the following members:

Laurence R. Becker
Jeanne C. Detenbeck
Albert W. Gilbert, Jr.
Carey Hengstenberg
Barbara L. Hennig
Jefferson P. Hoffer
Jon Kim
Carl Koteff
Eric T. Lapp
Frederick D. Larsen
J. Gregory and Nancy W. McHone
Alexis P. Nason
George Springston
Sharon Strassner
Art Stuckey
Peter J. and Thelma B. Thompson
Roger and Terry Thompson
David West

Respectfully submitted,
Stephen S. Howe, Chair

VERMONT STATE GEOLOGIST'S REPORT

Base and Applied Science – Information Development Cycle
The Vermont Geological Survey (Division of Geology) submits abstracts for a regional geology meeting as an impetus to pull together the previous field season's base and applied science. The Vermont Geological Survey geologists and project collaborators are authors on five papers presented March 27-29, 2008 at the 43rd Annual Meeting of the Northeastern Section of the Geological Society of America in Buffalo, New York. Four posters and one oral presentation include basic bedrock geologic studies, applied studies relating to groundwater resources, and surficial geology. Collaborators include the University of Vermont, Norwich University, and the University of Buffalo. The meeting is a way, in part, to vet the science while testing ways to present to the scientific community and the public. The outcome is that projects have been developed with base science so when applied to the protection of health, safety, and the general welfare the underlying science is defensible. The public wants to know that the base science is sound but focuses on the societal outcome.

GROUNDWATER RESOURCES IN THE TOWN OF WILLISTON, NORTHWEST VERMONT, BECKER, Laurence[1], KIM, Jonathan[2], DE SIMONE, David[2], GALE, Marjorie[2], and SPRINGSTON, George E.[3], (1) Vermont Geological Survey, 103 South Main St., Logue Cottage, Waterbury, VT 05671, laurence.becker@state.vt.us, (2) Vermont Geological Survey, 103 South Main Street, Logue Cottage, Waterbury, VT 05671-2420, (3) Department of Geology and Environmental Science, Norwich Univ, 158 Harmon Drive, Northfield, VT 05663

THREE DIMENSIONAL MODELING OF AN ANCIENT THRUST FAULT SURFACE IN THE TOWN OF WILLISTON, NORTHWESTERN VERMONT, DERMAN, Karen, Geology, University of Vermont, Delehanty Hall, Trinity Campus, 180 Colchester Ave, Burlington, VT 05405-1758, karen.derman@uvm.edu, KIM, Jonathan, Vermont Geological Survey, 103 South Main Street, Logue Cottage, Waterbury, VT 05671-2420, and KLEPEIS, Keith, Geology, Univ of Vermont, Burlington, VT 05405

TERRAIN ANALYSIS USING LIDAR TOPOGRAPHIC DATA: A CASE HISTORY FROM WILLISTON, NORTHWEST VERMONT, SPRINGSTON, George E**.**, Department of Geology and Environmental Science, Norwich University, 158 Harmon Drive, Northfield, VT 05663, gsprings@norwich.edu

FIELD EVIDENCE FOR READVANCES – THE LUZERNE EXAMPLE, DE SIMONE, David J**.**, VT Geological Survey & De Simone Geoscience Investigations, 957 Babcock Lake Rd, Petersburg, NY 12138, hawkeye272david@yahoo.com

WHAT THE CRATON CAN TELL US ABOUT APPALACHIAN TECTONICS FROM IAPETAN OPENING THROUGH THE TACONIC OROGENY, JACOBI, Robert D**.**[1], AGLE, Paul[1], LOEWENSTEIN, Stuart[2], MITCHELL, Charles[1], SMITH, Gerald[2], KIM, Jon[3], GALE, Marjorie[3], and BECKER, Larry[3], (1) Geology, University at Buffalo, Buffalo, NY 14260, rdjacobi@geology.buffalo.edu, (2) Nornew, 1404 Sweet Home Rd, Suite 12, Amherst, NY 14228, (3) Vermont Geological Survey, Waterbury, VT 05671

Respectfully submitted,
Laurence R. Becker, State Geologist

ANNOUNCEMENTS

VERMONT GEOLOGICAL SOCIETY LECTURER PROGRAM

The goal of the Vermont Geological Society Lecturer Program is to offer local colleges, universities, and high schools the opportunity to invite a member of the VGS to speak at their institution on timely topics within the broad realm of earth and environmental sciences. The program is primarily intended to reach those departments which either do not hold a regularly scheduled seminar series or whose finances do not permit them to invite external speakers to present talks on a regular basis. Any costs associated with the Lecturer's travel, lodging, and meals are borne entirely by the Vermont Geological Society.

Jon Kim, Ph.D., Geologist/Environmental Scientist, at the Vermont Geological Survey in Waterbury, Vermont, is our 2008 Lecturer. Jon is offering the following two lecture topics: "Nitrate Contamination of a Bedrock Aquifer in Central Vermont" and "Application of Tectonics to Groundwater Problems in Vermont." For scheduling information, see the Society's website at *www.uvm.org/vtgeologicalsociety/lecturer_program.html*

Stephen Wright, Ph.D., Department of Geology, University of Vermont, will be our 2009 Lecturer.

VGS SUMMER FIELD TRIP

Jon Kim will be leading the summer field trip, with the date and location to be determined later.

STUDENT RESEARCH GRANT APPLICATIONS

Students and secondary school teachers are encouraged to apply to the VGS Research Grant Program by October 1, 2008. Downloadable Research Grant Program applications are available from the Society's website at *www.uvm.org/vtgeologicalsociety/grantpolicy.html*

VERMONT GEOLOGICAL SOCIETY CALENDAR

April 26, 2008:	Spring Meeting, Middlebury College
Summer 2008:	Summer Field Trip *[details TBA]*
October 12-18, 2008:	Earth Science Week
October 5-9, 2008:	Geological Society of America Annual Meeting

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The **Executive Committee** of the Society is comprised of the Officers, the Board of Directors, and the Chairs of the Permanent Committees.

Officers

President	George Springston	(802) 485-2734	gsprings@norwich.edu
Vice President	John Van Hoesen	(802) 287-8387	vanhoesenj@greenmtn.edu
Secretary	David West	(802) 443-3476	dwest@middlebury.edu
Treasurer	Stephen Howe	(518) 442-5053	showe@albany.edu

Board of Directors

Richard Dunn	(802) 485-2304	rdunn@norwich.edu
Les Kanat	(802) 635-1327	les.kanat@jsc.edu
Jon Kim	(802) 241-3469	jon.kim@state.vt.us

Chairs of the Permanent Committees

Advancement of Science	Stephen Howe
Geological Education	Christine Massey
Membership	Stephen Howe
Public Issues	Laurence Becker
Publishing	Stephen Howe

Vermont Geological Society
P.O. Box 1224
Saint Albans, VT 05478-1224

ADDRESS CHANGE?
Please send it to the Treasurer at the above address

Vermont Geological Society
Spring Meeting
April 26, 2008, 8:30 AM
McCardell Bicentennial Hall, Room 220
Middlebury College, Middlebury, Vermont

Directions to Middlebury College:

From the town green in Middlebury, take Route 125 west, past the Catholic Church, and up the hill through the College. Go over the crest to the bottom of the hill as it flattens to a valley. Turn right onto Bicentennial Drive and follow the winding driveway to the large parking lot on the west side of McCardell Bicentennial Hall. The meeting will be held in Room 220.

THE GREEN MOUNTAIN GEOLOGIST

QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

VGS Website: www.uvm.org/vtgeologicalsociety/

SUMMER 2008	VOLUME 35	NUMBER 3

The Vermont Geological Society's
Summer Field Trip

Integration of Bedrock and Surficial Geology
in the Town of Williston, Vermont
August 9, 2008

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SUMMER FIELD TRIP DESCRIPTION

Saturday, August 9, 2008

TITLE: Integration of Bedrock and Surficial Geology in the Town of Williston, Vermont

LEADERS: Jonathan Kim*, David DeSimone*, George Springston**, Marjorie Gale*, and Laurence Becker* (*Vermont Geological Survey, 103 South Main Street, Logue Cottage, Waterbury, VT 05671; **Dept. of Geology and Environmental Science, Norwich University, 158 Harmon Drive, Northfield, VT 05663)

TIME: 9:15 AM – 3:30 PM (approx.)

MEETING PLACE AND DIRECTIONS: Meet at the Williston Central School at 9:15 AM. The directions to the school are: Take Exit 12 (Williston) off of Interstate 89. Proceed north on Vermont Route 2A to Tafts Corner. Turn right onto US Route 2. Travel east for 1.9 miles to Williston Town Center. Turn left (north) onto Library Lane. Proceed approximately100 yards to the School and into the parking lot on the right.

QUESTIONS?: Contact Jon Kim by telephone at (802) 241-3469 or by e-mail at jon.kim@state.vt.us

FIELD TRIP STOPS AND DESCRIPTION:

Stop 1 Top of Ledgewood Road hill: Panoramic view of topography and surficial and bedrock geology. Introduction to LIDAR slope map (bedrock lineaments, "bathtub rings", crag and tail till structures) and Cheshire Quartzite.

Stop 2 Pine Ridge School: Surficial deposits (fine sands and clays) from Ft. Ann Stage of Lake Vermont; incised ravines; bedrock control on deposits.

Stop 3 Oak Knoll Road: Discussion of variations in depth to Hinesburg Thrust and bedrock control on Old Creamery basin. Discuss surficial geology of Old Creamery basin.

Stop 4 5-Tree Hill Area: Fairfield Pond Formation; F3 folds and S3-related lineaments; thin till on ridges. Lunch.

Stop 5 Sucker Brook: Thick surficial deposits and bedrock control; Sucker Brook avulsion and erosion issue.

Stop 6 South Brownell Road quarry: Bascom Limestone; black shale slivers; fractures; lamprophyres; deformed till.

[Editor's note: The following abstract was originally intended to be published in the Spring 2008 *GMG* but was not received before the publication deadline. It is reproduced here to complement the Summer Field Trip.]

ABSTRACT

THREE DIMENSIONAL MODELING OF AN ANCIENT THRUST FAULT SURFACE IN THE TOWN OF WILLISTON, NORTHWEST VERMONT

Karen M. Derman*, Jon Kim**, and Keith Klepeis* (*Geology Department, University of Vermont, Burlington, VT 05405, **Vermont Geological Survey, 103 South Main Street, Logue Cottage, Waterbury, VT 05671)

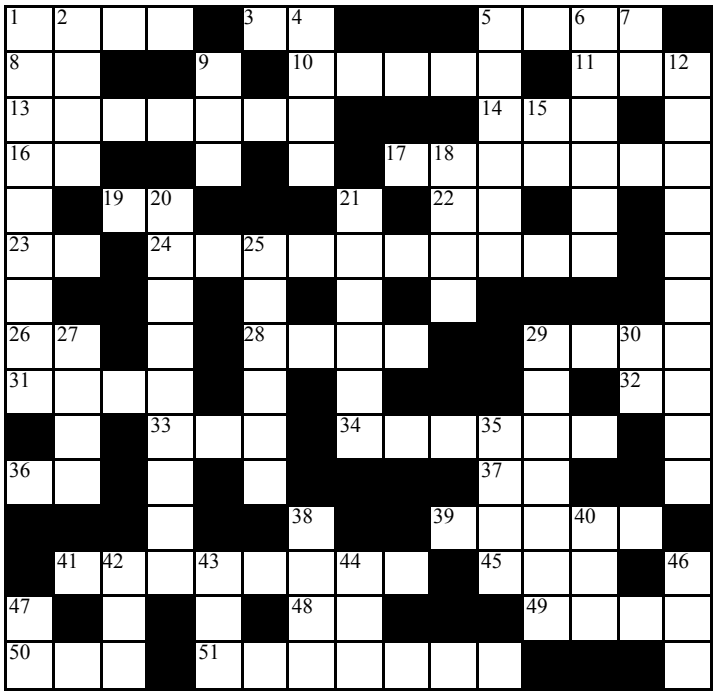
The Vermont Geological Survey mapped the bedrock geology of the Town of Williston during 2007 at 1:24,000 scale as a framework to help understand water quantity and quality issues associated with domestic wells. The bedrock in Williston is composed of metamorphosed rift clastic rocks of the Green Mountain geologic province on the east side and carbonate and clastic continental margin rocks of the Champlain Valley geologic province on the west side; these provinces were juxtaposed by the Ordovician Hinesburg Thrust Fault (HTF). The rocks in Williston were affected by four fold generations and at least two brittle events. Recent logs for domestic wells demonstrate that this thrust can be penetrated at depths ranging from ~100-1000' depending on where the well is drilled relative to the thrust front. The logs also indicate that these wells have significantly higher yields (avg=~50 gpm). Because of the polydeformational history of the HBT, it is very difficult to predict the depth that this fault is encountered. The goal of this study is to construct a 3-dimensional model of the HTF surface that can be used to enhance current groundwater planning efforts.

This study integrates data from the following sources: 1) depth and lithologic data from accurately located domestic wells, 2) topographic data of the area acquired via LIDAR, and 3) the Williston bedrock geologic map and associated structural data. Using GIS, TINs were created of the ground surface and underlying HTF surface and then overlaid. Preliminary analysis of the HTF TIN indicates that the fault has an irregular surface that is consistent with multiple deformational events. Ongoing research will attempt to associate specific ductile and brittle structures with irregularities in the HTF surface and to directly compare the topographic and thrust fault TINs. We anticipate that these methods that pair bedrock mapping with GIS computer modeling be exportable to other areas of Vermont and make drilling high-yield wells more predictable.

PRESIDENT'S LETTER

I thought that a crossword puzzle might be a fun way to get members thinking about the vast range of subjects that we geologists deal with. The theme of the puzzle below is largely that of geology and geography, especially having to do with Vermont. However, some terms from archaeology and chemistry and other places crept in as well. Give it a try and let me know what you think. The answers will be posted on the Society's website.

Respectfully submitted,
George Springston, President



Across
1. The Couching Lion or The _____
3. Element in pyrolusite
5. Appalachian and Middlebury _____
8. Anomalous element at K-T boundary
10. Passumpsic valley _____
11. Edge of a crater
13. Happened before the Acadian Orogeny
14. Flows in a riviere
16. Element below fluorine in Periodic Table
17. _____ Dome in southeast Vermont
19. Element in dolomite
22. Francoise would say “en”
23. Element in calcite
24. Mapped what became known as the RMC
26. Metal found with ultramafics
28. The _____ Age
29. Archaeologists search for this
31. City on the Dnieper River
32. Element after lead in Periodic Table
33. A clay min.
34. Melting ice leaves this type of hole
36. Abundant element in the Crust
37. Found in placers
39. Diatoms, kelp, Spirogyra
41. Foothills
45. A promontory to Jacque
48. Element in spodumene
49. Strike-_____ fault
50. Base of a slope
51. The Standing Pond Volcanics have them

Down
1. He has a late Pleistocene lake named after him
2. Mountains in Russia
4. A volcanic plug
5. Big mountains in Vermont
6. Black Mountain _____ or Averill _____
7. Granites have a lot of this element
9. Class of silicate including pyroxene
12. Sediments can become this metamorphic rock
15. Realgar contains this element
18. Stone tools were used to work on this
20. A Precambrian crunch
21. _____ Thompson, found Charlotte Whale
25. Diabase margins get this way
27. With erosion, this becomes a gully
29. They swam in the Champlain Sea
30. Symbol for Niobium
35. A powdery ultramafic
38. Editor of 1961 Bedrock map of Vermont
40. Short for a light-colored, fine-grained granitoid
42. Melts at 0°C.
43. _____-slip fault
44. Chance of finding a live Mammoth in Vermont
46. ___center of a quake
47. Plutach’s “and”

SPRING MEETING MINUTES

Saturday, April 26, 2008, Middlebury, Vermont

The meeting of the Executive Committee followed twelve student presentations associated with the Spring Meeting held at Middlebury College. President George Springston called the meeting to order with seven people in attendance. Treasurer Steve Howe indicated that the financial condition of the Society is sound (see the Treasurer's Report in this newsletter for details). Steve, in his role as Chair of the Advancement of Science Committee, indicated that no research grant applications were received prior to the latest grant application deadline (April 1st). Recognizing the increased costs associated with geological research, the Executive Committee engaged in a discussion on increasing the maximum award amount for individual student research grants and then voted unanimously to increase the maximum award amount to $700 effective at the next application deadline (October 1st). The Executive Committee also unanimously agreed to make the Spring Meeting Student Judging Forms available to presenters prior to next year's Spring Meeting. This form will be posted on the VGS website.

It was confirmed that Jon Kim, along with other colleagues at the Vermont Geological Survey, would be leading the VGS Summer Field Trip to the Williston area on August 9th. The Committee briefly discussed the Fall Field Trip and while a leader was not identified, the date of the trip was tentatively set for either October 18th or 25th to avoid conflicts with the NEIGC and GSA meetings.

It was brought to the attention of the Committee that the National Speleological Society (NSS) would be holding its 2010 annual convention in Essex Junction, Vermont (July 12-17, 2010). A field trip to local geological sites is expected to be run during this meeting and the NSS is interested in identifying geologists interested in organizing and leading this trip. Additional details, including whom to contact to volunteer, will be provided as they become available.

The Committee also discussed at length the possibility of changing the format and location of the Winter and Fall Meetings but deferred a decision pending further discussion at a future Executive Committee meeting.

Finally, members of the Executive Committee who were present at the meeting volunteered to stand for reelection to their current positions for the next year, with the exception of Steve Howe who will step down as Chair of the Advancement of Science Committee (he will continue in his role as Treasurer). The meeting was adjourned.

Respectively submitted,
David West, Secretary

TREASURER'S REPORT

The financial condition of the Society continues to be very strong. As of July 15, 2008, the Society's checking account balance was $6,844.66. To my knowledge, there are no outstanding bills.

The following member has been approved for membership in the Society since the last report: Patrick Niggel, Williston, Vermont.

Respectfully submitted,
Stephen S. Howe, Treasurer

ADVANCEMENT OF SCIENCE COMMITTEE REPORT

The Society's Spring Meeting was a showcase for the excellent research carried out by 13 undergraduate and graduate students from Middlebury College, Norwich University, the University of Vermont, and Harvard University. The following students received awards for their presentations:

1st Place Award and Doll Award ($100): Emily Dawson, Middlebury College
2nd Place Award ($75): Evan Ellenberger, Middlebury College
3rd Place Award ($50): Ethan Lake, Middlebury College

The Charles G. Doll Award, given for the top undergraduate student presentation, is a plaque with the student's name and school engraved on it that is kept at the student's school until the following year's Spring Meeting. The University of Vermont will be the host of the Spring 2009 Meeting.

The Committee will recommend several dates in early March 2009 for the Society's next Winter Meeting. Members are encouraged to contact me with any suggestions they may have for a theme for the meeting.

No applications to the Society's Research Grant Program were received by the Committee by the deadline of April 1, 2008. Applications for the second round are due October 1, 2008. Please see the Society's website for details.

Finally, I will be stepping down as Chair of the Advancement of Science Committee at the conclusion of the Society's Annual Meeting this fall. It has been a pleasure to serve the Society as Chair for the past eight years.

Respectfully submitted,
Stephen S. Howe, Chair

VERMONT STATE GEOLOGIST'S REPORT

Association of American State Geologists Meeting
From June 29 to July 2, 2008, the Vermont State Geologist attended the 100th Anniversary Meeting of the Association of American State Geologists (AASG) in Shepardstown, West Virginia as one of the State Geologists of the 50 United States and Puerto Rico. Founded in 1908, the AASG seeks to advance the science and practical application of geology and related earth sciences in the United States and its territories, commonwealths, and possessions.

As Vermont was one of 23 states at the first meeting, the 100th anniversary history volume includes a biography of its representative at that meeting, George H. Perkins, Vermont State Geologist from 1898-1933, compiled by the present State Geologist. The 2008 Annual Meeting was an opportunity to celebrate our common past and to visualize the future role of geological survey agencies in our society, with an emphasis on the responsibilities and challenges of the coordinated Federal/State Geological Survey Agency network that will be needed by the Nation.

The meeting was also a retreat for the State Geologists and the USGS to discuss cooperation for the big issues that will come before the next administration. The Director of the USGS, Dr. Mark Myers, and his associates for geology, water, mapping, and biology were in attendance throughout the entire meeting. There were keynote presentations on Energy, Water, Minerals, Hazards, and Climate Change. Other areas included: data preservation, information products for the public, LIDAR topographic mapping, and carbon sequestration. The Vermont State Geologist represents the AASG on the American Geologic Institute (AGI) Government Affairs Advisory Committee. For the earth science community, AGI will be an important representative in bringing these issues forward to the next administration and the incoming Congress.

Northeast State Emergency Consortium (NESEC) Meeting
The Vermont State Geologist chaired a meeting of Northeast State Geologists on May 21, 2008 in Portland, Maine. The group discussed a complete list of natural hazards to focus our interests that apply to emergency management needs. The State Geologists can help through education and bringing a view grounded in science while forecasting problem areas for mitigation and recovery with a multi-hazard approach and GIS expertise. The focused list includes: seismic, landslides, fluvial geomorphology, coastal erosion, HAZUS [Editor's note: a GIS-based natural hazard loss estimation software package developed and freely distributed by FEMA], and groundwater as a hedge against drought and terrorism. The Vermont and Maine State Geologists presented landslide/slope instability maps to the NESEC Board on May 22nd. The NESEC Executive Director will now search for funds to make this an annual event. The hope of the State Geologists is to build relationships with the Directors of Emergency Management Agencies through which we can work on specifics of our list and search for funds to bring needed geologic information for mitigation and recovery.

Hartford Slope Instability
Vermont Emergency Management (VEMA), through partnership with the Vermont Geological Survey, requested a field visit to a site west of White River Junction off of Route 14. Cracks are developing next to a house at the top of a slope with failure evidence and piping discharge at the base of a slope above Route14. It appears that the most recent movement is associated with spring runoff. The State Geologist and George Springston, Research Associate at Norwich University, visited the site and will be reporting on findings and recommendations to VEMA.

Smugglers Notch – Rockfall
George Springston and the State Geologist met with the Commissioner of Forests, Parks, and Recreation (FP&R), the Director of Operations for the Agency of Transportation (AOT), and Notch recreational planners to present draft results of George's rockfall study in the Notch. Both FP&R and AOT supported the study conducted by Norwich University in cooperation with the Vermont Geological Survey. Follow-up management issues were discussed at the meeting.

Respectfully submitted,
Laurence R. Becker, State Geologist

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WATER WORKSHOP

Water Workshop: Water Dynamics, November 9-12, 2008, at the Sheraton Hotel and Conference Center in Burlington, Vermont. For more information, see the website at *www.uvm.edu/EPSCoR/Water_Conference*

Water is a topic that should be of high priority in this century. Fundamental studies of water are important to all the NSF EPSCoR jurisdictions, and, indeed, are sponsored across many of the directorates at NSF. We ask you to save the date for an important workshop on research on water dynamics to be hosted by Vermont EPSCoR and featuring research on water across the NSF EPSCoR jurisdictions. The goals of the workshop will include sharing of information, exploration of collaborations, and learning about the opportunities for research on water through the NSF.

"*Although the movement of water links natural systems and human social systems, there are many gaps in our basic scientific understanding of water dynamics. We still know very little about the effects of climate change and resulting changes in human interventions and land use on the availability and quality of fresh water.*

One of the greatest environmental and economic challenges we face this century is to ensure an adequate, high-quality water supply for human use while maintaining the integrity of ecosystems. While humans can survive without petroleum, they can't survive without water." – Dr. Arden L. Bement. Jr., Director, NSF

VERMONT GEOLOGICAL SOCIETY CALENDAR

8/9/08	VGS Summer Field Trip, Integration of Bedrock and Surficial Geology in the Town of Williston, Vermont
9/26-28/08	NYSGA Annual Meeting, Lake George, New York
10/1/08	Student Research Grant Program Applications due
10/5-9/08	GSA Annual Meeting and Exposition, Houston, Texas
10/10-12/08	NEIGC 100th Annual Meeting, Westfield, Massachusetts
10/12-18/08	Earth Science Week
11/9-12/08	Water Workshop: Water Dynamics

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