THE GREEN MOUNTAIN GEOLOGIST
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DEPARTMENT OF GEOLOGY
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THE GREEN MOUNTAIN GEOLOGIST

QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

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WINTER 2004 VOLUME 31 NUMBER 1

The Vermont Geological Society's Winter Meeting

February 7, 2004, 8:30 AM at Norwich University

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Norwich University, Northfield, Vermont

February 7, 2004

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ABSTRACTS

TECTONIC DISMEMBERMENT OF THE ELBA IGNEOUS COMPLEX, ITALY

David S. Westerman, Geology Department, Norwich University, Northfield, VT 05663

In two separate areas of western and central Elba Island (Italy), late Miocene granite porphyries that were produced during post-collisional extension of the internal part of the Apennine orogenic belt, occur as shallow-level intrusions inside a stack of nappes rich in physical discontinuities. Detailed mapping of these intrusive rocks, along with their relations with country rocks, show that outcrops from western and central Elba Island expose the same rock types, with matching intrusive sequence, petrography and geochemical features. The sequence includes multiple, shallow-level porphyritic laccoliths, a major pluton, and a final dyke swarm, all within the span from about 8 to 6.8 Ma. Several distinct magma sources, in both the crust and mantle, have been identified as contributing to the Elba magmatism as it evolved from crust-, to hybrid-, to mantle-dominated. Structural and geological data indicate that these layers were originally part of a single sequence that was split by eastward-directed décollement and tilting. The two juxtaposed portions of the original sequence allow the restoration of a 5 km thick sequence, made up of nine main intrusive layers that formed three Christmas-tree laccoliths nested into each other to support a structural dome. The laccolith layers, ranging in thickness from 50 to 700 m and in diameter from 1.6 to 10 km, were emplaced at depths between 1.9 and 3.7 km by exploiting physical

discontinuities that served as crustal magma traps. During their construction, the role of the neutral buoyancy level was of minor significance with respect to the role played by the relatively thin overburden and/or the large availability of magma traps inside the intruded crustal section. Emplacement of the Monte Capanne pluton into the base of the domal structure likely caused oversteepening and initiated decapitation of the complex with gravity sliding of the upper half off the top.

TEMPORAL EVOLUTION OF THE NORUMBEGA FAULT SYSTEM IN MAINE: REVIEWING THE EVIDENCE FOR MIDDLE DEVONIAN – LATE CRETACEOUS MOVEMENT

David P. West, Jr., Department of Geology, Middlebury College, Middlebury, VT 05753 dwest@middlebury.edu

The Norumbega fault system, located along the eastern margin of the northern Appalachians, has been recognized as one of the most extensive and longest-lived structural features in the entire Appalachian orogenic belt. The orogen-parallel fault system extends continuously for a minimum of 450 km along strike and consists of numerous subparallel faults and shear zones that record a complex polyphase history of movement. As to be expected with such a complex structure, controversies have raged concerning the amount and nature of displacement, the timing and duration of this displacement, and whether the fault system ever served as a significant terrane boundary. The purpose of this abstract and talk is to review the timing of movement along the Norumbega fault system – which now appears to have spanned nearly 300 million years.

Earlier structural, petrologic and geochronologic work suggests that the Norumbega initiated as a right-lateral strike-slip fault system in Middle Devonian time (~ 380 Ma) during the waning stages of the Acadian orogeny. Evidence suggests that dominantly right-lateral displacements continued along portions of the system into Early Permian time during a protracted period of post-Acadian exhumation. However, significant (km scale) displacements along the Norumbega fault system did not stop with the end of the Paleozoic. Thermochronological (40Ar/39Ar mineral ages and apatite fission track ages) data from across the Norumbega fault system in the Casco Bay region of Maine reveal significant dip-slip displacements in the Mesozoic. Somewhat shockingly, apatite fission track ages from this region have revealed a significant Cretaceous time-temperature discontinuity across the structure and strongly suggest this portion of the structure accommodated km-scale movement in Late Cretaceous time (~ 80 Ma). While the region does not appear to be seismically active, portions of the Norumbega fault system have been active for hundreds of millions of years and suggests that the structure represents a fundamental zone of crustal weakness.

GEOLOGIC EVOLUTION OF DELTA-ALLUVIAL PLAIN SETTINGS AND ASSOCIATED PHOENICIAN HARBOR SITES OF PORTUGAL

Richard K. Dunn, Department of Geology, Norwich University, Northfield, VT 05663

Geologic coring, ground penetrating radar and electromagnetic induction surveys were employed to investigate three Phoenician sites in Portugal. The goal was to reconstruct the late Holocene evolution of the coastal, delta and alluvial plain settings, and to determine probable sites of Phoenician harbors and the preservation potential of buried shipwrecks and harbor facilities. Today, the Phoenician sites are as much as 35 km from the sea, but cores reveal that all three sites were formerly situated on coastlines fronted by open marine water. The sea-going Phoenicians, in the search for wood and metals(?), penetrated tens of kilometers into the interior of Portugal by accessing extensive marine embayments. At all three sites, core and geophysical data reveal likely Phoenician harbors buried below 1-4 meters of paralic and alluvial sediment and urban buildup. Former Phoenician harbor settings are generally amenable to archaeological excavation because burial is relatively shallow and preservation potential within the delta-alluvial plain sediments is moderate to high. Preliminary results suggest that the delta-alluvial plain systems of Portugal evolved as a function of the late Holocene slowing in the rate of relative sea-level rise, and a massive sediment influx to marine embayments related to land use practices of antiquity.

NITRATE CONTAMINATION OF BEDROCK WELLS IN EAST MONTPELIER, VERMONT

Jonathan Kim, Vermont Geological Survey, 103 S. Main St., Waterbury, Vt 05671, Sarah King, 344 Gully Hill Rd., Starksboro, Vt 05487, and Jeff

Comstock, Food + Markets Division, Vermont Dept. of Agriculture, Montpelier, Vt 05602

In 2000, routine Vermont Dept. of Agriculture testing of domestic wells in the vicinity of a large dairy farm in East Montpelier identified a grouping of bedrock wells with nitrate levels above the EPA MCL of 10 ppm. These wells were sampled as part of a routine testing program for ground water quality around large farms. Some wells also had positive detections of herbicides (<EPA MCL).

The nitrate problem has persisted in the same bedrock wells through two+ consecutive years of quarterly testing. The primary concern of the affected landowners is that the application of liquid manure/fertilizer to neighboring fields is the source of the nitrate in ground water. Although the fields in the vicinity of the contaminated wells are a likely source of the nitrate contamination, there are other possible nitrate sources that include a nearby ravine and local septic systems.

A preliminary analysis of the nitrate data for the bedrock wells in the large dairy farm vicinity revealed considerable short-term fluctuation of nitrate levels that appear to be related to significant snowmelt or precipitation events; these events may be nearly coincident with manure/fertilizer spreading events. Elevated nitrate levels have remained high and relatively stable on a biannual basis in spite of changes in the nutrient application practice.

The East Montpelier study area is located within the interbedded crystalline limestones and phyllites of the Waits River Fm. Dissolution of the crystalline limestone by ground water can generate significant secondary porosity. The weathered porous "limestone" could serve as a sink for nitrate-bearing groundwater. NNE trending moderately westward-dipping bedding/foliation is presumed to constrain ground water flow within the Waits River Fm bedrock. Although east-west trending nearly vertical fractures are dominant in frequency, the lack of nitrate contamination in wells to the east and west of the problem area suggests limited groundwater transport along these surfaces.

A comprehensive study of the East Montpelier nitrate problem is being planned for the spring and summer of 2004 with EPA funding. This six month long study will include the installation of monitor wells, borehole camera surveys, nitrate geochemistry, major and trace element ground water geochemistry, nitrogen and oxygen isotopic studies, CFC ground water dating, and a fluorescent tracer study.

SPECIATION AND FATE OF ATMOSPHERICALLY DEPOSITED PB IN MONTANE FOREST SOILS WITH ISOTOPES AND X-RAY ABSORPTION SPECTROSCOPY

Benjamin C. Bostick, James M. Kaste, Andrew J. Friedland and Stefan Stürup, Dartmouth College, Department of Earth Sciences, Hinman Box 6105-Fairchild Hall, Hanover, NH 03755

Fossil fuel combustion during the 20th century deposited of 1 to 4 g of lead (Pb) per square meter in otherwise pristine forests of the northeastern United States. Despite its widespread dispersal and potential toxicity, the processes that control the fate and bioavailability of Pb and other heavy metals in watersheds remain unclear. Here we trace the transport and speciation of atmospheric Pb in forest soils using Pb isotopic analyses and X-ray absorption spectroscopy. We sampled the organic and upper mineral soil horizons of two soil profiles from Camels Hump Mountain in Vermont: in the low elevation deciduous forest (600 m) and in the higher elevation coniferous forest (1200 m). Lead originating from the combustion of leaded-gasoline is strongly retained within the forest floor; it has penetrated 20 cm or less in both deciduous and coniferous forest soils, where total soil thickness is on the order of 60 cm. The forest floor retains atmospherically deposited Pb on timescales of 60 to 150 years, depending on forest zone. Lead extracted from forest floor samples with rinses of de-ionized water is associated with organic carbon, suggesting that the movement of colloidal phases dominate Pb transport. X-ray absorption spectroscopy reveals that Pb speciation changes with depth, foring a variety of complexes with soil organic matter and PbS colloids in more highly decomposed organic matter. Thus, Pb retention and speciation is linked to the cycling of organic carbon in these soils.

MEASURING RATES OF INCISION IN VERMONT RIVERS

Lori Barg, Step by Step Community Environmental Monitoring, 113 Bartlett Road, Plainfield, Vermont 05667, loribarg@together.net

The Vermont Geological Survey has been supporting field work on fluvial geomorphology and surficial geology to examine lateral and vertical

migration of river channels. Rapid stream incision and lateral migration can have major economic and environmental consequences. Lateral channel migration can be measured by overlaying maps and orthophotos or digging trenches perpendicular to rivers to expose the surficial deposits (Thomas, 2002). However, the rates of channel incision are more difficult to determine. Sources of information to determine historic rates of channel incision are scarce. Sources of data include historic documents such as: engineering surveys for railroads and bridges, historic photos and the bridges themselves (exposed footings and dates on bridges). Other clues can be found in the relationship of abandoned terraces to the stream and the age of the trees on the adjacent terraces and berms. Another source of information is from Carbon 14 dating of organic material taken from the river banks (on the Third Branch of the White River, and Ayers Brook) in Randolph. Rates of incision can be speeded up through the initiation of headcuts from gravel mining, channelization, breaching of dams, channel avulsions (increase in slope), increased runoff due to land use change and other factors. There is a general lack of data to determine rates of incision. The study of the processes and data from some watersheds may help determine rates of incision on others. This talk will hopefully get geologists motivated to look for clues in the landscape and existing data sources to determine rates of vertical incision.

Thomas, Peter A. 2002. The Evolving Alluvial Landscape In Vermont Consequences Of Nineteenth-Century Land-Clearing and Techniques For Identifying Historic Alluvial Sequences. Published For Vermont Geological Survey Field Trip.

SURFICIAL GEOLOGY OF A RECENT LANDSLIDE ON THE MAD RIVER IN WAITSFIELD, VERMONT

George E. Springston and Nathan P. Donahue, Geology Department, Norwich Univ., Northfield, VT 05663, and Shayne Jaquith, Rivers Management Section Vermont Department of Environmental Conservation, Waterbury, VT 05671

On or about 16 and 23 May, 2003, movement occurred on a landslide on the S side of the Mad River, immediately west of the confluence with High Bridge Brook and about 450 m ESE of the village of Waitsfield (UTM Zone 18, 674250 mE, 4894900 mN). The slide is 43 m wide (parallel to the river), 76 m long, 22 m high, and has an overall slope of 15.5°. Over 4000 m^3 of material slid towards the river, with at least several hundred cubic

meters of material being carried away as sediment. Turbidity resulting from these events extended at least as far downstream as Waterbury.

The material composing the slide is derived from a terrace composed of lacustrine sediments deposited in glacial Lake Winooski (GLW) with a cap of fluvial gravel. The base of the section consists of 9.1 m of deformed, varved silt and silty clay overlain by 12.2 m of fine sand and silty fine sand with layers of massive silty clay that appear to have been emplaced as subaqueous flows. Ball-and-pillow structures and rip-ups of silty clay are common. The top of the section consists of 0.7 – 1.2 m of planar and trough-crossbedded pebbly medium sand with some cobbles. This may be part of an alluvial fan formed by High Bridge Brook after the lowering of GLW. The terrace top is at about 225 m asl (740 ft), well below the elevation of GLW in this area (about 293 m asl, 960 ft). At about 211 m asl (694 ft), a bench in the slope has been partly exhumed by the western flank of the landslide, exposing a rooted tree trunk and sapling that have trunks tilted to the north and are surrounded by a deposit of silty fine sand and massive silty clay. We interpret this deposit to be from a paleo-landslide. The sapling has been dated as 5430 ± 50 ^{14}C years BP (^{13}C corrected). It appears that by this date the river had cut down to some- where below 211 m asl and was eroding a cut bank at the site. Subsequent to this episode the river migrated laterally away from the bank, leaving behind floodplain terraces as it has cut down to about 204 m asl (670 ft). The river is now impinging on the bank again, causing a fresh landslide.

The slide is a complex, rotational earth slide and earth flow. Although no lower bounding surface is exposed, the tilting of top surfaces on blocks in the upper part of the slide and the orientation of slickenlines on the flanks indicate a concave-upward failure surface. The foot of the slide consists of a chaotic jumble of medium sand and silty clay in irregular lenses. Scattered across the surface of the slide are several large blocks consisting of entire rooted trees and attached blocks of soil. Some have been translated over 30 m down the slide. Repeat measurements from monitoring stakes indicate no substantial enlargement since late May. However, several large trees are poised to fall and take blocks of soil with them. The principal internal change has been the formation of a central alluvial fan that is fed by the erosion of loose material from the upper parts.

The landslide has resulted in encroachment of the toe into the river channel: the thalweg was forced northward and the bankfull cross-sectional area was

reduced from about 54 m^2 to 23 m^2. The river has eroded back the toe at least 10 m since measurements began on May 28 and the cross sectional area at bankfull has increased to at least 45 m^2. An examination of earlier reports and imagery indicates that sliding has been in progress at this site for several years. An orthophoto from 1995 shows hints of the slide, but no indications of sliding are visible on 1974 and 1962 photos.

HYDROLOGY AND WATER QUALITY DYNAMICS IN VERMONT'S MOUNTAIN LANDSCAPE: COMPARISON OF A DEVELOPED AND FORESTED WATERSHED

Beverley Wemple, Dept. of Geography, University of Vermont, Burlington, VT 05405, and Jamie Shanley, U.S. Geological Survey, Montpelier, VT 05602

High elevation, forested watersheds are particularly vulnerable to stresses from development. Steep slopes and thin soils rapidly transmit water, nutrients and sediment when disturbed by logging, road construction or other activities associated with development. The effects of forest harvesting practices on streamflow and water quality in high-elevation, forested watersheds have been well studied and provide relevant information about the susceptibility of these ecosystems to anthropogenic disturbance. Few studies have directly addressed the hydrologic or water quality effects of ski resort development on mountain streams, and these studies draw almost entirely from western U.S. examples. Here, we report preliminary findings of a recently initiated paired-watershed study to examine the effects of alpine ski area development on water quantity and quality. Our study area is located on the eastern slope of Mt. Mansfield, Vermont, and includes the basins of Ranch Brook (9.6 km^2) and West Branch (11.7 km^2). Ranch Brook is undeveloped, except for a network of cross-country ski trails and unsurfaced access roads, and serves as our control watershed. West Branch encompasses nearly an entire major ski resort, with an extensive network of alpine ski lifts and trails, day lodges, snowmaking facilities, and vacation homes. Our preliminary analysis indicates distinct differences in runoff and water quality between the two basins. Differences in basin hydrographs suggest that ski trails alter the timing and magnitude of runoff, particularly during spring snowmelt. Elevated concentrations of total suspended solids in West Branch streamwater suggest that exposed surfaces (trails, parking lots) may be

important sources of sediment in the ski resort basin. Streamwater chemistry at West Branch also indicates contamination by deicing salts. These findings provide important baseline information for ski area management in the eastern U.S., where field studies have been sparse.

THE *LANDSCAPE CHANGE PROGRAM*: A COMMUNITY DIGITAL ARCHIVE OF VERMONT LANDSCAPE IMAGERY

BIERMAN, P., MASSEY, C., and HILKE, J., Geology Department, University of Vermont, Burlington, VT 05405 glcp@uvm.edu

Have you or your students ever wondered what Vermont looked like 100 years ago? Were there floods, landslides, or mines in your community? Were there forests on the hillslopes of your town or were those slopes clear-cut and barren?

The *Landscape Change Program* is a growing, web-based collection of Vermont landscape imagery hosted at the University of Vermont. We currently hold over 1500 digital images collected from libraries, historical societies, and private collections. All images are accessible from the project web site (uvm.edu/perkins/landscape) via either text or graphical search engines. The newly redesigned web site allows anyone to contribute images to the archive along with modern re-shots of historical scenes as well descriptions of the images and of the physical landscape-change evidence they contain. We have used the site with equal success in University as well as high school classrooms. The web site includes lesson plans based on Vermont state standards. Consider using the site in your classes either as a resource or as a tool to catalyze student learning in a place-based context.

Analysis of the image database suggests that reforestation is the major physical landscape change in Vermont over the past century. Barren slopes are dotted with landslides and gullies, the result of diminished effective cohesion as tree roots rotted away or were removed after clear cutting. Floods, and the landscape change they cause, are well represented, especially the flood of record in Vermont, 1927. We have fewer images of mining and excavation but the database includes photographs of engineering geology interest including land filling, road building, and slope stabilization.

We are actively soliciting image contributions to increase the size and diversity of the archive. If you hold historic images of Vermont landscapes, please consider uploading them. We can supply scanners, computers, digital cameras, and GPS units to assist in photo collection. In some cases, our staff can do the scanning, image documentation, and uploading with you. Please contact us at the email address above if you are interested in working with the program.

PRESIDENT'S LETTER

Dear Members:
Let me begin by extending a big thank you to Helen Mango for her stewardship of the VGS for the past year. I would also like to thank Marjorie Gale, and Stephen Wright before her, for their efforts in the editing and timely printing of the Green Mountain Geologist. Beginning with this issue, the GMG is now printed at Middlebury College under the editorial eye of Dave West, secretary of VGS. Thanks Dave and congratulations on your positive tenure decision! The other members of this year's VGS executive committee are Rick Dunn as vice president, Steve Howe as treasurer, and Helen Mango, Ray Coish, and Shelly Snyder on the Board of Directors.

After a successful fall field trip during which we examined Barrovian metamorphic rocks in the vicinity of the Pomfret dome, members of the executive committee met to discuss the agenda and business for VGS for the upcoming year. Several significant items of business were discussed during this meeting. The executive committee voted to extend the fall research grant deadline and this resulted in a significant increase in the number of grant applications. Please see the report by the Advancement of Science Committee in this issue for more information. Remember that the next deadline for research grant applications is April 1. The executive committee also discussed the idea of establishing funds for two different speaker programs. One of the programs involves creating a small honorarium for a local geologist to make a research presentation at approximately three colleges/universities during the course of an academic year. The other speaker program would involve providing funds for a speaker to make a presentation or conduct a workshop either during a scheduled VGS meeting or at another time that is open and accessible to

members of the VGS. The details of both of these programs have yet to be worked out but any input or comments would be most welcome. Please send them to grovert@castleton.edu

I was also wondering if there was interest in the society to get more involved in public outreach. This could be an excellent opportunity to promote our science. Marjorie Gale, who has been involved with Earth Science Week for a number of years, reports that the society's involvement in the most recent Earth Science Week was minimal. We should consider a greater level of participation in this event in the future. Another method of public outreach would be the development of a collection of field trips or geological sites of interest for K-12 education or the general public. Many of us have field trips guides in various states of completion. If these were collated into a single volume and/or made available on a web page it would make a useful resource for our community. If you have any interest or suggestions regarding public outreach and the VGS please let me know.

I am looking forward to the upcoming year and would welcome any help, suggestions, or comment you may have. Thanks and I hope to see you at the February meeting.

Happy Trails,
Tim Grover

ANNUAL MEETING MINUTES

Saturday, October 25, 2003 in Quechee, Vermont

The annual meeting followed an outstanding field trip led by Tim Grover of Castleton State College. The trip focused on the bedrock geology of the Pomfret Dome in east-central Vermont. Trip participants saw examples of the Connecticut Valley-Gaspe Synclinorium stratigraphy (Waits River, Standing Pond and Gile Mountain Formations) in east-central Vermont and spectacular examples of small-scale structures and regional metamorphism in the region. Tim also provided participants with a multi-page field trip guide, complete with colored maps and photomicrographs (please contact Tim if you are interested in a copy).

The formal portion of the executive committee meeting was called to order by President Helen Mango. The first order of business for the committee

was to thank Tim for his hard work in preparing and leading the field trip. This was followed by the election of the following new officers to the Executive Committee:

Tim Grover - President
Rick Dunn - Vice President
Dave West - Secretary
Steve Howe - Treasurer
Ray Coish - Board Member
Shelly Snyder - Board Member
Helen Mango - Board Member

The committee voted to extend the application deadline for Student Research Grants to Friday, November 14, 2003. This was done because no applications had been received by the October 1st deadline and recently there had been several enquiries about the availability of funds and whether the deadline could be extended. The committee discussed the possibility of starting an informal "Distinguished VGS Lecturer(s) Series" in an effort to promote geological research and awareness around the state. The program would involve 2 or 3 people traveling to small geology/natural science departments around the state and giving introductory level research talks. It was suggested that VGS could pay for speaker travel expenses and perhaps even a small honorarium. In addition, the committee also discussed the possibility of bringing in a "Keynote-type Speaker" at future VGS Winter and/or Spring meetings in the hopes of increasing attendance and interest. The committee decided both of these items should be explored in the coming months and discussed further at the Winter Meeting.

The committee tentatively set the Winter 2004 meeting for Saturday, February 7th at Norwich University and the Spring 2004 meeting for Saturday, April 24 at Middlebury College.

The Executive Committee acknowledged the outstanding service of outgoing President Helen Mango over the last year. The meeting was adjourned.

Respectfully submitted,
Dave West, Secretary

STATE GEOLOGIST'S REPORT

The Vermont Geological Survey continues to deliver new geologic maps and plan for future mapping projects. The following are some recent activities:

Geologic Maps Delivered – Base For Applied Purposes

On October 10, the Vermont Geological Survey delivered two major projects under the Vermont Survey's STATEMAP grant for FY2002. The projects in the Mad River Watershed and the Montpelier quadrangle employed detailed surficial and bedrock geologic mapping integrated with additional data to address slope instability issues, radionuclides in groundwater, and nitrates in fractured bedrock. The delivered products included basic geologic maps in paper and digital format, water well databases, a technical report, and derivative hazard maps. The derivative hazard maps created help Vermonters understand the connection between geology, human health and safety, and landscape development. Geologic maps are used for development of groundwater supplies, seismic hazard assessment, slope instability assessment, sand and gravel resources, and general land use planning. The maps will be released as open file reports in 2004.

Bedrock geologic mapping in the Montpelier, Vermont quadrangle was conducted during 2002-2003 by Jonathan Kim, Marjorie Gale and Sarah King, with 2 field assistants supported by the Association of American State Geologists Mentored Student Program. In 2002, Kim, King and Scott Rowe conducted gamma ray spectrometer surveys and a detailed study of fractures and nitrates near a large farm. Field work in the Mad River Watershed was conducted by George Springston, Rick Dunn and Nathan Donahue of Norwich University, Lori Barg, and field assistants during 2002-2003. The relationship between surficial materials and fluvial geomorphology was used to identify areas susceptible to erosion and slope failure.

Geologic Map Advisory Committee

On November 5, the Division submitted an application to the competitive USGS STATEMAP program to fund three new mapping projects. Prior to making the application, 10 members of the STATEMAP Advisory

Committee (SMAC) met on October 21 to help set mapping priorities and make comment on the Long Range Mapping Plan. The committee paid special attention to Act 133 of the 2002 Legislative Session requiring the Secretary of the Agency of Natural Resources to submit a report on the status of groundwater and aquifer mapping in the State of Vermont. The SMAC agreed to re-focus the Long Range Plan to increase emphasis on comprehensive understanding of geologic systems to address groundwater issues, geologic hazards, and resources. Knowledge of surficial and bedrock geology as a system is required. Previous focus on naturally-occurring radionuclides now fits under the overall ground water emphasis.

Bedrock Studies for Well Yield and Source Protection

The State Geologist and Marjorie Gale of VGS attended a New England Interstate Water Pollution Control Commission workshop in Lowell, Mass. on bedrock geology as it relates to the probabilities of finding higher yield wells, the influence of surficial geology on the bedrock aquifer and defining the size and shape of well head protection areas with geology in mind. In addition to presentations by USGS and the State of Maine, Steve Mabee-the Massachusetts State Geologist discussed future bedrock and surficial mapping projects and how the data will be presented to advance the understanding of yield potential and groundwater protection in Massachusetts.

Fluvial Geomorphology Data for Regional Planning Commissions – Review

As part of Geology's long-standing cooperation with the Rivers Management Section (RMS) in the Department of Environmental Conservation, the Vermont Geological Survey is reviewing a document that is intended for distribution to Regional Planning Commissions. The Fluvial Erosion Hazard Risk Assessment and Mapping Methodology is part of the document that will be distributed by RMS to Regional Planning Commissions. Geology will be testing this methodology (this winter) by drafting prototype maps based on watershed data collected through Geology funded projects that included both fluvial geomorphology data collection and surficial geologic mapping. The prototype erosion potential maps (in cooperation with Norwich University) will include both the fluvial hazard information and the slope instability/landslide data derived from the surficial geologic mapping.

Hardwick Landslide above Route 15

The Vermont Survey and George Springston of Norwich University are advising the Vermont Agency of Transportation on the geology of a landslide that began on November 6, 2003 and threatens Route 15 just east of the Hardwick village center. A delivered report includes a site description, site history, discussions of landslide triggers, hazards posed by the slide to residents and the highway below and suggests further work to better define the risks.

EDMAP

The State Geologist represents the Association of American State Geologists on the National EDMAP review panel. EDMAP is a grant program that supports geologic mapping for undergraduate, Masters and PHD students. Sixty-one proposals were reviewed in Reston, Virginia during the first week in January. Proposals are judged on their scientific merit as well as their application to societal issues. It is hoped that this grant program will help support the next generation of field geologists.

Respectfully submitted,
Laurence R. Becker, State Geologist, Vermont Geological Survey, 103 South Maine Street, Waterbury, VT 05671

ADVANCEMENT OF SCIENCE COMMITTEE REPORT

The Committee has been busy with two projects since its last report, soliciting abstracts for the Winter Meeting and reviewing applications to the Research Grant Program.

The Winter Meeting is shaping up to be an exciting one, with several new speakers presenting talks on topics outside of those typically discussed at our meeting.

Six applications to the Research Grant Program from students at Middlebury College, the University of Vermont, Dartmouth College, and Skidmore College were received by the extended deadline of November 14,

2003, making this the most competitive round in recent memory. The Committee awarded a total of $1,563.00 in this round, a significant increase over past awards, made possible by the generosity of a number of VGS members. The Treasurer anticipates that a sizeable award will be available to applicants in the next round ending April 1, 2004, though probably not as high as the level of the latest round.

Respectfully submitted,
Stephen S. Howe, Chair

TREASURER'S REPORT

The financial condition of the Society continues to be very strong. As of January 19, 2004, the Society's checking account balance was $4,671.58. As indicated in the Advancement of Science Committee report, a total of $1,563.00 was awarded to applicants to the Research Grant Program, and these funds have been mailed to the successful students. To my knowledge, there are no outstanding bills.

The 2004 membership renewal and directory information form was mailed to all members before December 31, 2003. The deadline for renewal is January 31, 2004. Many members have already returned their forms with their payments, including a number of additional contributions to the Research Grant Program, but there are still quite a few members who have not yet returned their forms. Please help the Society keep expenses to a minimum by renewing your membership promptly.

Respectfully submitted,
Stephen S. Howe, Treasurer

EARTH SCIENCE WEEK 2003

The week of October 1218, 2003 was the sixth annual national celebration of Earth Science Week. The Vermont Geological Society has participated in Earth Science Week since its inception in 1998. Governor Douglas issued the 2003 Earth Science Week Proclamation (posted at

http://www.anr.state.vt.us/dec/geo/Esproc03.htm on the Vermont Geological Survey web site).

This year, the Society and the Vermont Geological Survey focused on hosting and staffing Geologists-in-the-Parks. 150 students and chaperones visited Mt. Philo, Owl's Head in Groton, and Little River. We did not advertise the program this year, so most participants were repeat visitors. We also only held the program on one day, making it much more manageable. Thanks to Lori Barg, Craig Heindel, Rob Farley, Jon Kim, Kent Koptiuch, Marjorie Gale, and George Springston for leading field trips. If any members are interested in volunteering next year, please let us know.

OMYA, Inc. hosted another very successful Quarry Open House. 500 people attended OMYA's third annual Open House at the Middlebury Quarry. Many thanks to OMYA for participating and special thanks to Alice Blount, Shannon Foster, Ruth Gibbud and Andy McIntosh. For photographs and information, visit OMYA's web site at http://www.omya-na.com/pr010504.htm. The fourth annual Open House is scheduled for October 16, 2004.

The Perkins Geology Museum at UVM was not able to participate in Earth Science Week 2003. The annual Earth Science Week Poster Contest previously organized through the museum is fun and popular with students and teachers statewide. We hope that the poster contest will be continued, but do need an organization to sponsor it, display the student posters, and hold the awards ceremony.

Karen Busshart and Tom Benoit from the Mercury Program at Vermont DEC served as guest speakers. Several university seminar talks (UVM & Middlebury) and special museum exhibits (Montshire Museum and the new ECHO Center) coincided with Earth Science Week. The American Geological Institute hosted several national art and photography contests.

Please contact us if you would like to organize or host an event in 2004.

Thanks to everyone who worked to make Earth Science week successful.

Respectfully submitted,
Marjorie Gale and Christine Massey, ES Week Coordinators

CALL FOR ABSTRACTS

SPRING MEETING OF THE VERMONT GEOLOGICAL SOCIETY
SATURDAY, APRIL 24, 2004, 8:30 A.M.

The Vermont Geological Society will hold its Spring 2004 meeting in Bicentennial Hall room 220 at Middlebury College in Middlebury, VT. 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 outstanding undergraduate paper will be presented. A cash award for "Best Paper and/or 2nd place" will also be presented based on quality of the research, the abstract, and the presentation of the paper, including abstract content and style, presentation clarity and thoroughness, and the student's mastery of the subject matter.

Abstracts should be prepared using the style employed for abstracts submitted to Geological Society of America meetings (maximum of 2000 characters without spaces). We strongly encourage speakers to send their abstracts electronically as a Word file attachment to an e-mail message – and send the message to David West at dwest@middlebury.edu

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

David West
Department of Geology
Middlebury College
Middlebury, VT 05753

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

Deadline for abstracts: Monday, April 5, 2004.

For additional information regarding abstract submission or capabilities for presentations at the meeting, contact Dave West at 802-443-3476 or the e-mail address above.

ANNOUNCEMENTS

STUDENT RESEARCH GRANT APPLICATIONS DUE APRIL 1, 2004

Students and secondary school teachers are encouraged to apply to the VGS Research Grant Program by April 1, 2004. Downloadable Research Grant Program Applications are available from the Society's website at www.uvm.org/vtgeologicalsociety/. For those without Internet access, forms may be obtained by writing to Stephen Howe at the Dept. of Earth and Atmospheric Sciences, University at Albany, ES-351, 1400 Washington Avenue, Albany, NY 12222-0001. Tel: (518) 442-5053; E-mail: showe@csc.albany.edu

MEMBERSHIP RENEWALS DUE JANUARY 31, 2004

Downloadable Membership forms are available from the Society's website at www.uvm.org/vtgeologicalsociety/. Renewal notices were mailed to members in December. Please send your dues to Stephen Howe, 9 Warner Drive, St. Albans, VT 05478-1575. Thanks.

VGS SPRING MEETING AND STUDENT PAPER PRESENTATIONS APRIL 24, 2004

BICENTENNIAL HALL, MIDDLEBURY COLLEGE
MIDDLEBURY, VT

LANDSCAPE CHANGE PROGRAM

After 6 months of work by colleagues at UVM, the Landscape Change Program is finally available on line at the following address:

http://www.uvm.edu/perkins/landscape

The Landscape Change Program is a digital archive of Vermont images that documents landscape change over time using historical imagery paired where and when we can with modern images of the same sites. More than 1500 images in the archive representing many towns throughout the state are now available. This work has been supported by grants from both the National Science Foundation and the Lintilhac Foundation.

The project staff at UVM are continuing to work with schools and historical societies to collect Vermont images. The newly developed web software allows anyone to submit an image and image description making this truly a community archive. If you have any interesting images of Vermont landscapes, give it a try! Submit your image from the program web page and in a few days, it too will be part of the archive.

If you have any questions, or want to know about getting involved in the project, please contact any of the project staff via either the project email glcp@uvm.edu or our personal emails.

Jens Hilke (project coordinator, jhilke@zoo.uvm.edu),
Christine Massey (museum education specialist, cmassey@zoo.uvm.edu),
or Paul Bierman (professor, pbierman@zoo.uvm.edu).

CALENDAR

January 31:	VGS membership dues deadline
February 7:	**VGS Winter Meeting, Norwich University**
March 25-27:	NEGSA/SEGSA meeting, Tysons Corner, VA
April 1:	Student grant applications due
April 5:	Student paper abstracts due
April 5:	Submit executive committee reports to GMG
April 24:	**VGS Spring Meeting, Middlebury College**