THE GREEN MOUNTAIN GEOLOGIST

QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

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

WINTER 2010	VOLUME 37	NUMBER 1

The Vermont Geological Society's
Winter Meeting

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

February 6, 2010, 9:30 AM
Cabot Science Building, Room 085
Norwich University, Northfield, Vermont

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ABSTRACTS

MANAGING RIVERS FOR EQUILIBRIUM *[Keynote Address]*

John Field, Field Geology Services, Farmington, ME; jfield@field-geology.com

Human land use in watersheds throughout New England has greatly altered runoff and sediment transport, particularly direct impacts to the channel caused by berming, channel straightening, and wood removal. Habitat degradation, increased bank erosion, and accelerated channel migration occurs in areas where stream power and sediment transport capacity rapidly change. Those reaches most susceptible to channel adjustment following human alteration of the stream tend to be near geological constraints such as bedrock constrictions, high banks of glacial sediments, and alluvial fans, because of the rapid decreases in stream power or increases in sediment delivery that result. Bringing back a balance, or equilibrium, to altered stream systems requires more evenly distributing sediment and stream power throughout the watershed. In the upper watersheds, adding wood to the channels by selectively felling trees in the riparian zone (i.e., chop and drop technique) can lead to greater channel complexity, narrower stream channels, and increased sediment storage. Encouraging sediment storage on the lower valley bottoms in

protected floodplain areas can create aquatic habitat and decrease downstream erosion hazards. Using restoration techniques that bring about equilibrium conditions is the best approach for sustainable watershed management throughout New England.

POST-GLACIAL EXHUMATION OF THE UPPER WINOOSKI RIVER VALLEY, CENTRAL VERMONT

George E. Springston, Department of Geology and Environmental Science, Norwich University, Northfield, VT; gsprings@norwich.edu

The landforms within an 18-mile section of the Upper Winooski River valley from East Montpelier village upstream to the Marshfield–Cabot town line preserve a record of the progressive incision of the river through a sequence of till, ice-contact deposits, lacustrine silt and clay, and lacustrine sands, which are capped in a few places by late glacial stream gravels. The lacustrine deposits formed in glacial Lake Winooski (GLW), which had a present-day shoreline elevation of about 965 feet ASL at Plainfield village. The waters of this proglacial lake were impounded by ice to the west of Montpelier and drained through Williamstown Gulf into the White River watershed. As the river cut through the deposits, it left terrace remnants along the valley walls. Many of the remnants are preserved due to bedrock outcrops in critical upstream locations that deflected the river away from the terraces and out onto softer unconsolidated deposits closer to the center of the valley. A set of these terraces is preserved in Plainfield village, with elevations of 775 feet, 740 feet, 725 feet, and 710 feet (active floodplain is about 705 feet). Total down-cutting since the drainage of GLW (as derived from four sites in study area) ranges from ~40 to 45 feet. At Plainfield village, the original lake bottom is interpreted to be the 775 foot terrace, giving a depth for GLW at this location of ~190 feet.

Two alluvial terraces within about 2 meters of present bankfull elevation contain archaeological sites with pre-settlement artifacts near the present land surface. This suggests that there was no significant post-settlement aggradation and that there has been limited streambed degradation, at least in the stream reaches upstream of Plainfield village. Downstream of Plainfield, present-day bankfull elevations are between 1 and 2 meters below the main floodplain in several locations, suggesting some recent incision. Some of this incision may be due to the breaching of a dam at East Montpelier in mid-20th century.

Analysis of maps, air photos, and orthophotos from 1873 to 2005 shows that downstream migration of bends, lateral migration of meanders, and meander cutoffs with resulting oxbows are characteristic of the high sinuosity reaches. Low sinuosity reaches commonly are those with bedrock control and/or human straightening and show little channel movement.

USING NRCS SOIL DATA TO BETTER UNDERSTAND VERMONT RIVERINE SYSTEMS

Caroline Alves, USDA Natural Resources Conservation Service, Williston, VT; Caroline.Alves@vt.usda.gov

At the macro-scale, soils maps from the Natural Resources Conservation Service (NRCS) show the extent of alluvial deposits. By combining information from various sources, such as river

corridor mapping, FEMA floodplain delineations and NRCS map-units prone to flooding, a more complete picture can be derived of the spatial distribution of fluvial systems. Standard soil survey maps, generally done at 1:20,000 scale, cannot fully depict the complex distribution of soils found within the floodplain environment. Nonetheless, soil series descriptions include generalized data on texture, percentage of rock fragments, rooting depth, drainage, etc., which have a major influence on the susceptibility of riverbanks to erosion. At the site-specific scale, University of Vermont researchers and NRCS are conducting characterization studies on alluvial soils along 5 river corridors. This will provide in-depth laboratory data on the chemical and physical characteristics of soil samples taken from the most widely distributed floodplain map-units within Vermont. The primary goal is to build a database of background or native phosphorus (P) levels in non-managed alluvial soils. Additionally, an assessment of how well the data gathered fits into the range of characteristics for a given soil series will be made. In a parallel data gathering effort, NRCS has collaborated with the VT DEC River Management Program and the Agricultural Research Service to take soil samples at riverbank locations where *in-situ* tests for shear stress and resistance to erosion have been run. It is important to develop a database of P levels in soils, derived from lab data, which covers a wide range of soil series and geographic locations. Without actual data, estimated values could lead to distorted results from sediment transport models when quantifying the contribution of P from bank erosion. Preliminary data results will be discussed along with the implications of this data gathering effort on future updates to floodplain soil maps.

USING THE AGRICULTURAL RESOURCE SERVICE NATIONAL SEDIMENTATION LAB'S BANK STABILITY AND TOE EROSION MODEL (BSTEM) TO PREDICT RATES OF STREAM BANK EROSION AND ASSOCIATED PHOSPHORUS CONTRIBUTIONS

Shayne Jaquith, Vermont DEC River Management Section, Waterbury, VT; shayne.jaquith@state.vt.us

The Missisquoi River contributes a significant amount of the phosphorus that is responsible for the nutrification of Lake Champlain. Identification of effective solutions for reducing the rate of phosphorus delivery to Lake Champlain requires an understanding of the source of the sediment-bound phosphorus found in the Missisquoi. The Vermont Department of Environmental Conservation has partnered with the USDA National Sedimentation Lab to conduct a study of bank stability along the Missisquoi and its tributaries.

The USDA Agricultural Resources Service, National Sedimentation Laboratory has developed and used in a number of studies in various regions of North America and other continents, a deterministic bank stability and toe erosion model (Simon et al., 2000) that incorporates geotechnical data from bank soils and hydrologic data to determine bank stability. During the fall of 2009, field teams comprised of staff from the National Sedimentation Lab, Vermont DEC, USDA Natural Resources Conservation Service and one post-graduate student from the University of Vermont Engineering Department collected geotechnical data from twenty sites along the banks of the Missisquoi River and four of its tributaries. These data will be used by the National Sedimentation Lab to model bank stability along the Missisquoi, predict annual sediment loading rates resulting from bank erosion and explore the use of various best management practices to mitigate erosion and facilitate long-term channel equilibrium.

FLUVIAL EROSION HAZARD ZONES FOR THE ISINGLASS RIVER, SOUTHEASTERN NEW HAMPSHIRE

Shane Csiki, New Hampshire Geological Survey, Concord, NH; Shane.Csiki@des.nh.gov

New Hampshire is undertaking the development of a fluvial geomorphology program, modeled on Vermont's approach. As part of these efforts, the New Hampshire Geological Survey recently completed a Phase 2 rapid geomorphic assessment of the Isinglass River, in southeastern New Hampshire. The results of the assessment are used to create fluvial erosion hazard (FEH) zones adjacent to river reaches, which are in part determined by the sensitivity of a reach to future erosion and channel migration. This presentation will evaluate how the final sensitivity ratings compare to known existing surficial and bedrock geology, and the processes operating on the Isinglass. A brief description of New Hampshire's efforts, including plans for future assessments, will also be presented.

POSTER ABSTRACTS

BEDROCK CONTROL ON THE COURSE OF THE OTTAUQUECHEE RIVER, WOODSTOCK, VERMONT

Peter J. Thompson, Department of Earth Sciences, University of New Hampshire, Durham, NH; pjt3@cisunix.unh.edu

The Ottauquechee River rises in Killington, Vermont, on the east slopes of the Green Mountains, and flows SSE parallel to rock layers east of the Green Mountain anticlinorium, until it reaches West Bridgewater, where it turns abruptly east. The river has cut a valley across the grain of the geology to the Bridgewater/Woodstock town line, where steep easterly dips in Ordovician bedrock give way to gentler dips in Silurian and Devonian rocks between Chester and Pomfret domes. Across the town of Woodstock, the Ottauquechee jogs alternately ESE and NE, parallel to the two dominant joint sets measured in rock outcrops within the town. Photolinears from DEM and DOQ images follow these same two directions. Two tributaries, Broad Brook and Kedron Brook, follow a NNW photolinear to meet the Ottauquechee at Woodstock village. Depth-to-bedrock data from the Vermont water well database show that a buried channel up to 120 feet deep more or less follows the same course as the modern river through Woodstock. Farther downstream the river proceeds east across the south end of the Pomfret dome to Quechee, then turns south parallel to foliation and a mafic dike through Quechee Gorge (165 feet deep), and then SE to join the Connecticut River in North Hartland.

SUNCOOK RIVER AVULSION, EPSOM, NH: ASSESSMENT OF THE PRESENT EQUILIBRIUM STATUS OF THE RIVER

Nicole Kuenzel, Department of Earth Sciences, University of New Hampshire, Durham, NH; nikki@ccom.unh.edu

A portion of the Suncook River, located in the town of Epsom in southeastern NH, underwent a major avulsion during a flood event in May of 2006. The initial avulsion event was facilitated by land-use alteration in the form of a gravel pit excavation, which allowed for floodwaters to

breach the southern end of the gravel pit and erode headward. This created a steeper gradient and the water that originally split and flowed in two channels was redirected into a single channel. Presently, the system is not in equilibrium but is adjusting toward new equilibrium conditions after having crossed a geomorphic threshold during the avulsion. The adjustments are evident as knickpoint migration upstream, continuous downcutting that is also progressing upstream, sediment accumulation downstream and subsequent channel adjustment downstream since 2007. It is uncertain how long it will take for the system to reach a state of quasi-equilibrium again, but stream stabilization is likely to eventually occur as the upstream gradients are decreased by erosion and thereby decreasing sediment supply downstream. The rate of downcutting has slowed considerably from ~5 ft/month in the summer of 2006 immediately following the avulsion to ~0.125 ft/month in the fall of 2009. In addition, there is potential for stabilization of the knickpoint due to the shallow depth to bedrock in the area, which ranges from 45 ft in alluvium south of Round Pond, 32 ft in glaciolacustrine deposits west of where the two old channels used to split and 25-35 ft in alluvium upstream from the avulsion area, as observed from wells and test-borings in the area.

USING A GENERALIZED REGRESSION NEURAL NETWORK TO CLASSIFY STREAM HABITAT CONDITION

Bree R. Mathon[1], Nikos Fytilis[1], Lori Stevens[2], Michael Kline[3], and Donna M. Rizzo[1], [1]School of Engineering, [2]Department of Biology, University of Vermont, Burlington, VT; [3]River Management Program, VT Agency of Natural Resources, Waterbury, VT

The ability to identify streams with high environmental risk is essential for a proactive adaptive watershed management approach. In efforts to describe the conditions of streams, environmental managers must gather and assess various forms of information—quantitative, qualitative and subjective. We research and develop a classification tool to identify stream habitat values based on several geomorphic and biological parameters. In the development of this work, we are using the rapid geomorphic assessment protocols (RGA), as well as the rapid habitat assessment protocols (RHA), from 1412 Vermont stream reaches assessed by the Vermont Agency of Natural Resources (VTANR).

Geomorphic and biological health information (e.g., fish density, macroinvertebrate density) is traditionally researched separately by different experts. We build upon previous work (Besaw et al., 2009) by including biological data to assess habitat conditions. We explore the relationships between the RGA and RHA. Our research focuses on the integration of fuzzy numbers to assess the uncertainty in geomorphic and biological parameters with artificial neural networks (ANNs) to classify the biological condition of the reach. GIS is used to visualize the results.

A generalized regression neural network (GRNN) (Specht, 1991) will be modified to incorporate uncertainty (assigned by experts) in RGA and biological parameter values. This GRNN architecture allows for (1) the incorporation of uncertainty that is often ignored in traditional analysis techniques, (2) is sufficiently flexible to allow for continual updates and refinements as understanding/condition of fluvial geomorphology evolves, (3) the combination of data often collected separately, and (4) the potential to save time and resources, while enabling a truly adaptive management approach using expert opinion.

QUANTIFYING SEDIMENT LOADING DUE TO STREAMBANK EROSION IN IMPAIRED AND ATTAINMENT WATERSHEDS IN CHITTENDEN COUNTY, VT

K. M. Garvey[1], L. A. Morrissey[1], D. Rizzo[2], and M. Kline[3], [1]Rubenstein School of Environment and Natural Resources, [2]School of Engineering, University of Vermont, Burlington, VT; [3]River Management Program, VT Agency of Natural Resources, Waterbury, VT

High spatial resolution digital orthophotography acquired over a 9-year period of study and detailed LiDAR elevation data were combined to quantify lateral stream channel migration over time and associated sediment loading due to streambank erosion in 15 watersheds within Chittenden County, VT. Even after conservatively accounting for differences in pixel size and registration errors, extensive channel migration was observed in all watersheds. Migration rates were compared for impaired and attainment (reference) watersheds. Erosion "hot spots" within each watershed were identified and linked to watershed and corridor stressors. Our results are preliminary but demonstrate the value of remote sensing to quantify spatial and temporal variability in fluvial geomorphic change at watershed scales and a potentially viable methodology to evaluate sediment loading to streams at subreach to watershed scales.

GEOLOGIC AND GEOMORPHIC CONTROLS ON WATER QUALITY: IMPLICATIONS FOR WATERSHED MANAGEMENT, ADDISON COUNTY, VT

Kristen Underwood, South Mountain Research & Consulting, Bristol, VT; southmountain@gmavt.net

The Addison County River Watch Collaborative and LaPlatte Watershed Partnership have collected over 12 years of water quality monitoring data in seven watersheds of the eastern Lake Champlain basin. Monitored watersheds range in size from 53 to 498 square miles and span the Champlain Valley and Northern Green Mountain geologic provinces in Addison County and southern Chittenden County, Vermont. Bedrock and surficial deposits of these watersheds both directly and indirectly influence river water quality, through their controls on precipitation patterns, hydrology, geomorphology, soil types, vegetation, and human land use. Median turbidity and total phosphorus concentrations measured during baseflow and summer storm conditions are positively correlated with percent glaciolacustrine parent materials and percent agricultural land use in the upstream watershed (and inversely correlated with percent forest cover). Observed trends highlight the importance of different watershed-management priorities for the Champlain Valley province versus the Northern Green Mountain province.

PRESIDENT'S LETTER

Rivers on my mind

In the last decade a tremendous effort has been undertaken to understand the fluvial geomorphology of Vermont and adjacent areas. This has largely been driven by the recognition by river managers that old-style engineering fixes were expensive and often not effective over the long-term. The current view among most river management specialists is that it is necessary

to understand and accommodate the dynamic stability of the river system: A "stable" stream is one that will be able to transport a given amount of water and sediment with a corresponding cross-sectional profile, planform, and longitudinal profile, without substantial aggradation or degradation of its bed. This doesn't mean the channel will stay fixed in position. Rather, migration of meander bends and shifting of channel position across a floodplain are normal events, which we interfere with at our peril. Instead, although the channel position of a stable stream may shift over a few years time, factors such as the stream gradient, width-depth ratio, and meander wavelength would tend to be relatively constant. Of course, if there are changes to the banks or riparian zone, the watershed characteristics, or the climate, the stream will tend to adjust to compensate for these changes. Much of the river management effort at present involves trying to give the stream a meander belt of sufficient width to allow for these processes to play out without undue interference with human structures and facilities—a big task!

In order to apply the new river management techniques, considerable fieldwork is required (and GIS analysis as well). According the Vermont River Management Section, there have been about 120 assessment projects in Vermont since 2003. For more information, see their website at http://www.vtwaterquality.org/rivers.htm.

The Winter Meeting of the Vermont Geological Society on February 6th will showcase some of the results of this recent renaissance in studies of our dynamic river systems. The emphasis will be on the geologic factors that influence river forms and processes. I hope that many of you will be able to come and listen to the talks, view the posters, and participate in the discussions. See you there!

Respectfully submitted,
George Springston

ANNUAL MEETING MINUTES & ELECTION RESULTS

The Vermont Geological Society did not hold an Annual Meeting during the fall of 2009, nor did the Executive Committee meet. Instead, the members of the Committee communicated with one another on several occasions by e-mail to discuss a number of issues and to plan the upcoming Winter 2010 Meeting. As mentioned in the Treasurer's report, there has been some discussion of the possibility of establishing a cap on the total amount of funds that can be awarded for research grants during each of the two semiannual rounds, while still maintaining a maximum award per grant of $700.00, based on the Society's annual income derived from membership dues, additional research grant contributions, and publications sales. The Committee expects to discuss this matter more formally following the Winter 2010 Meeting.

Since the Society would not be holding an Annual Meeting during the fall, Steve Howe suggested to the rest of the Executive Committee that the Society initiate the use of electronic ballots to supplement the traditional paper ballots included within the Fall *Green Mountain Geologist*, since members would not have an opportunity to cast their votes for the officers standing for election at a meeting. Kristen Underwood agreed to tabulate the votes cast on the electronic ballots. Kristen reported that a total of 28 valid electronic ballots were received by the

voting deadline, while Dave West reported that he received 3 valid paper ballots by the deadline. The following officers were elected for the 2009-2010 year, with the number of votes cast in favor indicated in parentheses after the candidate's name:

President	George Springston (31)
Vice-President	John Van Hoesen (30)
Secretary	Dave West (31)
Treasurer	Steve Howe (31)

Based on the success of the electronic ballot initiative, Steve will recommend that the Executive Committee vote to establish electronic balloting as the preferred method of balloting for future elections. Kristen has kindly volunteered to tabulate electronic ballots in the future.

Respectfully submitted,
Stephen S. Howe

TREASURER'S REPORT

The financial condition of the Society continues to be very strong. As of January 8, 2010, the Society's checking account balance was $5,112.35. As indicated in the Advancement of Science Committee report, three Research Grant proposals were submitted by the October 1, 2009 deadline, and these proposals were awarded a total of $1,721.00. The Executive Committee is considering the possibility of establishing a cap on the total amount of funds that can be awarded for research grants during each of the two semiannual rounds, while still maintaining a maximum award per grant of $700.00, based on the Society's annual 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: Lilly Corenthal, Middlebury, Vermont and Victor Guevara, Middlebury, Vermont.

The 2010 membership renewal and directory information form was mailed to all members before December 31, 2009. The deadline for renewal is January 31, 2010. Please help the Society keep expenses to a minimum by renewing your membership promptly. When renewing, please consider making an additional tax-deductible contribution to the Society's Research Grant Program.

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, 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

Three research grant proposals were received and funded by the Vermont Geological Society (VGS) during the fall of 2009:

Kyle Thomas Ashley, a graduate student in the Master's Program at the University of Vermont, received an award of $461.00 for his proposal entitled "TitaniQ Thermobarometry of Fabric Development in the Strafford Dome, Vermont: Linking Microstructures to Orogenic Processes."

Lilly Corenthal, an undergraduate student at Middlebury College, received an award of $700.00 for her proposal entitled "Identifying the Source of Arsenic in Three Public Water Supplies in North-Central Vermont: Potential Contribution of Ultramafic-derived Arsenic."

Victor Guevara, an undergraduate student at Middlebury College, received an award of $560.00 for his proposal entitled "A Geochemical and Petrographic Study of the Echo Pluton, VT."

As a condition for receiving this grant money, the Vermont Geological Society expects that the results of these studies will be presented at a future VGS spring student meeting or a professional meeting. We also anticipate upcoming presentations by Lauren Chrapowitzky and Halen Earle, both from the University of Vermont, who received VGS research grants during the spring of 2009.

Respectfully submitted,
Jon Kim, Chair

VERMONT STATE GEOLOGIST'S REPORT

Joint Northeastern–Southeastern Section Mtg., Geological Society of America, March 14-16, 2010
If you can make the trip to Baltimore this year for the combined Northeastern and Southeastern Section Meeting of the Geological Society of America, please join us for an exciting symposium entitled *The New Bedrock Geologic Map of Vermont: New Answers, New Problems, and New Uses of Bedrock Geologic Data*, chaired by Nicholas M. Ratcliffe, U.S. Geological Survey; Marjorie Gale, Vermont Geological Survey; and Peter Thompson, University of New Hampshire.

The forthcoming bedrock geologic map of Vermont represents a 20-year effort by numerous geologists from federal, state, and academic institutions. This symposium will focus on new aspects and questions associated with the geology of Vermont. Following an introduction by State Geologist Laurence Becker and USGS Program Director Peter Lyttle, Nick Ratcliffe will present an overview of the new map. The Sunday morning session on March 14th begins 15 minutes early and the poster session will be held in the afternoon. The map will be on display at the entrance to the poster session.

List of talks:
Introduction to the New 1:100,000 Bedrock Geologic Map of Vermont, by Ratcliffe

U-Pb Geochronology Studies in Vermont, by Aleinikoff, Ratcliffe, and Walsh

New Bedrock Map and Cross-Sections of Vermont: Structural and Stratigraphic Constraints for Northern Vermont, by Gale and Thompson

Along-Strike Changes in Depositional Facies and Structural Style as Portrayed on the Bedrock Map of Vermont, by Thompson and Gale

The Connecticut Valley–Gaspe Trough in Vermont, by Walsh, McWilliams, Ratcliffe, Aleinikoff, Thompson, Gale, and Rankin

The Bronson Hill Arch, Upper Connecticut Valley, North of 43º 52.5', by Rankin and Tucker

Tectonic Evolution of The Rowe–Hawley Belt In Central And Northern Vermont, by Kim, Gale, Coish and Laird

The Origin of The Moretown Formation, Vermont—An Alternative Perspective From The Southern Québec Appalachians, by DeSouza and Tremblay

Conodonts—Useful But Underused Tools For Deciphering Geology In Vermont, by Repetski, Ratcliffe, Walsh, Thompson, Thompson, and Harris

Creation of The Bedrock Geologic Map Of Vermont—An Evolution From Analog To Digital Mapping Techniques by Walsh, Ratcliffe, Masonic, Gale, Thompson, and Becker

Vermont Applied Projects as a Guide for Use of the New State Bedrock Map, by Becker, Gale, Kim, Thompsons, Springston, Eliassen, and Walsh

List of posters:
Contrasting Origins of Mafic Rocks in the Rowe–Hawley Belt of Vermont: Evidence from Geochemistry, by Coish, Kim, Gale, and Laird

Variations in Slaty Cleavage and Stretching Lineation Orientation in the Taconic Allochthon, Vermont and New York, by Mirakian, Drennan, Thorne, Feder, and Crespi

C. H. Hitchcock's 1877-78 Geologic Maps of New Hampshire, Vermont and Western Maine: His First Relief Map Restored, by Bothner, Batchelder, Lecain, King, and Thompson

Comparison of Ductile Structures across the Hinesburg and Champlain Thrust Faults in NW Vermont by, Earle, Kim, and Klepeis

New Data Available as Geodatabases
New data available for download as geodatabase files are posted on our website. The data includes bedrock and/or surficial and groundwater resource data for the following areas: Burlington, Brandon, Charlotte, Colchester, Dorset, Hinesburg, Londonderry, Lowell Mtns., Manchester, Rutland, Wallingford, Williston, and Woodstock.

Respectfully submitted,
Laurence R. Becker, State Geologist

CALL FOR STUDENT ABSTRACTS

SPRING MEETING OF THE VERMONT GEOLOGICAL SOCIETY

The Vermont Geological Society has tentatively scheduled to hold its Spring 2010 Meeting on Saturday, April 24, 2010, in Bicentennial Hall at Middlebury College, Middlebury, Vermont, but the date and location are subject to change. 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 5, 2010 at noon

ANNOUNCEMENTS

STUDENT RESEARCH GRANT APPLICATIONS DUE APRIL 1, 2010

Students and secondary school teachers are encouraged to apply to the VGS Research Grant Program by April 1, 2010. 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.

SUMMER FIELD TRIP

This is a preliminary announcement that Jon Kim and George Springston expect to lead a field trip for the Vermont Geological Society entitled "Bedrock Control on Surficial Deposits and Groundwater Issues in Part of the Knox Mountain Granite Pluton, Central Vermont" next summer. Details will be announced as summer approaches.

VERMONT GEOLOGICAL SOCIETY CALENDAR

February 6:	Winter Meeting, Cabot Science Building, Norwich University
March 14-16:	Joint Northeastern and Southeastern Section Meeting, Geological Society of America, Baltimore, Maryland
April 1:	Student Research Grant Program applications due
April 5:	Student abstracts for Spring Meeting due
April 5:	Executive Committee reports due
April 24:	Spring Meeting, Bicentennial Hall, Middlebury College

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

Officers

President	George Springston	(802) 485-2734	gsprings@norwich.edu
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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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ADDRESS CHANGE?
Please send it to the Treasurer at the above address

Vermont Geological Society
Winter Meeting
February 6, 2010, 9:30 AM
Cabot Science Building, Room 085
Norwich University, Northfield, Vermont

Directions to Norwich University:

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