THE GREEN MOUNTAIN GEOLOGIST

QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

VGS Website: http://www.uvm.org/vtgeologicalsociety/

WINTER 2009	VOLUME 36	NUMBER 1

The Vermont Geological Society
Winter Meeting
April 4, 2009, 1:00 PM
Delehanty Hall, Room 219
University of Vermont, Burlington, Vermont

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WINTER MEETING PROGRAM

1:00PM	Potluck Lunch
1:55PM	Introduction of Keynote Speaker, Stephen B. Mabee
2:00PM	Stephen B. Mabee: "Fracture Characterization Mapping in Bedrock: How Useful Is It?"
3:00PM	Members' Roundtable And Executive Committee Meeting

ABSTRACT

FRACTURE CHARACTERIZATION MAPPING IN BEDROCK: HOW USEFUL IS IT?

MABEE, Stephen B., Massachusetts State Geologist; Department of Geosciences, 269 Morrill Science Center, University of Massachusetts, 611 North Pleasant Street, Amherst, MA 01003-9297; sbmabee@geo.umass.edu

Bedrock geologic maps, while important primary resources, often lack information on the brittle structure of the bedrock and do not necessarily provide the right kinds of information to address some of today's topical issues, such as groundwater. At the Office of the Massachusetts State Geologist, we have been developing a new suite of fracture characterization mapping products at 1:24,000-scale using the "hydrostructural domain" concept to augment the traditional bedrock geologic map. Engineers and the consulting community have found the maps useful for a variety of purposes including ground-truthing lineament analyses, developing better conceptual models of fractured-bedrock aquifers and making better decisions on how to plan subsurface boring investigations. However, the maps still only provide a qualitative approach to understanding fluid flow in fractured-rock aquifers. What is still lacking is a more quantitative measure of the hydrologic properties of the bedrock. This talk will describe what fracture characterization maps are, how we construct them and then briefly mention some of the new work we have undertaken to test the applicability of the hydrostructural domain concept in a quantitative manner.

PRESIDENT'S LETTER

I'd like to encourage all of you to attend the upcoming "Winter" Meeting at UVM on April 4th. Here are three great reasons to attend: 1) Our speaker will be Massachusetts State Geologist Steve Mabee, who will be giving a detailed presentation on the status of fracture studies related to groundwater in Massachusetts (I can testify that Steve is a great speaker); 2) his talk will be preceded by a potluck lunch, coordinated by our own chef/geologist Jon Kim; and 3) following Steve's talk there will be an important members' roundtable discussion about ways we can improve member participation in our meetings and field trips and recruit new members as well. The Executive Committee has some good ideas on these topics, but we really want to hear from you. What topics do you want at our meetings? What format should we use for the meetings?

When should they be held? Where? How can we get the word out better? How can we interest more students to join the VGS and attend the meetings?

I urge you to come to the April meeting and share your thoughts. If you can't attend, send your comments to me at gsprings@norwich.edu and I'll bring them up at the meeting. We'd like to hear from you!

If indoor meetings don't suit you, then keep an eye out for announcements of the Summer and Fall VGS field trips and the 101st meeting of the New England Intercollegiate Geologic Conference (NEIGC), based this year out of Lyndonville on September 25th to 27th. Visit the NEIGC website at http://w3.salemstate.edu/~lhanson/NEIGC/ for details.

Sincerely,
George Springston, President

ANNUAL MEETING MINUTES & ELECTIONS

The Executive Committee of the Vermont Geological Society met in Waterbury following the Fall Field Trip to the Craftsbury–Northfield area led by Dave Westerman on October 25, 2008. As Secretary Dave West was not able to attend the Annual Meeting, Steve Howe took the minutes.

Steve Howe, as Treasurer, reported that the financial condition of the Society is extremely strong. As of October 25, 2008, the checking account balance was $6,838.70.

Steve Howe, as Chair of the Advancement of Science Committee, reported that no Research Grant proposals were submitted by the October 1, 2008 application deadline.

Steve Howe, as Chair of the Publishing Committee, reported that the publication of the *Green Mountain Geologist* (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. Steve noted that the electronic GMG delivery option has significantly reduced costs associated with the production and mailing of the GMG and that he would continue to recommend that members still receiving the GMG by postal mail consider switching to electronic delivery instead.

Most of the remainder of the meeting was devoted to a discussion of how best to rejuvenate the Society's Winter meetings, including having a single keynote speaker, moving the venue to a more central location, changing the time of day the meeting is held, and including some sort of catered or potluck luncheon or dinner. Jon Kim and George Springston said they would take the lead in identifying a potential speaker, and Jon said he would investigate the possibility of holding the meeting in Waterbury. Several dates for the meeting were discussed and there was general agreement that the meeting time should be moved to early afternoon.

There was a brief discussion of potential field trips, including one along the Connecticut River, for 2009 and 2010.

The Committee confirmed the unanimous election of the following VGS officers for the 2008-2009 year:

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

Rick Dunn, Les Kanat, and Jon Kim were all elected to new two-year terms on the Board of Directors. In addition, Jon Kim was elected as Chair of the Advancement of Science Committee, replacing Steve Howe who had served in that capacity for the past eight years.

Respectfully submitted,
Stephen S. Howe

TREASURER'S REPORT

The financial condition of the Society continues to be extremely strong. As of March 15, 2009, the Society's checking account balance was $8,584.11. No Research Grant proposals were submitted by the October 1, 2008 deadline, despite the Society's commitment to increase the award level to $700.00. 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 members have been approved for membership in the Society since the last report: Thomas Eliassen, Montpelier, Vermont, Kate Gladstein, Burlington, Vermont, and Amanda Northrop, Burlington, Vermont.

The 2009 membership renewal and directory information form was mailed to all members before December 31, 2008. The deadline for renewal was January 31, 2009. 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 the 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 Advancement of Science Committee, along with President George Springston, suggested that the Society try a different format for this year's "Winter" Meeting, to be held Saturday, April 4th at the Geology Department at the University of Vermont. Instead of having multiple Vermont Geological Society professionals giving short talks in the morning, we will have an early afternoon potluck lunch followed by a single speaker giving a 45 minute-1 hour talk. This meeting's speaker will be the Massachusetts State Geologist, Dr. Steve Mabee, who will speak on "Fracture Characterization Mapping in Bedrock: How Useful Is It?" Steve's talk will focus on his recent work that integrates the characteristics of fractures seen in surface outcrops with those of fractures observed in boreholes. A one-hour Roundtable Discussion for members and an Executive Committee meeting will follow this talk. I hope you will all attend to support this new format.

Although March is now half over, we have not received any applications to the Society's Research Grant Program (April 1st deadline). The maximum grant award was recently increased to $700. Details about this grant program are available on the Society's website.

Respectfully submitted,
Jon Kim, Chair

VERMONT STATE GEOLOGIST'S REPORT

Radon Conference
On Thursday, January 15, 2009, Larry Becker and Jon Kim of the Vermont Geological Survey (VGS) co-presented a 45-minute talk with the Radon Program of the Vermont Department of Health (VDH) entitled "Geologic Context of Radon Levels in Vermont." Radon is the second leading cause of lung cancer in the United States. 6000+ radon-in-air tests were connected (geocoded) with specific addresses by the VDH and these results were plotted on geologic maps. The VGS established preliminary correlations between the bedrock and surficial (glacial) geology and the statewide radon levels. Further collaboration between the VGS and the VDH is planned to seek additional geologic correlations. The conference was sponsored by the American Lung Association of New England and the VDH.

Groundwater Mapping, One-Time Appropriation
The State Geologist is managing the overall integration of a $335,000 appropriation passed at the end of the legislative session in 2007 for "Groundwater Mapping." A number of work elements are underway, some conducted by the VGS. In presentations before groundwater study and legislative committees, the State Geologist projected that preliminary versions of maps would be available early in 2009. During the week of December 15th, the State Geologist met with those conducting the studies to discuss preparation of cartographic versions of preliminary products. The well interference analysis contractor (Eric Hansen of Vermont Rural Water/Stone Environmental), contracted with the Water Supply Division in the Department of Environmental Conservation (DEC), is constructing preliminary maps of public water supply pump tests sites showing a local example of a density of wells monitored in relation to pump test locations,

monitored wells that have shown a response, and test graphics to bring visual understanding. Higher groundwater use by census track and where groundwater use is expected to grow statewide will be shown on maps by the USGS (Laura Medelie). Marjorie Gale of the VGS is focusing on a general statewide understanding of the availability of groundwater through an analysis of statewide water well data placed over bedrock geology. *Preliminary* maps are posted at: http://www.anr.state.vt.us/dec/geo/gwaterSTATEinx.htm

George Springston of Norwich University is developing a version of one county that is the prototype for sand and gravel favorability mapping at the 1:100,000 scale. Land use activities as point sources that may have an influence on groundwater quality will be shown by the DEC IT-GIS group (a number of these data sets are also available on the DEC web site). Updates of these databases and transfer of water quality data from other State departments is a future hoped-for step.

Respectfully submitted,
Laurence R. Becker, State Geologist

CALL FOR STUDENT ABSTRACTS

SPRING MEETING OF THE VERMONT GEOLOGICAL SOCIETY
SATURDAY, APRIL 25, 2009

The Vermont Geological Society will hold its Spring 2009 Meeting in Delehanty Hall at the University of Vermont, Burlington, 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. An example of last year's judging form will be placed on the Society's website shortly.

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 with a .doc extension attached 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 12 minutes with 3 additional minutes for questions. A computer projection system is available for PowerPoint presentations.

Deadline for abstracts: Monday, April 6, 2008 at noon

For additional information regarding capabilities for presentations at the meeting, contact Stephen Wright at (802) 656-4479 or stephen.wright@uvm.edu

ANNOUNCEMENTS

STUDENT RESEARCH GRANT APPLICATIONS DUE APRIL 1, 2009

Students and secondary school teachers are encouraged to apply to the VGS Research Grant Program by April 1, 2009. Downloadable Research Grant Program applications are available from the Society's website at http://www.uvm.org/vtgeologicalsociety/. For those without Internet access, forms may be obtained by writing to Jon Kim at the Vermont Geological Survey, 103 South Main Street, Logue Cottage, Waterbury, VT 05671, e-mail: jon.kim@state.vt.us, or by calling (802) 241-3469.

VERMONT GEOLOGICAL SOCIETY CALENDAR

April 1:	Student Research Grant Program applications due
April 4:	Winter Meeting, Delehanty Hall, University of Vermont
April 6:	Student abstracts for Spring Meeting due
April 6:	Executive Committee reports due
April 25:	Spring Meeting, Delehanty Hall, University of Vermont

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	Jon Kim
Geological Education	Christine Massey
Membership	Stephen Howe
Public Issues	Laurence Becker
Publishing	Stephen Howe

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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
April 4, 2009, 1:00 PM
Delehanty Hall, Room 219
University of Vermont, Burlington, Vermont

Directions to the University of Vermont:

Delehanty Hall is located on the old Trinity College campus adjacent to the University of Vermont. From I-89, take Exit 14 (Main Street–Route 2 exit), and go west (towards the lake) to East Avenue. Turn right on East Avenue and go to the end of East Avenue. At the stoplight, proceed straight across Colchester Avenue and into the driveway ahead of you. Once on the driveway, bear around to the left and the parking lot is in the rear of Delehanty Hall, which has a slate exterior and large granite blocks in front of it.

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SPRING 2009	VOLUME 36	NUMBER 2

The Vermont Geological Society

Spring Meeting

April 25, 2009, 8:30 AM
Delehanty Hall, Room 219
University of Vermont, Burlington, Vermont

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SPRING MEETING PROGRAM

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9:15AM Elgita Eglite: HYDRODYNAMICS OF ST. ALBANS BAY, VERMONT

9:30AM Brett Woelber: POST-GLACIAL ENVIRONMENTAL CHANGE RECORDED IN NULHEGAN POND, BRIGHTON, VERMONT

9:45AM Kirsten Stokes: A COMPARISON OF THE REEFAL AND LAGOONAL DEPOSITIONAL ENVIRONMENTS OF THE CROWN POINT FORMATION

10:00AM Samuel Schultz: LITHOFACIES OF THE CROWN POINT REEFAL AND INTER-REEF STRATA AT ISLE LA MOTTE, VT

10:15AM Daniel Chow: EVIDENCE FOR ULTRAMAFIC-DERIVED ARSENIC IN BEDROCK MONITORING WELLS, NORTH-CENTRAL VERMONT

10:30AM Jared Bean: A GEOCHEMICAL ANALYSIS OF GEOLOGIC CONTROLS ON NATURALLY-OCCURRING RADIOACTIVITY IN GROUNDWATER: HINESBURG, VERMONT

10:45AM BREAK

11:00AM Marissa Saccente*, Jessica Sperling, Ed Greiner, and Greg Druschel: THE FORMATION OF INTERMEDIATE SULFUR SPECIES DUE TO THE OXIDATION OF $FeS_{(aq)}$ CLUSTERS AND SULFUR SPECIATION WITHIN AN ANOXIC SPRING AT ELY MINE, VERSHIRE, VERMONT

11:15AM Robert Charnock*, Jonathan Kim, Keith Klepeis, and Daniel Chow: BRITTLE STRUCTURES AND TOPOGRAPHY IN THE KNOX MOUNTAIN GRANITE, NE VERMONT

11:30AM Spencer Paddock: LATE NEOGLACIAL HISTORY OF THE AGASSIZ GLACIER, MONTANA

11:45AM Simeon Hamilton: INTERPRETING LACUSTRINE PROXIES OF MID-HOLOCENE ENVIRONMENTAL CHANGE IN THE UINTA MOUNTAINS, NORTHEAST UTAH

12:00PM Charles L. Cavness III: SPATIAL DYNAMICS OF TERTIARY IGNEOUS INTRUSIONS IN RATON BASIN, SOUTHERN COLORADO

* Speaker

12:15PM Tucker Levy: GEOCHEMISTRY AND CLAY MINERALOGY OF ALLUVIAL FAN PALEOSOLS, SOUTHEASTERN SPAIN

12:30PM Katie J. Gladstein: ERUPTION DEFORMATION ANALYSIS OF MOUNT ETNA, SICILY, ITALY (2007-2008)

12:45PM JUDGING and AWARDS PRESENTATIONS

1:15PM EXECUTIVE COMMITTEE MEETING

ABSTRACTS

PRESENT-DAY HYDRODYNAMICS AND SEDIMENT PROCESSES OF THE INLAND SEA OF LAKE CHAMPLAIN

Charlotte Bemis, Geology Department, Middlebury College, Middlebury, VT 05753

The Inland Sea, located in the Northeast corner of Vermont's Lake Champlain, has restricted circulation from the Main Lake resulting in a unique hydrodynamic setting. In 2005, hydrodynamic data were gathered by instruments placed on eight subsurface moorings throughout the Inland Sea. Instruments on these moorings included temperature sensors and Acoustic Doppler Current Profilers (ADCPs) which monitored backscatterance, water speed and direction. Water level sensors were also set up in four locations throughout the Inland Sea. The hydrodynamic data were merged with sediment size information obtained from LISST instruments (in-situ laser diffraction particle size analyzers) and meteorological data from the Main Lake to create a complete picture of the hydrodynamic and sediment processes occurring in the Inland Sea. Analysis showed the presence of a dynamic internal standing wave, strong counter-clockwise circulation pattern in the deeper hypolimnion, less developed flow in the surface layer as well as the movement and eventual deposition of surface algal blooms into the deep water. Side scan sonar imagery combined with water velocity data confirm sediment scouring or at least the lack of deposition in the deep central channel connecting the northern and southern portions of the Inland Sea.

HYDRODYNAMICS OF ST. ALBANS BAY, VERMONT

Elgita Eglite, Geology Department, Middlebury College, Middlebury, VT 05753

Since the 1960's, St. Albans Bay has experienced significant alteration in its aquatic ecosystem due to prevalence of an algae-dominated environment. Extensive Cyanobacteria blooms are a severe response to continuous influx of phosphorus (P) from runoff. It is believed that poor circulation, especially applicable to the inner bay, limits water exchange and the P concentration increases over time. In this region, the algal blooms have caused significant property value depreciation, losses in tourism industry and more importantly health concerns. The issue is also pertinent to other restricted circulation regions such as Missisquoi, Malletts and Carry Bays within Lake Champlain. While $85 million have been spent so far on Vermont's Clean and Clear program to date, little if any improvement in water quality is observed in St. Albans Bay.

Mechanisms for increased primary productivity of algae depend on physical and geochemical parameters such as transparency, temperature, acidity, nutrient loading, oxygen abundance, nitrogen-P ratios and currents. None of the previous studies have considered the effects of hydrodynamics in their results.

In the summer of 2007, 13 subsurface moorings consisting of four Acoustic Doppler Current Profilers, 13 temperature sensors, 4 pressure-temperature sensors and 3 laser particle analyzers were placed in St. Albans Bay. Over 1.2 million *in situ* observations melded with wind data from Colchester Reef meteorology station are being analyzed to better understand the circulation dynamics of this region. The study should provide other researchers with valuable information relating to the distribution of geochemical characteristics.

Some preliminary findings show an average counterclockwise circulation in the inner and outer bays, even though there are strong oscillatory circulation patterns observed. The strongest link between the sections is a shallow passage along the southern coast via which both southerly and northerly winds promote influx of water into inner bay. In the outer bay, there is a component of northward flow through the Ball Island and Burton Island passages. There appear to be phases of inflow of hypolimnic water from Inland Sea that also flood the inner bay. Oscillations range from 1.7-3.5 days, some linked to the Inland Sea.

POST-GLACIAL ENVIRONMENTAL CHANGE RECORDED IN NULHEGAN POND, BRIGHTON, VERMONT

Brett Woelber, Geology Department, Middlebury College, Middlebury, VT 05753

Changes in lake sediment properties over time can reveal past climate change in a given catchment. Sedimentary proxy trends reflect variations in the environmental variables of temperature and precipitation. This study investigated the sedimentary record from Nulhegan Pond, located within the Nulhegan Basin in NE Vermont. The Nulhegan Basin is a flat-floored depression mantled by permeable glacio-fluvial sediments and underlain by an igneous pluton. A series of Livingstone cores retrieved in 2006 and 2007, and a surface core retrieved in 2008, were combined to yield a composite stratigraphy extending from the modern sediment surface down to the base of the lacustrine sediment (~14 m in ~4 m of water). Analyses employed in this study include Loss-on-Ignition (%LOI), Carbon-to-Nitrogen ratio (C/N), and Grain Size (GS). %LOI analyses were previously conducted at a 1-cm interval along the entire length of the core by Rodgers (2007); C/N and GS were sampled at 4-cm intervals for only this study. Six AMS radiocarbon dates provide an age-depth model with an average sedimentation rate of 1.2 mm/year (~8 years/cm). Lake formation occurred in the latest Pleistocene (ca. 13.5 ka BP) as Wisconsinan ice vacated the Nulhegan Basin. Early-deposited silts (~13.5-12 ka) yield low %LOI, large grain size, and high C/N values, indicating a period of low lake productivity and large amounts of inwashing sediment. From ~12-8.5 ka, a prolonged rise in %LOI, high C/N values, and oscillating GS values track the variable maturation of Nulhegan Pond's aquatic ecosystem. From ~8.5-5.5 ka, %LOI and GS levels are high but C/N remains low, suggesting a long period of low lake level and shallow, productive water. From ~5.5 ka-present, all three proxies increase, possibly indicating slow eutrophication of the lake environment. All three proxies exhibit notable changes in the frequency of their variability ca. 5.5 ka BP, indicating that

natural climate forces and/or minor sedimentation rates changed around 5.5 ka BP. The most modern sediment contains an age-date of -53 BP, and provides both a reference point for all proxy values and a predictive trend for future climate values.

A COMPARISON OF THE REEFAL AND LAGOONAL DEPOSITIONAL ENVIRONMENTS OF THE CROWN POINT FORMATION

Kirsten Stokes, Department of Geology, University of Vermont, Burlington, VT 05405

The stratigraphic section of the Middle Ordovician Crown Point Formation of the Chazy Group was measured and sampled at Crown Point, New York so that lithofacies could be identified and compared to reef-bearing horizons of the unit found on Isle la Motte. The Crown Point Formation is 90 feet thick at this locality. Three lithofacies were identified: (1) wackestone containing cross-lamented ripple marks and interbedded with dolomite; (2) massive dolostone beds; wackestone containing variety of broken allochems; and (3) micstone and interbedded dolomite layers; and dolograinstone. Lithofacies are all interpreted to record a shallow lagoon environment. The exposed Crown Point Formation at Isle La Motte is different in that its lithofacies represent low energy reefal and inter-reefal environments. The similarities between the lithofacies at Crown Point and Isle La Motte are the presence of dolomite and micrite. In addition, trilobites, crinoids, and brachiopods are found frequently in both. At the Crown Point, New York locality, the massive dolostone bed and the wackestone lithofacies is repeated in the sequence. This cyclic repetition through the stratigraphic column is indicative of sea-level rise and fall. The dominant allochems in all lithofacies at Crown Point are trilobites and echinoderm (crinoid) fragments. Although oncolites are not found in every sample, their presence is an important indicator of my interpretation of a shallow water environment.

LITHOFACIES OF THE CROWN POINT REEFAL AND INTER-REEF STRATA AT ISLE LA MOTTE, VT

Samuel Schultz, Department of Geology, University of Vermont, Burlington, VT 05405

The reef and inter-reef rock of the Crown Point Formation at Isle La Motte, VT were sampled and analyzed to identify lithofacies that could refine the depositional environment in which the stromatoporoid mounds of this formation are found. Three lithofacies were identified: (1) grainstone containing a high percentage of micrite and dolomite with a variety of allochems which are dominated by crinoids, trilobites and brachiopods; (2) rudstone containing abundant micrite-encrusted allochems with a mix of dolomite and spar. The allochems present were mainly echinoderms and trilobites but bryozoa, coral, and algae were also found; and (3) boundstone containing large allochems of stromatolites with internal mud and dolomite. The abundance of mud was somewhat surprising but it suggests that either the stromatoporoids produced localized low energy environments that could accumulate mud and/or much of the micrite was produced by encrusting algae. In addition to identifying lithofacies of the Crown Point reefal horizons, I conducted an analysis of carbonate and oxygen isotopes of the calcite spar present in this strata. While these results are still being interpreted, delta Carbon -13 values recorded for reef rock were between -0.195 and -0.241, and between 1.230 and 1.378 for inter-

reef rock. The oxygen isotope values for the reef rock were between -7.9 and -8.33, while the inter-reef rock values were between -5.37 and -7.67.

EVIDENCE FOR ULTRAMAFIC-DERIVED ARSENIC IN BEDROCK MONITORING WELLS, NORTH-CENTRAL VERMONT

Daniel Chow, Geology Department, Middlebury College, Middlebury, VT 05753

High arsenic (As) levels in private water supplies in north-central Vermont were first noted in the spring of 2005 when As levels of 90 and 327 ppb were found in two private wells (the EPA MCL is 10 ppb). Middlebury College students Kevin Bright (2006) and Colleen Sullivan (2007) found that serpentinite and other ultramafic rocks are the bedrock type with the highest As concentrations by far in the region. The purpose of this study is to further analyze As in regional bedrock and examine evidence for As migration into groundwater. With funding from the Lintilhac Foundation, three monitoring wells were drilled in a recharge area near Waterbury, VT. Well A is drilled through 30 m of Barnes Hill ultramafic (BHU) rock through a fault into underlying phyllites of the Stowe Formation, Well B is solely in the BHU body, and Well C is drilled through 5 m of BHU through a fault into phyllites of the Ottaquechee Fm. A 70-cm soil pit was also dug near the sites of wells A and B, revealing deeply weathered ultramafic saprolite. Rock chips were sampled every 1.5 meters and 44 rock samples from the wells and soil pit were analyzed by ICP-AES at Middlebury College and by ICP-MS at ACME labs in Vancouver, Canada. Groundwater was also obtained from October to March and analyzed by ICP-MS and other methods by the DEC for major and trace elements and anions. By far the highest As concentrations were found in ultramafic rock from well C (341-1104 ppm), but elevated values were also found in other ultramafics and several metasedimentary samples (up to 190 ppm). Groundwater in all three wells is characterized by an Mg-HCO_3 signature, consistent with ultramafic-derived water, and arsenic concentrations range from 2-9 ppb, with the highest value recorded in Well C. Given that this water is produced from a recharge area and contains a strong ultramafic signature, the arsenic in these monitoring wells appears to be derived from weathering of ultramafic rocks.

A GEOCHEMICAL ANALYSIS OF GEOLOGIC CONTROLS ON NATURALLY-OCCURRING RADIOACTIVITY IN GROUNDWATER: HINESBURG, VERMONT

Jared Bean, Geology Department, Middlebury College, Middlebury, VT 05753

Several studies over the past decade have identified and investigated elevated levels of radionuclides in the bedrock aquifer that straddles the east-dipping Ordovician Hinesburg Thrust (HT), which juxtaposes Precambrian-Cambrian meta-sedimentary rocks to the east atop Cambrian-Ordovician carbonate rocks to the west. The majority of these studies focused on the upper plate of the HT and hypothesized that its formations are the radionuclide source while groundwater from the lower plate exhibits low radioactivity and contributes to dilution of GA levels. Since elevated radioactivity in water poses a health concern, the purpose of this study is to carry out geochemical analyses of the lower plate in order to facilitate a comprehensive study of this complex aquifer system. 20 private well water samples and 24 bedrock samples were obtained from the lower plate west of the Hinesburg Thrust. None of the wells sampled in this

study contained gross alpha (GA) levels above the EPA maximum contaminant level (MCL) of 15 pCi/L. However, 12 of the 20 wells were above the Vermont Department of Health action level of 5 pCi/L recommending further testing for ^{226}Ra and ^{228}Ra. However, positive correlations between U and GA indicate that ^{238}U is likely the dominant source of alpha radiation in the lower plate carbonates. No correlation exists between distance from the HT and GA concentration, perhaps related to the low hydraulic conductivity of the thrust fault, which may act as an aquitard. Well yield is negatively correlated with GA, presumably reflecting low residence time and dilution of GA. Wells in the Clarendon Springs, Bascom, Shelburne, Winooski, and Monkton formations all contained wells producing water above the VDH action level of 5 pCi/L. Two of the wells contained elevated levels of nitrate which also poses a health risk. While agricultural runoff is a common source of this groundwater contaminant, corresponding elevated levels of Na and Cl indicate septic leachate.

THE FORMATION OF INTERMEDIATE SULFUR SPECIES DUE TO THE OXIDATION OF $FeS_{(aq)}$ CLUSTERS AND SULFUR SPECIATION WITHIN AN ANOXIC SPRING AT ELY MINE, VERSHIRE, VERMONT

Marissa Saccente, Jessica Sperling, Ed Greiner, and Greg Druschel, Department of Geology, University of Vermont, Burlington, VT 05405

In order to better understand the geochemical processes behind Acid Mine Drainage (AMD), it is important to understand the chemical pathways and species underlying the dissolution and oxidation of iron sulfide minerals. One particular intermediate, the iron sulfide aqueous cluster $FeS_{(aq)}$, is a key product in the formation, dissolution, and equilibrium description of Fe-S minerals [1]. $FeS_{(aq)}$ molecular clusters are important in understanding the redox pathways which Fe-S minerals follow, as the clusters are important in promoting the solubility of metal sulfide minerals in natural aqueous systems due to their high natural abundance in various environments [1]. Here, experiments show that $FeS_{(aq)}$ oxidizes along a pathway that yields different intermediate sulfur species than Fe-S minerals. $FeS_{(aq)}$ clusters, when subject to oxic conditions, produce only sulfate. Detectable levels of intermediate sulfur species, such as thiosulfate, were not produced. Research regarding the study of pyrite oxidation as it relates to the formation of sulfur intermediates shows that the primary intermediates formed at circumneutral pH's are thiosulfate and sulfite, this suggests that $FeS_{(aq)}$ clusters undergo alternate oxidative pathways which may be too rapid to measure [2]. The Ely Mine, one of Vermont Copperbelt mines, is characterized by acid mine drainage and is a comparable site for the investigation of sulfur speciation, where iron sulfide minerals are abundant. Sulfur speciation within an anoxic spring, fed by groundwaters percolating through tailings piles containing Fe-S minerals was evaluated by detailed geochemical analysis, surficial, and ground-water mapping and sediment analysis of contributing waters. The spring contains products from the anoxic dissolution of Fe-S minerals that oxidize only to sulfate, with no discernible thiosulfate or sulfite present in solution—in agreement with lab experiments.

[1] Goldhaber, M. B. (1983). Experimental Study of Metastable Sulfur Oxyanion Formation During Pyrite Oxidation at pH 6-9 and 30C. American Journal of Science, 193-217.

[2] Oduro, H., and Druschel, G. (2008). The Formation and Oxidation of FeS(aq) Molecular Clusters: Decoupling Iron Sulfide Mineral Surface Dissolution and Oxidation Reactions.

BRITTLE STRUCTURES AND TOPOGRAPHY IN THE KNOX MOUNTAIN GRANITE, NE VERMONT

Robert Charnock[1], Jonathan Kim[2], Keith Klepeis[1], and Daniel Chow[3], (1) Department of Geology, University of Vermont, Burlington, VT 05405; (2) Vermont Geological Survey, 103 South Main St., Logue Cottage, Waterbury, VT 05671; (3) Geology Department, Middlebury College, Middlebury, VT 05753

The Knox Mt. granite pluton of the New Hampshire Plutonic Series intruded Late Silurian-Early Devonian staurolite-grade metasedimentary rocks of the Gile Mt. and Waits River fms. during the Middle Devonian. The Vermont Geological Survey constructed a bedrock map of part of this pluton and surrounding rocks during the 2008 field season to serve as a framework for understanding elevated U levels in groundwater from public and domestic bedrock wells in the granite. One of the primary focuses of this study was to analyze brittle structures. The attitudes of 600+ fractures and 100+ pegmatites were measured in the field area. The topography of the granite landscape is characterized by distinct groups of steep elongate or blocky hills separated by flat low-lying areas. The purpose of this investigation is to correlate major fracture sets with topographic patterns in the field area.

For the granite portion of the field area, the dominant fractures and topographic lineaments trend to the NE, NW, and E-W. Most (~70%) pegmatites have a NW trend with subordinate groupings that strike ~E-W and ~N-S; many fractures develop along pegmatite/granite contacts. The major fracture and lineament azimuths vary geographically within the granite. Consequently, we divided the granite into six geographic domains: (1) Western Contact Domain, (2) Drew Mt. Domain, (3) Marshfield and Burnt Mt. Domain, (4) Lord's Hill Domain, (5) Owl's Head Domain, and (6) Hardwood Mt. Domain. The blocky shapes of the hills in domains 2, 3, 4, and 6 are controlled by two orthogonal "Lego" fracture sets, however, these fracture sets are not the same for each domain. The elongate and streamlined shapes of the hills in domains 1 and 5 are controlled by a single dominant fracture set. Topographic lineaments within the Gile Mt. and Waits River fm. rocks follow the NNE-trending dominant foliation (S1) whereas the most abundant fractures are roughly perpendicular to this foliation; subordinate NW and NE trending fracture sets also occur.

NNE-SSW, E-W, and NW-SE trending fracture surfaces with pronounced slickensides were observed at numerous granite outcrops. Based the presence of asymmetric steps on some of these fracture surfaces, slickenside kinematics were determined. Fault solutions show strike-slip and normal fault activity in the pluton and host rock.

LATE NEOGLACIAL HISTORY OF THE AGASSIZ GLACIER, MONTANA

Spencer Paddock, Geology Department, Middlebury College, Middlebury, VT 05753

The National Park Service identified understanding glacier dynamics as the primary issue facing Glacier National Park in the Park's 2004 Geologic Resource Evaluation. Current models predict the disappearance of all glaciers from the Park by 2030, but historical context is needed to discern whether this rapid retreat is part of natural climate variation or an unprecedented effect of anthropogenic climate change. To this end, two percussion cores were taken from Upper Kintla

Lake in the northwest corner of Glacier Park. The Agassiz Glacier, once one of the largest in the Park, lies less than 3 km upstream of Upper Kintla and is the dominant source of sediment in the watershed. Radiocarbon dating reveals that the cores span the past 1000 years at sedimentation rates averaging 3.3 mm yr^{-1}, meaning that both pre- and post-industrial revolution glacier dynamics are recorded in the sediment. Both cores were analyzed for biogenic silica (bSi) content at 2-cm resolution and grain size (GS) at 1-cm resolution. Additional bSi and GS analysis of sediment retrieved from a surface core was spliced with the percussion core data to extend the Agassiz's history from AD 1000 to AD 2007, with the uppermost surface sediment providing a reference point for down-core comparisons. Both proxies, bSi and GS, were also compared with Loss-on-Ignition (LOI) data previously gathered for the cores, which track the amount of organic productivity in the watershed and the amount of carbonate bedrock transported to the lake as glacial flour. Together these four proxies reveal a millennium where the Agassiz Glacier was primarily comparable to its current size, with several advances from 980-1020, 1527-1625, 1577-1597, and 1803-1884 AD, and two major retreats from 1260-1310 and 1908-1990 AD.

INTERPRETING LACUSTRINE PROXIES OF MID-HOLOCENE ENVIRONMENTAL CHANGE IN THE UINTA MOUNTAINS, NORTHEAST UTAH

Simeon Hamilton, Geology Department, Middlebury College, Middlebury, VT 05753

The sedimentary layers deposited in high-elevation lakes contain information about past climate variability. Understanding the nature, magnitude, duration, and timing of these climate changes provides a better understanding of current climate trends and improves models designed to predict future climate trends. This study focuses on sediment cores retrieved from nine lakes ranging from 2900 to 3500 m a.s.l. in the Uinta Mountains of Utah. Grain size distribution (GS), biogenic silica content (bSi), and mineralogy using X-ray diffraction (XRD) were applied to sections of each core spanning the interval ca. 4.5 to 4 ka BP to interpret the extent to which this region was affected by mid-Holocene climate change. Loss-on-ignition (LOI) analysis previously demonstrated a significant decrease in organic matter ca. 4.2 ka BP in six of the nine cores, while two cores showed no variation in organic matter at this time, and one core showed significant variation in organic matter throughout all of its sedimentary layers. The decrease in organic matter in the six cores is notable because numerous other records have suggested extensive drought in the central region and low-elevation western region of the U.S. at this time. Four of the cores that showed an LOI decrease at ca. 4.2 ka BP demonstrated an increase in total surface area of particles at this time. In GS analysis, an increase in total surface area of particles draws parallel to an increase in silt (<6μm) and clay (<2μm) sized particles. An influx of these types of sediments at ca. 4.2 ka BP is considered to be consistent with an increase in eolian processes related to regionally extensive drought. Ongoing bSi analysis will be used to determine if and how the productivity of the aquatic environment changed during this time, while ongoing XRD analysis will reveal whether changes occurred in the mineralogy of the lake sediment during this interval. This multi-proxy analysis from nine widely distributed lakes in the Uinta Mountains should allow for more detailed interpretations of the extent and characteristics of environmental changes during the ca. 4.2 ka BP paleoclimate event.

SPATIAL DYNAMICS OF TERTIARY IGNEOUS INTRUSIONS IN RATON BASIN, SOUTHERN COLORADO

Charles L. Cavness III, Geology Department, Middlebury College, Middlebury, VT 05753

The Raton Basin in southern Colorado contains several kilometers of Late Cretaceous to Early Tertiary sedimentary rocks that host extensive coal and coal-bed methane (CBM) reserves. During the Oligocene the basin was intruded by mafic dikes associated with the Spanish Peaks volcanic complex located along the northwestern margin of the basin. In addition to these dikes, thinner sills are pervasive within the basin, often preferentially intruding coal beds used by oil and gas companies to extract CBM. Previous research focusing on the geothermal potential of the basin suggests that the sill complexes are directly related to "feeder dikes" and are partially responsible for the elevated geotherm in the region. This report combines 100 CBM well logs and an aeromagnetic survey to test the feeder dike hypothesis.

Sills are identified in well logs by dual induction resistivity (DIR) log spikes exceeding 2,000 ohms. Dikes are identified by rotated to poll (RTP) vertical magnetic gradients exceeding 65 nT/m and can be mapped by tracing anomalous gradient ridges on aeromagnetic maps. Net sill thickness is quantified for five stratigraphic categories in each well. Net sill thicknesses are compared to (a) the proximity of the nearest dike to a given well, and (b) the number of dikes within ten proximity ranges (500 meter intervals from 500 m to 5 km).

Results show that net sill thickness is significantly controlled by the number of dikes within 500 meters from a well, but that dikes outside of the 500 meter range have an insignificant effect on sill abundance in a well. Furthermore, the proximity of the single closest dike has a negligible effect on sill abundance. Results are presented in a series of scatter and bar graphs with accompanying regression analysis. Isopach maps of sill thickness supports statistical results by showing sill "hotspots" coinciding with areas of dike convergence.

Given the quantitative and qualitative evidence that dike frequency within close proximity to a well affects net sill thickness, the feeder dike hypothesis can be confirmed. These results can be used to extrapolate sill abundance based on aeromagnetic surveys and predict areas of coal alteration near dike convergence centers. Additionally, the findings can guide further research into relationships between geothermal gradients and intrusion patterns.

GEOCHEMISTRY AND CLAY MINERALOGY OF ALLUVIAL FAN PALEOSOLS, SOUTHEASTERN SPAIN

Tucker Levy, Geology Department, Middlebury College, Middlebury, VT 05753

The geologic and topographic evolution of Andalusia (southeastern Spain) is dominated by post-Miocene uplift and deformation associated with the Betic Orogeny. The Betic Cordillera began to uplift at approximately 15-20 Ma. This event uplifted a previously submerged land surface to heights of up to 3500 m. The Betic Orogeny has resulted in massive denudation of uplifted areas and deposition in the numerous basins in the region, primarily in the form of alluvial fans. Due to a relatively arid, stable Holocene climate, these fans continue to form, leaving relic paleosols buried just below the surface. Depositional events mainly occur over longer time scales as a

result of gradual erosion off the range by surface water, but larger, singular mass wasting events triggered by floods and tectonic activity of the Padul Fault also contribute to fan evolution.

Two alluvial fan paleosol sequences were examined, one 20 km south of Granada (Durcal), and one on the SE margin of the Granada Basin (Ronda-Sur). Both sites are roadcuts. 8 samples were taken from a single stacked paleosol profile at Durcal and 16 samples were taken from three profiles at Ronda Sur. Analytical methods include XRD for clay mineralogy, ICP-AES for paleosol geochemistry (< 2 mm), Munsell analysis of color and oxide mineralogy, and pH analysis of soil exchange complexes.

The paleosols are middle to late Pleistocene and formed via weathering of garnet-mica schists and marbles denuded from the Nevado-Filabride and Alpujarride complexes that compose the Sierra Nevada. The paleosols contain 55-75% SiO_2, 10-20% Al_2O_3, 4-7% Fe_2O_3, <7% MgO, and 1.5-20% CaO, and all samples have pH in the range of 7.5 to 8.5. Parent mineralogy of the < 2 mm fraction consists of muscovite, paragonite and chlorite. Horizons range from distinctly red paleosols that formed during moist periods and contain pedogenic smectite phases and kaolinite, to caliche-like paleosols that are rich in parent materials and formed during periods of aridity. The weathering index of base cations (Al_2O_3+Fe_2O_3) generally correlates to field, Munsell and mineralogical indicators of weathering. Pedogenic clay minerals include ordered mica-smectite that is presumably derived from layer-by-layer decomposition of muscovite, as well as smectite and kaolinite that appear to be derived from chlorite.

ERUPTION DEFORMATION ANALYSIS OF MOUNT ETNA, SICILY, ITALY (2007-2008)

Katie J. Gladstein, Department of Geology, University of Vermont, Burlington, VT 05405

The largest and most active volcano in Europe, a Sicilian stratovolcano named Etna, towers 3343 m above the Mediterranean Sea, near the boundary between the African, Eurasian, and adjacent microplates. Etna's theorized east and southward gravitational spreading has created extensional summit structures and compressional base and flank structures, largely dictating the structural and magmatic evolution of volcanic constructs, including numerous cones, the massive Valle del Bove depression, and a concentration of dykes injecting east of the summit craters.

As one of the most actively erupting and degassing volcanoes in the world, the significance of monitoring Etna's activity and deformation is expansive. Volcanic eruptions have a direct impact on atmospheric chemical composition, and have altered global climates more abruptly than any other natural process. Etna dominates a fairly populated region of Sicily, including the major city of Catania; a region which has experienced and will face many more frequent, voluminous, and hazardous eruptions in years to come.

A new fissure eruption, accompanied by over 200 superficial earthquakes, began on May 13, 2008, about 2800 m above sea level, at the headwall of the Valle del Bove and just east of the summit craters. Several months later, during September and October of 2008, I assisted Dr. John Murray from the Open University (UK) in monitoring Etna's deformation via global positioning satellite (GPS) and leveling measurements, which Murray has been surveying annually for the

past 38 years. The May 13 fissure eruption, still taking place at a low intensity, has become the longest Etnean flank eruption of the third millennium.

With Dr. Murray, I utilized Leica GPS transits to monitor about 90 GPS stations in Etna's region, as well as a Leica level and staff to record the elevation of about 215 leveling nails. Our GPS data indicates that Etna has deformed a significant amount over the last year, with significant deformation in the eastern fissure region as well as on a southwestern flank. In addition, the leveling data provides a subsurface implication for the elevation changes that have accompanied the recent activity. I will be presenting an analysis of Etna's 2007-2008 deformation by interpreting our data as well as its implications for the flux of magma beneath Etna's surface.

PRESIDENT'S LETTER

Below are my notes from the members' roundtable discussion that the Society held on Saturday afternoon, following Steve Mabee's excellent presentation at our Winter Meeting.

Comments on this meeting:
The early afternoon time for the meeting was popular, making it easier for those coming from far away to attend. The single-speaker format seemed successful. The social aspect of the meeting (potluck luncheon with plenty of a great variety of food) received good reviews. Jeff Hoffer pointed out that he liked the timing of this meeting (during "mud season").

Ideas for future indoor meetings:
Dave West suggested that we could mix up the style of the Winter meeting in particular, perhaps alternating between soliciting abstracts for short talks from professional Society members (as we have done the past several years) and inviting a single outside speaker to give a longer talk, and this seemed like a popular idea. Jon Kim offered to arrange another speaker, perhaps for a fall meeting. Jon noted that we could make use of the rooms at the Cyprian Learning Center at the State Office Complex in Waterbury at a modest cost, but only during the week, not on weekends. Steve Howe reminded us that we do indeed need to have a fall meeting, which according to the Society's Bylaws must be within 30 days of October 15th. Kristen Underwood suggested a joint meeting with the watershed groups in the State. Larry Becker and Dave West mentioned the success of the recent Maine Groundwater Conference that was held in conjunction with the recent Northeast GSA meeting in Portland, Maine.

Field trips:
Both summer and fall field trips are generally popular. We discussed running only a summer field trip this year, as NEIGC is in Vermont this year. We need someone to volunteer to lead a summer trip.

Meeting the needs of K-12 educators:
Greg Walsh offered to lead a workshop in using GoogleEarth as an effective tool for geological education.

Encouraging students to join the Society:
Thelma Thompson pointed out that in the early days of the Society there was heavy student involvement, largely from UVM students. John Van Hoesen suggested that we could lead field trips focused on some particular method (fracture analysis, pump test, etc.). This evolved into the idea that students might be able to come out in the field with professionals when something interesting was happening, such as pump tests, soil borings, etc. The new ListServ could be a way of getting the word out for such opportunities. Probably there would be coordination with professors. Dave West suggested that some sort of mentoring activity for students seeking employment would be quite popular with students. There was discussion as to whether or not we'd be able to get employers involved who actually were hiring. Finally, we discussed the idea of offering prizes to entice students to join the VGS (such as a rock hammer, hand lens, or Brunton), but this was met with mixed enthusiasm.

I know I've left some things out, but I think this gives you a good idea of the spirit of the discussion. If any of this inspires you with an idea or an observation, let us know. You can email me at gsprings@norwich.edu or call me at (802) 485-2734.

Sincerely,
George Springston, President

WINTER MEETING MINUTES

The meeting of the Executive Committee followed the potluck lunch, Steve Mabee's talk on fractures studies and groundwater in Massachusetts, and a member's roundtable discussion (see the President's Letter above for the details of this discussion) held on April 4, 2009 at the University of Vermont. President George Springston called the meeting to order with a total of five people in attendance. The meeting began with finalizing plans to make the "VGS ListServ" available to VGS members and beyond. The ListServ will allow for on-line discussion of issues related to Vermont geology and the Society. It was agreed that an e-mail will be sent out to members with instructions on how to subscribe. Members will then have the option whether to participate or not. It was also agreed that non-members should be able to subscribe and subscription instructions will be posted on the VGS website.

Treasurer Steve Howe indicated that the financial condition of the Society is sound (see the Treasurer's Report for details). It was indicated that fewer than 20 paper copies of the GMG are now being mailed and this has resulted in a significant savings in copying and postage costs. Jon Kim, Chair of the Advancement of Science Committee, indicated that two student Research Grant proposals were received before the most recent April 1st submission deadline. It was confirmed that each proposal should be reviewed by more than one person and that a short critique of each proposal, along with justification of the amount awarded, should be provided to applicants. A somewhat lengthy discussion of student eligibility requirements for the VGS Research Grant Program followed. The issue surrounds whether students who do not receive degree credit for independent research at their home institutions should be eligible for student Research Grants. The Executive Committee did not make a final decision on this matter but will

solicit additional opinions and continue discussions. It is hoped that a decision on this matter can be reached before the next student Research Grant submission deadline (October 1st).

The Committee briefly discussed the Summer Field Trip and agreed to work in the coming weeks to secure a leader for a trip. The meeting was adjourned.

Respectfully submitted,
Dave West, Secretary

TREASURER'S REPORT

The financial condition of the Society continues to be extremely strong. As of April 4, 2009, the Society's checking account balance was $8,519.11. Two Research Grant proposals were submitted by the April 1, 2009 deadline and are currently under review by the Advancement of Science Committee. The amount of the funding awarded during this round will be reported in the Treasurer's Report in the Summer 2009 *Green Mountain Geologist*. 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 rejoined the Society since the last report: Peter Ryan, Middlebury, Vermont.

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

Laurence R. Becker
Ray Coish
John E. and Anita M. Cotton
Jeanne C. Detenbeck
Barry Doolan
Bruce F. Douglas
Albert W. Gilbert, Jr.
Carey Hengstenberg
Barbara L. Hennig
Jefferson P. Hoffer
Eric T. Lapp
Frederick D. Larsen
J. Gregory and Nancy W. McHone
Alexis P. Nason
Peter Ryan
George Springston
Sharon Strassner
Peter J. and Thelma B. Thompson
Roger and Terry Thompson
David West

Respectfully submitted,
Stephen S. Howe, Treasurer

ADVANCEMENT OF SCIENCE COMMITTEE REPORT

On Saturday, April 4, 2009, the "Winter" Meeting of the Vermont Geological Society (VGS) was held in 219 Delehanty Hall, the home of the University of Vermont's Department of

Geology. The meeting consisted of a potluck lunch, a guest lecture by the Massachusetts State Geologist, Dr. Steve Mabee, and a members' roundtable discussion. Twenty people attended this meeting and dined on the eclectic cuisine prepared VGS members Steve Howe, Marjie Gale, George Springston, John Van Hoesen, Jon Kim, Dave West, Kate Gladstein, Larry Becker, Peter Thompson, Greg Walsh, Jeff Hoffer, Kristen Underwood, and Joe Hayes. Thanks to all these contributors.

Steve Mabee's presentation, entitled "Fracture Characterization Mapping in Bedrock: How Useful is it?" was basically divided into two parts. The first part explained in detail the procedures that the Massachusetts Geological Survey (MGS) uses to collect fracture data in the field and to analyze these data to delineate "hydrostructural domains" (bodies of bedrock with similar fracture characteristics). Examples of the MGS fracture and groundwater maps were shown in the talk and also hung on the walls of the meeting room. The users of these maps were also outlined. The second half of the talk discussed how the "hydrostructural domain" concept was tested by the MGS and the U.S. Geological Survey in numerous Nashoba Terrane bedrock wells in eastern Massachusetts using modern borehole logging equipment. Three important preliminary findings of this study were that groundwater only flowed along 4% of fractures logged, different "hydrostructural domains" could have similar hydrogeologic characteristics, and that groundwater flow in fractures was restricted to the upper 100 meters of the wells. The talk was followed by 40 minutes of questions and discussion.

The Advancement of Science Committee received two applications to the VGS Research Grant Program. These proposals will be evaluated in the near future.

Respectfully submitted,
Jon Kim, Chair

VERMONT STATE GEOLOGIST'S REPORT

Geological Society of America – Northeastern Section (NEGSA) Meeting
The Vermont Geological Survey (VGS) participated with Middlebury College, the University of Vermont, and Norwich University on presentations and posters at the NEGSA meeting in Portland, Maine, March 22-24, 2009. The State Geologist chaired a symposium on natural hazards and gave the introductory presentation:

THE VERMONT NATURAL HAZARD EXPERIENCE AND THE NESEC STATE GEOLOGISTS, BECKER, Laurence R.[1], SPRINGSTON, George E.[2], DEWOOLKAR, Mandar M.[3], KIM, Jonathan J.[1], and DESIMONE, David J.[1], (1) Vermont Geological Survey, (2) Department of Geology and Environmental Science, Norwich University, (3) Civil and Environmental Engineering, University of Vermont.

The Northeastern States Emergency Consortium (NESEC), consisting of the Directors of the Emergency Management Agencies for eight states in the Northeastern U.S., invited the state geologists in the region to advise NESEC on the science of natural hazards and the Vermont State Geologist is organizing this new group. Two other State Geologists gave talks. Eight

papers covered such hazards as seismic activity and risk, landslides, coastal erosion, river erosion and flash floods. George Springston of Norwich University gave a talk on an "ANALYSIS OF ROCK FALL AND DEBRIS FLOW HAZARDS IN SMUGGLERS NOTCH, GREEN MOUNTAINS, NORTHERN VERMONT", summarizing work conducted in cooperation with the VGS, the Department of Forest and Parks, and the Agency of Transportation.

Groundwater-related Presentations and Posters

The work presented follows from geologic mapping projects, groundwater chemical analyses, and student support.

RADIONUCLIDES, GROUNDWATER GEOCHEMISTRY, AND HYDROGEOLOGY ABOVE, BELOW, AND THROUGH THE HINESBURG THRUST: NW VERMONT, KIM, Jonathan[1], RYAN, Peter[2], NORTH, Katharine[2], BEAN, Jared[2], and DAVIS, Leland[2], (1) Vermont Geological Survey, (2) Geology Department, Middlebury College.

CONNECTION BETWEEN ORDOVICIAN MANTLE METASOMATISM AND ARSENIC IN VERMONT GROUNDWATER, RYAN, Peter C.[1], KIM, Jon[2], CHOW, Daniel[1], SULLIVAN, Colleen[1], and BRIGHT, Kevin[1], (1) Geology Department, Middlebury College, (2) Vermont Geological Survey.

BEDROCK CONTROL ON SURFICIAL DEPOSITS AND GROUNDWATER ISSUES IN PART OF THE KNOX MOUNTAIN GRANITE PLUTON: NE VERMONT, KIM, Jonathan[1], SPRINGSTON, George[2], and CHARNOCK, Robert[3], (1) Vermont Geological Survey, (2) Department of Geology and Environmental Science, Norwich University, (3) Department of Geology, University of Vermont.

Tectonics and Geomorphology

Basic geologic mapping is also at the core of the following poster:

THE RELATIONSHIP BETWEEN BRITTLE STRUCTURES AND TOPOGRAPHIC PATTERNS IN THE KNOX MOUNTAIN GRANITE: NE VERMONT, CHARNOCK, Robert[1], KIM, Jonathan[2], KLEPEIS, Keith[1], and CHOW, Daniel[3], (1) Department of Geology, University of Vermont, (2) Vermont Geological Survey, (3) Geology Department, Middlebury College.

VGS Web Postings

Marjorie Gale continues to post additional material to the Survey web site:
http://www.anr.state.vt.us/dec/geo/mapsonlineinx.htm

VG09-1, Wright, S., S. Fuller, S. Jones, A. McKinney, S. Rupard, and S.D. Shaw, 2009, Surficial geologic map of the Burlington, Vermont 7.5 minute quadrangle, 1 color plate, scale 1:24,000.

VG95-7a, Doolan, B., 1995, Bedrock geologic map of the Gilson Mountain, Vermont 7.5 minute quadrangle, 2 color plates, scale 1:24,000.

VG09-2, Wright, S., A. McKinney and S. Rupard, 2009, Surficial geologic map of the Colchester, Vermont 7.5 minute quadrangle, 1 color plate, scale 1:24,000.

VG09-3, De Simone, D. and Gale, M., 2009, Surficial geology and hydrogeology of Dorset, Vermont, 9 color plates, scale 1:24,000.

VG08-2, De Simone, D., 2008, Surficial geologic map of the town of Londonderry, Vermont, 2 color plates, scale 1:24,000.

VG08-3, Kim, J., Charnock, R., Chow, D. and Springston, G., 2008, Bedrock geologic map of the Knox Mountain pluton area, Marshfield and Peacham, Vermont, 3 color plates, scale 1:24,000.

VG08-4, Springston, G. and Kim, J., 2008, Surficial geologic map of the Knox Mountains area, Marshfield and Peacham, Vermont, 2 color plates, scale 1:24,000.

2/17/09–Preliminary statewide analyses of groundwater resources is posted.

2/9/09–Bulletins 5 and 9 text as PDF files have been added to the web site.

Ten USGS Open-File Report maps have also been posted as PDF files on our site.

Respectfully submitted,
Laurence R. Becker, State Geologist

ANNOUNCEMENTS

VERMONT GEOLOGICAL SOCIETY'S NEW LISTSERV

I am happy to announce that we have tested and now implemented an electronic ListServ for anyone with questions or interests related to Vermont geology. This ListServ will hopefully develop into a central portal used to disseminate information regarding educational opportunities, pertinent local and regional meetings, workshops, and talks. It will also serve an educational role by allowing member and non-members to ask the geologic community questions.

If you are interested in joining the Society's new ListServ, please visit this link:

http://listserv.greenmtn.edu/scripts/wa.exe?SUBED1=VGS&A=1

You will be able to control the way and how frequently you receive information via the ListServ during registration. Please contact me if you have any questions regarding the ListServ via vanhoesenj@greenmtn.edu

John Van Hoesen, Vice President

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.

Stephen Wright, Ph.D., Department of Geology, University of Vermont, is our 2009 Lecturer. Stephen is offering the following lecture topic: "Glacial Geology of Northern Vermont: Ice Flow, Water Flow, and Glacial Lake History." For scheduling information, see the Society's website at http://www.uvm.org/vtgeologicalsociety/lecturer_program.html

STUDENT RESEARCH GRANT APPLICATIONS

Students and secondary school teachers are encouraged to apply to the VGS Research Grant Program by **October 1, 2009**. Downloadable Research Grant Program applications are available from the Society's website at http://www.uvm.org/vtgeologicalsociety/. For those without Internet access, forms may be obtained by writing to Jon Kim at the Vermont Geological Survey, 103 South Main Street, Logue Cottage, Waterbury, VT 05671, e-mail: jon.kim@state.vt.us, or by calling (802) 241-3469.

VERMONT GEOLOGICAL SOCIETY CALENDAR

April 18	LCRC Spring Student Symposium, Poultney, Vermont
April 25:	VGS Spring Meeting, Delehanty Hall, University of Vermont
Sept. 25-27:	NEIGC Conference, Lyndonville, Vermont
Oct. 1:	VGS Research Grant Program applications due
Oct. 18-21	Geological Society of America Annual Meeting, Portland, Oregon

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	Jon Kim
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
Winter Meeting
April 25, 2009, 8:30 AM
Delehanty Hall, Room 219
University of Vermont, Burlington, Vermont

Directions to the University of Vermont:

Delehanty Hall is located on the old Trinity College campus adjacent to the University of Vermont. From I-89, take Exit 14 (Main Street–Route 2 exit), and go west (towards the lake) to East Avenue. Turn right on East Avenue and go to the end of East Avenue. At the stoplight, proceed straight across Colchester Avenue and into the driveway ahead of you. Once on the driveway, bear around to the left and the parking lot is in the rear of Delehanty Hall, which has a slate exterior and large granite blocks in front of it.

THE GREEN MOUNTAIN GEOLOGIST

QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

VGS Website: http://www.uvm.org/vtgeologicalsociety/

SUMMER 2009	VOLUME 36	NUMBER 3

The Vermont Geological Society's
Summer Field Trip

Geology Hike in Smugglers' Notch, Vermont
August 15, 2009

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SUMMER FIELD TRIP DESCRIPTION

Saturday, August 15, 2009

TITLE: Geology Hike in Smugglers' Notch, Vermont

LEADER: George Springston, Dept. of Geology and Environmental Science, Norwich University, 158 Harmon Drive, Northfield, VT 05663

TIME: 8:30 AM – 4:00 PM (approx.)

FIELD TRIP DESCRIPTION: A strenuous, day-long hike in Smugglers' Notch to examine the bedrock and surficial geology and the geomorphology of one of Vermont's most popular scenic attractions. Topics will include the influence of ductile fabrics on brittle structures, the glacial and post-glacial history of the Notch, and the geomorphic processes that operate in the Notch today.

ITINERARY: Meet at the Waterbury Park-and-Ride at 8:30 AM. We will then carpool up into the Notch. After parking some of the cars at the main parking area up in the Notch we will backtrack in the remaining cars to the Smugglers' Notch Picnic Area and begin hiking north along the Long Trail. Along the way we will examine the bedrock and surficial deposits and cross a debris flow path. The Elephant's Head overlook provides a great view of the amphitheatre of cliffs on the western side of the Notch and may serve as a good lunch spot. We will then continue north along the Long Trail, taking a short side trip to the top of Sterling Peak if time permits, until we reach the Sterling Pond Trail, where we will turn west and descend into the Notch. In the floor of the Notch we will hike about 1/3-mile south along Vermont Route 108 to examine the fallen boulders and examples of the lower portions of the debris flows. Finally, we will return to the main parking lot up in the Notch and complete the car shuttle back to the Picnic Area. Estimated ending time is 4:00 PM.

This is a strenuous 5.2-mile hike and the footing is often difficult. Although the hike is mostly on trails, you need to be able to negotiate steep rock steps and slippery roots. Wear sturdy hiking boots (no sneakers or running shoes). Bring a large lunch, plenty of water, and rain gear. The trip will be postponed to the following Saturday (August 22nd) in case of heavy rain.

Limit is 12 participants and pre-registration is required. Those interested in going on the field trip **must pre-register** between 9:00 AM on July 29th and 5:00 PM on August 12th either by calling George Springston at (802) 454-1220 or by e-mailing him at gsprings@norwich.edu. All questions about the trip and directions to the Waterbury Park-and-Ride should be directed to George.

[Editor's note: The following abstract was originally intended to be published in the Spring 2009 *GMG* but was not received before the publication deadline.]

ABSTRACT

PETROLOGY OF A MULTIPLE META-IGNEOUS INTRUSIVE OUTCROP, TUPPER LAKE, NEW YORK

Kyle Thomas Ashley, Department of Geology, State University of New York, College at Potsdam, Potsdam, NY 13676 [presently at Geology Department, University of Vermont, Burlington, VT 05405]

Numerous metamorphic rock types, Precambrian in age, occur in an outcrop on the east side of Route 30, about 10.5 miles south of Tupper Lake, New York. Rock types range from grey garnet-poor gneisses to pink garnetiferous gneisses to black hornblende-plagioclase amphibolites. The grey gneisses, common at the northern end of the outcrop, contain abundant plagioclase feldspar, hornblende, and orthopyroxene that has been partly altered to chlorite. The presence of opx and low quartz suggests these gneisses were originally mangeritic granites. Hornblende crystals are locally up to 3-4 centimeters in diameter, and garnet is largely absent.

The pink gneisses are comprised of potassium feldspar and quartz, with lesser amounts of ortho- and clinopyroxene, plagioclase, biotite, apatite, sphene, and magnetite/ilmentite. Scattered garnets, 2-3 mm in diameter, are found throughout the massive pink gneisses, with pockets containing higher densities and larger grain sizes of garnets (up to 2 cm). Microprobe analysis of the garnets gives a compositional formula of $(Fe_{2.18}Mg_{0.27}Ca_{0.37}Mn_{0.14})Al_{1.97}Si_{3.05}O_{12}$, almandine. Microprobe traverses show there is no zoning across the garnets, except around the edges where decreased iron is most likely caused by metamorphic alteration. Consumption of the mafic phases during the metamorphic reaction creating garnet could explain the low concentration of mafic mineral phases. Perthitic texture within potassium feldspar crystals suggest a low crystallization temperature for the granitic protolith, and the presence of orthopyroxene would make these charnockitic granites. Crosscutting the pink gneisses are three hornblende-plagioclase-biotite amphibolites. Most likely these were originally basaltic dikes.

Pegmatite intrusions containing large potassium feldspar and hornblende grains commonly occur as pockets in the gneiss, up to one meter in diameter. Pale green orthopyroxene and pale pink pleochroic orthopyroxene also occur within the pegmatites. The orthopyroxene is partly altered to chlorite, but crystal structure and observation of unaltered portions of grains positively identify these as such. Due to the mineralogy of the pegmatites being similar to the host rock, they are most likely the result of hot, watery fluids that recrystallized the gneiss in late stages of metamorphism.

PRESIDENT'S LETTER

I'm sure that most VGS members would agree with me when I say that maps have a tremendous influence on how we view the world. I can lose myself in a map for long periods of time while trying to understand some geographic pattern. Well, I was recently given a beautiful book of maps, graphs, and images that is going to give me much to think about in the coming months: *Where the Great River Rises: An Atlas of the Connecticut River Watershed in Vermont and New*

Hampshire (edited by Rebecca Brown, Dartmouth College Press, Hanover, New Hampshire, 263 p., 2009.)

I haven't yet had time to read through this special project of the Connecticut River Joint Commissions, so I can't really give you a proper review, but my first impressions are that it is quite an achievement. The section on *The Physical Landscape* has a chapter on *Physiography and Bedrock Geology* by Jon Kim and David Wunsch, *Glacial Geology* by Laurence Becker and David Wunsch, and *Soils* by Thomas Villars. I could be expected to be excited about those, but this is so much more than just a geology and soils book. The 36 chapters in 7 sections include a chapter on *Weather and Climate* by Steve Maleski, *Groundwater* by Sarah Flanagan, *Forests* by Charles Cogbill, *Native Space* by Lisa Brook and others, *The Postindustrial Economy* by Preston Gilbert and Rebecca Brown, *Water Travel* by Sharon Penney, and *Cultural Institutions* by Rebecca Brown, to name only a few.

Flipping through, I see a map of the chronology of glacial retreat in Vermont and New Hampshire, graphs showing changes in mean annual temperature and annual precipitation over the last century, a map of effective stream runoff in the Upper Connecticut River watershed, a map of forest composition circa 1800, a graph of salmon returns over the last 40 years, a graph comparing the numbers of sheep and humans in Connecticut River valley towns circa 1840, and a map of early turnpikes circa 1820. There are photos or woodcuts of everything from the Ely Copper Mine to the steamboat "Barnet" and a 1912 log drive at the Ledyard Bridge at Hanover.

By weaving together so many disparate themes, this volume should add greatly to our understanding of the natural and human history of the watershed of the mighty Connecticut. Whether or not you actually live in the watershed, I encourage you to buy a copy and to also make sure there's a copy in your local library. There's something in it for everyone.

Respectfully submitted,
George Springston, President

SPRING MEETING MINUTES

The Executive Committee did not meet following the student presentations of the Spring Meeting held at the University of Vermont on Saturday, April 25, 2009.

The Society's Spring Meeting was a showcase for the excellent research carried out by 14 undergraduate and graduate students from Middlebury College and the University of Vermont. The following students received awards for their presentations:

1st Place Award ($100) and Doll Award: Charles Cavness III, Middlebury College
2nd Place Award ($75): Charlotte Bemis, Middlebury College
3rd Place Award ($50): Marissa Saccente, University of Vermont

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.

Respectfully submitted,
Stephen S. Howe

TREASURER'S REPORT

The financial condition of the Society continues to be very strong. As of July 21, 2009, the Society's checking account balance was $6,900.83. To my knowledge, there are no outstanding bills.

The following members have been approved for membership in the Society since the last report: Kyle Ashley, Burlington, Vermont; Lauren Chrapowitzky, Burlington, Vermont; Halen Earle, Burlington, Vermont; David Gross, East Hardwick, Vermont; Laura Webb, Burlington, Vermont; and Jonathon Wells, Minneapolis, Minnesota.

Respectfully submitted,
Stephen S. Howe, Treasurer

ADVANCEMENT OF SCIENCE COMMITTEE REPORT

Two research grant proposals were funded by the Vermont Geological Society during the spring of 2009. Both proposals were well written, had reasonable scopes of work, and had exemplary references.

Halen Earle, an undergraduate in the Department of Geology at the University of Vermont, received an award of $687.40 for his proposal entitled "Analysis of Ductile and Brittle Bedrock Structures in the Town of Charlotte, Vermont."

Lauren Chrapowitzky, an M.S. candidate in the Department of Geology at the University of Vermont, received an award of $700.00 for her proposal entitled "Sedimentology, Stratigraphy, Paleoenvironments, Burial History, and Diagenesis of the Valcour Formation (Middle Ordovician, Chazy Group), Vermont and New York."

Both students were reminded of their obligation to report their research findings at the Vermont Geological Society Spring Meeting in April 2010 and/or at a professional meeting such as the Northeastern Section Meeting of the Geological Society of America.

The Advancement of Science Committee is currently looking into the possibility of having another invited lecturer and potluck dinner in November 2009. This was discussed at the last Executive Committee Meeting in April.

Respectfully submitted,
Jon Kim, Chair

VERMONT STATE GEOLOGIST'S REPORT

Radon and the Health Department
The Health Department's (VDH) radon program is distributing 1,000 free long-term radon-testing kits. They consulted with the Vermont Geological Survey (VGS) as to where previous testing and bedrock geology might suggest levels are higher. We worked in cooperation with Lori Cragin and Peter Young of VDH, and Jon Kim of VGS developed additional GIS data. We reviewed maps of radon test results by town and cooperatively produced maps of geocoded radon results and bedrock and surficial geologic maps. In both data sets, it is apparent that rocks of the Connecticut Valley Belt (Waits River and Gile Mountain formations and New Hampshire Series granites) have a greater percentage of indoor radon in air tests greater than or equal to 4 picocuries/liter than the surrounding bedrock belts. On these cooperative maps, 14-21% of radon tests in this belt had radon levels greater than or equal to 4 picocuries/liter. Certain towns in the Northeast Kingdom are under-tested but have the geologic indicators above and some towns have >20% of all tests exceeding the 4 picocurie/liter action level for radon. Twenty-two towns are recommended by VGS for the free test distribution. The Health Department will work with the Fairbanks Museum's radon program to distribute the tests.

Smugglers' Notch
George Springston of Norwich University and the State Geologist met with the Secretary of the Agency of Natural Resources and the Commissioner of Forest Parks and Recreation to present the results of a geologic study undertaken to assess rockfall and debris flow risk in Smugglers' Notch. The study will help guide management decisions in the Notch. The Agency Secretary asked the VGS to propose ways to continue to monitor the Notch, to be a clearinghouse for rockfall and debris flow data for the Notch from other information sources, and to develop a plan to inform decision-making if an earthquake event occurs that has the potential to destabilize the potential rockfall source areas.

Respectfully submitted,
Laurence R. Becker, State Geologist

ANNOUNCEMENTS

VERMONT GEOLOGICAL SOCIETY'S NEW LISTSERV

The Society hopes that the ListServ will develop into a central portal used to disseminate information regarding educational opportunities, pertinent local and regional meetings, workshops, and talks. It will also serve an educational role by allowing members and non-members to ask the geologic community questions.

If you are interested in joining the Society's new ListServ, please visit this link:
http://listserv.greenmtn.edu/scripts/wa.exe?SUBED1=VGS&A=1

You will be able to control the way and how frequently you receive information via the ListServ during registration. Please contact John Van Hoesen at vanhoesenj@greenmtn.edu if you have any questions regarding the ListServ.

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.

Stephen Wright, Ph.D., Department of Geology, University of Vermont, is our 2009 Lecturer. Stephen is offering the following lecture topic: "Glacial Geology of Northern Vermont: Ice Flow, Water Flow, and Glacial Lake History." For scheduling information, see the Society's website at http://www.uvm.org/vtgeologicalsociety/lecturer_program.html

STUDENT RESEARCH GRANT APPLICATIONS

Students and secondary school teachers are encouraged to apply to the VGS Research Grant Program by October 1, 2009. Downloadable Research Grant Program applications are available from the Society's website at http://www.uvm.org/vtgeologicalsociety/. For those without Internet access, forms may be obtained by writing to Jon Kim at the Vermont Geological Survey, 103 South Main Street, Logue Cottage, Waterbury, VT 05671 or by calling him at (802) 241-3469.

VERMONT GEOLOGICAL SOCIETY CALENDAR

8/15/09	VGS Summer Field Trip, Geology Hike in Smugglers' Notch, Vermont
9/25-27/09	NEIGC 101st Annual Meeting, Lyndonville, Vermont
9/25-27/09	NYSGA 81st Annual Meeting, New Paltz, New York
10/1/09	Student Research Grant Program applications due
10/11-17/09	Earth Science Week
10/18-21/09	GSA Annual Meeting and Exposition, Portland, Oregon

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

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Saint Albans, VT 05478-1224

ADDRESS CHANGE?
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Vermont Geological Society
Summer Field Trip
August 15, 2009, 8:30 AM
Geology Hike in Smugglers' Notch, Vermont

Limit is 12 participants and pre-registration is required. Those interested in going on the field trip **must pre-register** between 9:00 AM on July 29th and 5:00 PM on August 12th either by calling George Springston at (802) 454-1220 or by e-mailing him at gsprings@norwich.edu. All questions about the trip and directions to the Waterbury Park-and-Ride should be directed to George.

THE GREEN MOUNTAIN GEOLOGIST

QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

VGS Website: http://www.uvm.org/vtgeologicalsociety/

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Vermont Geological Society
Winter Meeting

Call for Presentations

Geologic Controls on River Systems in the Northeastern U.S.

Norwich University, Northfield, Vermont
Saturday, February 6, 2010, 9:00 AM

The Vermont Geological Society invites presentations on the influence of surficial and bedrock geology on the stability and evolution of river systems in the northeastern U.S. The State of Vermont has pioneered the application of fluvial geomorphic principles to community planning, ecosystem restoration and conservation, and hazard mitigation. Neighboring states of New Hampshire, Maine, and New York are also developing river management programs that incorporate the science of fluvial geomorphology. The goal of this meeting is to bring together professionals and citizens engaged in river and watershed studies and to highlight the influence of surficial and bedrock geology on the present-day form, processes, condition, and sensitivity of our fluvial systems.

The keynote speaker will be John Field, Ph.D., of Field Geology Services, Farmington, Maine.

Professionals, students, and citizen scientists working in the fields of geology and fluvial geomorphology are invited to present results of their work. **Each oral presentation will be 15 minutes, with 5 minutes for questions and answers. Poster presentations are also encouraged**. It is hoped that the meeting will include a combination of applied as well as academic studies. These can be either field-based or theoretical/conceptual in nature. Suggested topics include:

- Characterization/assessment methods
- Watershed hydrology/floods
- Groundwater/surface water interactions
- Sediment transport
- Ecosystem processes
- Geoarchaeology
- Historic landscape development
- Holocene landscape evolution
- Water quality
- Hillslope processes/mass movement
- River restoration design
- Fluvial erosion/landslide hazard mapping

Abstracts Due: January 11, 2010

For more information, contact:
George Springston, President, Vermont Geological Society, (802) 485-2734,
gsprings@norwich.edu

To submit an abstract, contact:
Kristen Underwood, South Mountain Research & Cons., (802) 453-3076,
southmountain@gmavt.net

ANNUAL MEETING AND ELECTION

No Annual Meeting will be held this year. Four officers will be elected by a combination of electronic and paper ballots. The ballot was sent as a Word document to all members receiving the GMG electronically, but it is also included at the end of this issue. Members are encouraged to send their voted ballots by e-mail to Kristen Underwood at southmountain@gmavt.net. Members without access to e-mail should send their voted paper ballots to David West, Dept. of Geology, Middlebury College, Middlebury, VT 05753. The deadline for the receipt of both electronic and paper ballots is December 3, 2009 at 5:00 PM.

PRESIDENT'S LETTER

[Unavailable at publication time]

SUMMER MEETING MINUTES

No Executive Committee Meeting was held following the Society's Summer Field Trip to Smugglers' Notch, Vermont area on August 15, 2009.

TREASURER'S REPORT

The financial condition of the Society continues to be very strong. As of October 1, 2009, the checking account balance was $6,910.83. To my knowledge, there are no outstanding bills. A financial statement for the period 9/22/08-10/1/09 is indicated below.

The Society has five student members, two of whom received free membership for one year as an additional benefit of having been awarded Research Grants. Income slightly exceeded expenses during this 12-month period, primarily due to membership dues and voluntary Research Grant contributions more than offsetting increased Research Grant awards. The *Green Mountain Geologist* was printed this year at no cost to the Society due to the generosity of the Department of Geology at Middlebury College. In addition, the Society did not incur any VGS Lecturer expenses this fiscal year, and meeting expenses decreased.

The 2010 membership renewal and directory information form will be mailed out to all members by December 31, 2009. The deadline for renewal will be January 31, 2010.

Respectfully submitted,
Stephen S. Howe, Treasurer

Income and Expenses
9/22/08-10/1/09

INCOME		
Total Dues (2009 membership)		$1,479.00
Member	$1,155.00	
Family	$240.00	
Student	$24.00	
Institution	$60.00	
Student Research Grant Contributions		$560.00
Miscellaneous Donation		$2.00
Delinquent 2008 Membership Dues		$15.00
Vermont Geology Sales		$10.00
TOTAL INCOME		$2,066.00
EXPENSES		
Green Mountain Geologist Printing		$0.00
Postage		$72.70
Office Supplies		$10.59
Post Office Box Rental (to 8/1/10)		$60.00
VGS Lecturer Reimbursement		$0.00
Winter Meeting Speaker Reimbursement		$140.00
Winter Meeting Refreshments		$13.28
Spring Meeting Refreshments		$80.40
Awards		$1,612.40
Research Grants	$1,387.40	
Spring Meeting Student Talks	$225.00	
TOTAL EXPENSES		$1,989.37
TOTAL INCOME – TOTAL EXPENSES		$76.63

ADVANCEMENT OF SCIENCE COMMITTEE REPORT

[Unavailable at publication time]

STATE GEOLOGIST'S REPORT

National Geothermal Data System – Grant Accepted by DOE
The Association of American State Geologists (AASG) organized a coalition of 40 state geological surveys to populate the Department of Energy's (DOE) National Geothermal Data System with relevant state-specific geothermal data. The national project is to receive $17.79 million from the DOE over 3 years. As part of the grant, the Vermont Geological Survey is to receive over $150,000 to compile state-specific geothermal data in an integrated distributed and searchable data system that should drive renewed efforts to identify, assess, and exploit geothermal energy resources in Vermont. This effort is a national collaboration of State and Federal agencies, universities, and industry, with the potential to reshape America's energy landscape, reduce greenhouse gas emissions, and leverage non-renewable petroleum resources well into the 21st Century.

Statemap Projects, delivered October 31, 2009 to USGS
Town of Charlotte, 1:24,000 scale, Bedrock (Marjorie Gale and Jon Kim, VGS) and Surficial Geology (George Springston, Norwich University and Stephen Wright, UVM). Town of Rutland, 1:24,000 scale, Surficial Geology (John Van Hoesen, Green Mountain College).

Smugglers' Notch
George Springston of Norwich University and the State Geologist met with the Secretary of the Agency of Natural Resources and the Commissioner of Forest Parks and Recreation to present the results of a geologic study undertaken to assess rock fall and debris flow risk in Smugglers' Notch. The study will help guide management decisions in the Notch. An immediate outcome of the report is installation of warning signs at the approaches to the Notch and the closing of informal parking areas at the base of potential debris flow pathways.

Jeffersonville – Monitoring for Potential Slope Instability
In cooperation with George Springston of Norwich University and Les Kanat of Johnson State College, drilling was performed at the top of the high and steep bank above the Jeffersonville, Vermont Elementary School to better assess the risk of potential slope failure. A monitoring cable that can indicate internal movement within the bank was installed and will be read on a periodic basis by using time-domain reflectometry recording equipment.

Hazards Funding
The State Geologist continues to obtain funds in cooperation with Vermont Emergency Management for hazard studies in cooperation with George Springston of Norwich University. Three new sources of funds were added this year. The VGS obtained a nationally competitive Pre-disaster Mitigation Grant for $92,628 from FEMA to finalize a landslide mapping protocol that will be an addendum to the State Hazard Mitigation Plan (Anne Clift supported the grant writing effort). The Agency of Natural Resources (ANR) Clean and Clear funds supports slope instability assessments in cooperation with ANR's Rivers Management section. This involves visiting failure sites associated with river corridors and co-development of realistic river corridor set backs. In 2009, The State Geologist received news that a National Earthquake Hazard Reduction Program grant of $50,600 will support a site class, amplification, and liquefaction mapping project for the Burlington area to work with critical facilities that are at risk of damage from earthquake shaking. To conduct the work, the Vermont Geological Survey plans to work in cooperation with Norwich University and Professor Mandar Dewoolkar of the Civil Engineering Department at the University of Vermont.

Respectively submitted,
Laurence R. Becker, State Geologist

ANNOUNCEMENTS

VERMONT GEOLOGICAL SOCIETY LECTURER PROGRAM

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Glacial Lake History." For scheduling information, see the Society's website at http://www.uvm.org/vtgeologicalsociety/lecturer_program.html

USGS REPORT AVAILABLE ON-LINE

Greg Walsh sends word that the following publication is available on-line only at http://pubs.usgs.gov/of/2009/1229/:

Walsh, G. J., 2009, A method for creating a three dimensional model from published geologic maps and cross sections: U.S. Geological Survey Open-File Report 2009–1229, 16 p.

VERMONT GEOLOGICAL SOCIETY CALENDAR

2/6/10	VGS Winter Meeting, Geologic Controls on River Systems in the Northeastern U.S., Norwich, Vermont
3/13-16/10	Geological Society of America Northeastern/Southeastern Combined Meeting, Baltimore, Maryland

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VERMONT GEOLOGICAL SOCIETY BALLOT

This year, Members will be voting for four Officers. Associate Members, Student Members, and Honorary Members are not eligible to vote per Society Bylaws.

All existing Officers have agreed to stand for reelection. Returning members of the Board of Directors are Richard Dunn, Les Kanat, and Jon Kim. Permanent Committee Chairs are:

Advancement of Science Committee: Jon Kim
Geological Education: Christine Massey
Membership: Stephen Howe
Public Issues: Laurence Becker
Publications/Editorial: Stephen Howe

Please enter your name and address here:

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_____

Officers

President	George Springston	_____
Vice-President	John Van Hoesen	_____
Secretary	David West	_____
Treasurer	Stephen Howe	_____

Those members voting electronically should return the Word document ballot attached to an e-mail message to Kristen Underwood at southmountain@gmavt.net. Members without access to e-mail should send their voted paper ballots to David West, Dept. of Geology, Middlebury College, Middlebury, VT 05753**. The deadline for the receipt of both electronic and paper ballots is December 3, 2009 at 5:00 PM.**

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

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Don’t forget to vote!