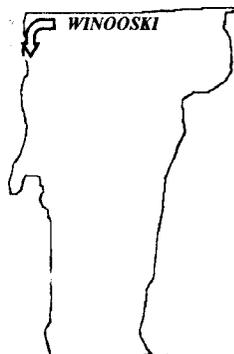

THE

GREEN MOUNTAIN GEOLOGIST



QUARTERLY NEWSLETTER OF THE VERMONT
GEOLOGICAL SOCIETY

WINTER, 1995

VOLUME 22

NUMBER 1

*The Vermont Geological Society
Winter Meeting:*

A SYSTEM DYNAMICS WORKSHOP WITH ROLFE STANLEY

*Join us for a Hands-On Approach with STELLA
Winooski High School, Winooski, Vermont
SATURDAY MARCH 11, 1995, 10:00 AM*

See Inside For Details.

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WINTER MEETING PROGRAM

Winooski High School Computer Lab

Winooski, Vermont

Saturday, March 11, 1995

DIRECTIONS

The Winooski High School is located immediately south of Exit 16 on I-89, on the east side of Route 7. Enter the High School by the entrance closest to the parking lot. Take the stairs up to the second floor. The computer lab is immediately on the right.

9:30 *Coffee & Doughnuts (provided)*

10:00 *"A System Dynamics Workshop With Rolfe Stanley:"*

Rolfe will introduce interested VGS members to the *STELLA* program using examples from the earth sciences. *STELLA* utilizes system dynamics to explain almost any type of large-scale process. Large-scale processes in the earth sciences (such as mountain building) result from the interaction of many small-scale processes all operating at differing rates. *STELLA* is a computer program designed to explore system dynamics whereby these smaller-scale processes can be described and their influence on one another, and on the system as a whole, can be observed.

12:00 *Lunch and Executive Committee Meeting:*

Members are welcome to *brown bag their* lunch and join the Executive Committee, or feel free to partake at one of Winooski's numerous, nearby restaurants.

1:00 *Open:*

Members are invited to experiment with the *STELLA* program, and to pick Rolfe's knowledge of the system!

2:00 *Meeting Adjourns.*

**VERMONT GEOLOGICAL SOCIETY
BUSINESS AND NEWS**

New Members

- Scott Gaffney Newfane, Vermont
- Lin Li Burlington, Vermont
- Timothy Schmaltz Waterbury, Vermont

Treasurer's and New Members Report

Of the 150 members of the Society prior to the end of the calendar year, 120, or 80%, have renewed their membership as of February 22, 1995. Although the deadline for membership renewal was January 15th, dues continue to trickle in. The vast majority of the 30 members who have not yet renewed are members who have retired or moved out of New England in the past year. Also, only a few of our institutional members have renewed, but this is not unusual as they are often notoriously slow in remitting their dues.

The Society's financial condition continues to improve, and our retained income is at its highest level since I became Treasurer three years ago. In fact, our balance is now at a consistently high enough level that I will seek the approval of the Executive Committee to move our finances into an interest-bearing account with an even higher interest rate than the rate we currently enjoy. Continued tight cost controls will remain in place to insure that our healthy financial condition persists. For example, nearly \$50.00 were saved by mailing the dues notices several weeks early, before the postal rate increase at the beginning of 1995. Small cost-saving measures involving the publication of the Green Mountain Geologist are also being explored.

The Society's strong financial condition makes possible our continued support of the Student Research Grant Program. I am pleased to report that we awarded Amy Church, a graduate student in the Department of Geology at the University of Vermont, financial support to continue her Master's Thesis research during the last round of awards in November. The next deadline for submittal of proposals is May 15, 1995.

In addition to our three newest members noted above, eight applications for membership will be considered by the Executive Committee at its next meeting in March. Applicants include:

- Tania Bacchus Johnson, VT
- Arlen Bloodworth Pittsford, VT
- Stephen Bracket Keene, NH
- Kathleen Callum Brandon, VT
- Allen Carpenter South Burlington, VT
- Richard Chamberlain Wayland, MA
- Timothy Grover Castleton, VT
- Julia Nicholson Woodstock, VT

As always, I welcome comments and suggestions concerning the financial condition of the Society from all members.

Respectfully submitted,
Stephen S. Howe

(Continued on page 6)

(VGS Business & News: Continued from page 5)

Executive Committee Minutes -

The Executive Committee of the Vermont Geological Society was called to order at 5:30 p.m. on November 7, 1994 at the University of Vermont, Burlington, Vermont. Members present included Steve Howe, Nancy Keller, Kent Koptiuch, Helen Mango, and Stephen Wright.

- **Treasurer's Report:** Steve Howe reported an approximate balance of \$2,89.00 in the VGS account. Three new members have joined the Society since the last Executive Committee meeting: Scott Gaffney of Newfane, VT, Lin Li of Burlington, VT, and Timothy Schmaltz of Waterbury, VT. Dues statements for 1995 will be mailed to members by early December to take advantage of the \$0.29 postage rate. The Executive Committee supported Steve's recommendation to maintain the dues at \$15.00 for regular membership, and \$10.00 for student membership.
- **Reciprocal Agreements:** Stephen Wright reported that he is awaiting a message regarding the status of the reciprocal agreement with the New Hampshire Geological Society. VGS is currently a member of the Maine Geological Society and is receiving their mailings and newsletters. Kent Koptiuch has finalized the reciprocal agreement with the *Soil and Water Conservation Society (SWCS)*.
- **Publications/Editorial Committee:** The theme for the Winter Meeting and the next issue of the GMG was discussed. It was suggested by Stephen Wright, and approved by the Executive Committee, that we ask Rolfe Stanley to offer a workshop at the Winter Meeting in systems modeling using STELLA. The date suggested for the Winter Meeting was February 11, 1995. The location would be decided later, dependent upon the availability of computer facilities at UVM or Middlebury College. The Winter GMG would then feature articles from those individuals currently using STELLA for geologically related purposes. Stephen agreed to pursue this matter further with Rolfe.
- **VGS Research Grants:** The deadline for the VGS Research Grant proposals is November 15, 1994. Rolfe Stanley and Ron Parker have agreed to review the applications.
- **Constitution and Bylaw Changes:** Changes to the constitution and bylaws are on hold until Steve Howe and Shelley Snyder have had an opportunity to review them. The proposed changes will be circulated among the members of the Executive Committee, and an amended version will appear in the Summer 1995 GMG. A final, referendum vote of the proposed changes will take place at the Fall 1995 meeting.
- **VGS/GSA Campus Representatives:** Kent brought it to the attention of the Executive Committee that Vermont has a noticeable absence of GSA representatives on its college campuses. He suggested that we contact selected faculty members at Vermont colleges and ask if they would serve as both a GSA and a VGS representative. A representative's purpose would be to serve as a contact person for those students and faculty members interested in becoming involved with these organizations. Stephen Wright and Helen Mango agreed to be the representatives for UVM and Castleton State College, respectively. Helen and Kent will also contact faculty members at other colleges to request their representation. More information will be available from Kent at the next Executive Committee meeting.

(Continued on page 7)

(VGS Business & News: Continued from page 6)

- **Membership Drive:** Sue Hadden of Rock and Mineral magazine had contacted Steve Howe mentioning that the June 1996 issue would be featuring Vermont minerals. Although the articles are already set, there is advertising space available. The Executive Committee agreed to place an ad in this publication to let others know about the VGS. Kent agreed to produce a mock-up of an ad, to be reviewed and approved by the Executive Committee at the next meeting.

Kent also reported that he and Ron Parker would like to put together a pamphlet that would educate others about the VGS. This pamphlet would then be mailed to other geologists in Vermont who are not currently members of the VGS. The Executive Committee approved of this mailing and will review its progress at the next Executive Committee meeting.

Pamphlets about the VGS, and samples of our publications would also be made available at the Northeast GSA convention in Hartford, Connecticut on March 19-22, 1995. Stephen Wright agreed to transport and place these items on display at the convention.

- **Next Meeting:** The Executive Committee will meet following the Winter Meeting on February 11, 1995.

Meeting adjourned at 6:30 p.m.

Respectfully submitted,
Nancy Keller

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**THE GREEN
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GEOLOGIST, VGS,**
DEPT. OF GEOLOGY,
UVM, BURLINGTON,
VT. 05405-0122

SEMINARS, MEETINGS, and FIELD TRIPS

- **March 6, 1995: *Spring Seminar Series***, University of Vermont, 4:00 PM, Perkins Geology Building. Dr. Ray Spear, SUNY Geneseo, "*Revegetation of the White Mountains of New Hampshire Following the Retreat of the Laurentide Ice Sheet.*"
- **March 6-7, 1995: *Movement and Fate of Contaminants in Surface Water, Groundwater and Soils***, Boston, MA. Contact American Society of Civil Engineers, 345 East 47th Street, New York, NY 10017, 1-800-548-2723.

At only \$15.00 per year the VGS offers one of the best bargains in Professional Association dues around. Do you know a "rock head" who'd like to enrich his/her depositional environment? Let's get their mudcast today!

- **March 11, 1995: *Winter Meeting***, Vermont Geological Society, Winooski High School, Winooski, Vermont. *A SYSTEM DYNAMICS WORKSHOP with ROLFE STANLEY*, 10:00 am.
- **March 20-22, 1995: *Northeastern Section Meeting***, Geological Society of America, Radisson Hotel, Hartford, CT. For details see the December 1994 issue of **GSA TODAY** or call the GSA Meetings Department at 1-800-472-1988.
- **April 2-5, 1995: *Fifth Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst***, Gatlinburg, TN. Abstracts deadline: September 2, 1994. Contact P.E. LaMoreaux & Associates, Inc., Box 4412, Oak Ridge, TN 37831-4412.
- **April 3, 1995: *Spring Seminar Series***, University of Vermont, 4:00 PM, Perkins Geology Building. Dr. Orin Pilkey, Duke University, "*Shifting Shores and Rising Sea Levels - A Geologic 'Solution' to the Problem.*"
- **April 17, 1995: *Spring Seminar Series***, University of Vermont, 4:00 PM, Perkins Geology Building. Dr. Julie Palais, National Science Foundation Polar Programs, "*Polar Ice Cores and their Record of Global Climate Change.*"

- **April 24, 1995: *Spring Seminar Series***, University of Vermont, 4:00 PM, Perkins Geology Building. Dr. Brian Atwater, United States Geological Survey, "*Prehistoric Earthquakes.*"
- **April 28, 1995: *Our Waters - Whose Rights are Right? A Conflict Resolution Workshop*** sponsored by the New Hampshire-Vermont Chapter of the Soil and Water Conservation Society. To be held at the Lake Morey Inn, Fairlee, Vermont. Contact: Nick Comerci at (802) 748-3885.
- **April 29, 1995: *Spring Meeting***, Vermont Geological Society, Tentative date, University of Vermont, *Presentation of Student Papers.*
- **May 21-24, 1995: *Opening the Toolbox: Strategies for Successful Watershed Management*** is the theme of the **Fourth National Watershed Conference**, Charleston, West Virginia. Sponsored by the National Watershed Coalition.
- **August 6, 1995: *Annual Field Trip***, New Hampshire Geological Society, "*Geology of Mount Monadnock*" with Peter Thompson.

EDUCATIONAL OPPORTUNITIES

The **Folkways Institute of Portland Oregon** is offering a specially designed, educational tour to *Great Britain's Classic Geological Sites*. The program tour director will be Dr. Dick Thoms, Portland Sate University Professor of Geology.

Program Dates: September 2 - 24, 1995
Registration Deadline: April 15, 1995
Program Fee: \$3,085.00 (includes airfare, transportation, entrance fees, meetings, accommodations, breakfast/dinner), or
Program Fee: \$2,545.00 (includes all of above except airfare).
Enrollment: Open to persons interested in geology.
Activity Level: Bus Travel plus Site Visit Walking.
Departure City: New York
Information: 1-800-225-4666.

Follow in the footsteps of the founding fathers of modern geology. Study the terrane that prompted early geologists to set the standards for geological units, and to establish the basic principles of stratigraphy as they developed the first truly scientific theory of the earth.

From London to Cornwall, and Wales to Scotland, here's a unique opportunity to combine a rich background of observations, field experience, museum visits, and informal, on-site instruction to gain an understanding of the British pioneers in the geological sciences.

DRINKING WATER UPDATE

K.S. Koptiuch

The **Environmental Quality Institute** (University of North Carolina-Asheville) has released a study that supports the National Ground Water Association's stance that significant levels of lead are not leaching into groundwater supplies from submersible well pumps operating under typical installation conditions. We still haven't heard much from the EPA since their much-touted warnings in April 1994.

Current research, ongoing at **Michigan State's Hancock Turfgrass Research Center**, in cooperation with **Michigan State Extension** researchers and the **Grand Traverse County Drain Commissioner** has indicated that properly managed fertilizer application programs, as promoted by turfgrass managers and golf course superintendents for years, have little effect on nitrogen or nitrite concentrations in groundwater and soils. The studies suggest that well-maintained turf is ideally suited to maximizing the use of nitrogen, thus minimizing impact to water supplies. Having once owned and operated a turf management company in southwestern Connecticut for a number of years, it is gratifying to see that independent research is finally validating what turf managers and fertilizer manufacturers have known for years.

STATE HAPPENINGS

Governor Appoints New ANR Liaison

Governor Dean has appointed Tasha Wallis of Norwich as a policy analyst to replace James Bressor. Bressor took a post with the Agency of Natural Resources last year. Wallis will act as a liaison between the governor's office, the Agency of Natural Resources, and the Agency of Development and Community Affairs. As a former independent consultant, Wallis conducted extensive studies on the links between environmental protection and the community. She can be contacted at the office of policy research at 802-828-3333.

ANR Bringing Permit Process On-line

The Agency of Natural Resources is developing a computer permit tracking system that will open permit information to anyone with a modem and a computer. The system would allow people in the Agency, and the general public to pull up specific permit information on any given project.

Users could see the status of permits associated with the project and identify the ANR staff working on the permit. The ANR anticipates having the system up and running by this coming Fall.

ANR Seeks Restoration of Waste Tax

*Need to vent
some geo-
internal
energy? The
VGS always
welcomes
member input.*

The Agency of Natural Resources will be asking the legislature to restore a hazardous waste surcharge tax that expired in 1994. The surcharge is needed to fund Agency programs in hazardous waste reduction. The tax will affect between 800 and 1000 businesses in Vermont. It is anticipated that annual revenues from the tax will amount to approximately \$150,000. The federal government provides matching funds for the tax.

VNRC Pushing for Fees on Public Water Use

The Vermont Natural Resource Council is seeking to impose legislative fees on the private use of public water in Vermont. The plan would charge a per-gallon fee to private industry when taking water from public waterbodies. The funds generated would be dedicated to fish and wildlife protection.

Environmental Board Nominees to be Confirmed

Smooth sailing is expected in the Senate on upcoming confirmation hearing for Governor Dean's nominees to the State Environmental Board. The nominees are John Farmer, Arthur Gibb, Marcy Harding, William Martinez, and Robert Page. The Senate has high hopes that the new board members will

*Your tax-free contributions to the VGS
Research Grant Fund, or to the General Fund,
are always welcome!*

Palisades Landfill on the Block

The controversial, and bankrupt, Palisades Landfill in Moretown is scheduled to go up for auction. Requests by the landfill owners, the Rainbow Trust, for reorganization have been denied.

**Order your VGS
VERMONT GEOLOGY, VOLUME 7
"FIELD TRIP GUIDEBOOK NUMBER 3"**

Editor: Stephen F. Wright

Contents

Cretaceous Intrusions in the Northern Taconic Mountains Region, Vermont

J. Gregory McHone & Nancy W. McHone

Depositional Environments in the Mid-Ordovician Section at Crown Point, New York

Brewster Baldwin & Lucy E. Harding

The Altona and Rock Jack Pine Barrens, Altona, New York

David A. Franzi & Kenneth B. Adams

The Champlain Thrust Fault, Lone Rock Point, Burlington, Vermont

Rolfe S. Stanley

Stratigraphy of the Cambrian Platform in Northwestern Vermont

Charlotte J. Mehtens

**Vermont Geological Society
Student Research Grants**

are designed to aid our future geologists investigate Vermont's geo-history.

Help the VGS to promote a deeper insight into Vermont Geology.

Students receiving assistance through the program will present their research results at the VGS Spring Meetings. Your generosity will help cover a lot of terrane!

To receive your copy of **Vermont Geology, Volume 7**, or to contribute to the **VGS Student Research Grant Program**, clip this form and send it, along with your check or money order made payable to VGS, to:

Stephen Howe, Treasurer, Vermont Geological Society
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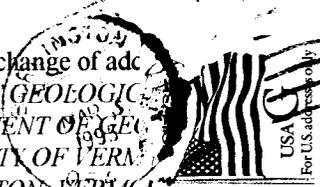
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The **GREEN MOUNTAIN GEOLOGIST**

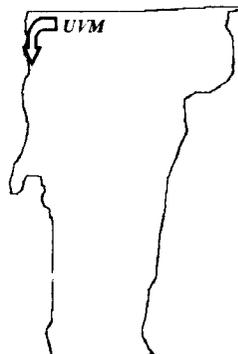
is published quarterly by the **Vermont Geological Society**, a non-profit, educational corporation, dedicated to the advancement of the study of geological science in Vermont and its locale.

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THE

GREEN MOUNTAIN GEOLOGIST



QUARTERLY NEWSLETTER OF THE VERMONT
GEOLOGICAL SOCIETY

SPRING, 1995

VOLUME 22

NUMBER 2

The Vermont Geological Society
Spring Meeting for the
PRESENTATION OF STUDENT PAPERS
SATURDAY APRIL 29, 1995, 8:30 AM
Room 1, Calkin Building
University of Vermont

See Inside For Details.

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PRESIDENT'S LETTER

April 19, 1995

Dear Members,

Spring student presentations are here and we are pleased to feature sixteen very promising papers from Vermont's future geologists. The range of topics stretches from structural through geochemistry and mineralogy to geomorphology, with study areas that reach from close to home, encompass much of North America, and into the South Atlantic! I hope that you can join us on the 29th for what promises to be an excellent program.

We are still searching for suitable Summer and Fall field trip topics, and field trip leaders. Please contact me or any other member of the executive committee with your ideas or suggestions. Also, we need you to start thinking about your future role within the Vermont Geological Society. This organization is structured totally upon volunteerism. A number of positions will be open for election at our annual Fall meeting; please consider contributing some of your valuable time to keeping the VGS strong.

I hope you take the time to read Thomas Bell's guest viewpoint in this issue. I was going to dive headfirst into the USGS issue in this editorial, but Mr. Bell - the publisher of *U.S. Water News*, has already summed up many of the issues. He was kind enough to grant permission to reprint his editorial. Although Mr. Bell's opinions are centered around the role of the USGS in respect to water resources, we know how important a role the Survey plays in all aspects of geological research throughout this country. If the Survey were eliminated, as has been proposed by some members of Congress, there really is no other agency capable of absorbing and integrating the pivotal role that the Survey provides. The costs to us as a nation truly would be immeasurable. Yes, we should advocate responsible fiscal management in our federal government. And if that means paring down the USGS budget, along with those of other federal agencies, so be it. But to eliminate the Survey would be a folly so great that its detrimental effects will be felt for generations.

It may be true, as I have heard, that geologists are, as a scientific order, a bunch of independent cusses not prone to take political stances (*I think that came out of the dictionary of geologic terms under "Geologist"*), but the very soul of our profession - indeed our very basis for recognition as professionals, is being threatened by people who have no conception of the role that geology plays in the structure of this nation's fabric. It is time that we, as individuals, begin to take a stance and let our voices be heard in Washington. No one else is going to stand up for us; as scientists, we have never cottoned to professional lobbying organizations. It is therefore vital that we all contact our representatives and voice our opinions. Yes, use the phone preliminarily, but be sure to put your thoughts on paper, too. It is the volumes of mail that really impact the decisions our elected officials make. As constituents, it is our social responsibility to tell our government what we want, or we will only end up doing what others have decided for us.

Our Representative and our Senators work for us (*or at least they are supposed to*), so let's let them know what direction they should be going in. Elsewhere in this issue, there are listed the names, addresses and phone numbers of our representatives by proxy in Washington. Please take the time today to inform them of your feelings. And, if you feel that this is an appropriate stance for the VGS to take officially, please call and let me know, I will be pleased to present our position with your guidance.

Sincerely,
Kent S. Koptiuch

INDUSTRY & COMMUNITY NEWS

Citizens Utility is still seeking to renew its license to operate hydroelectric generating stations on the Clyde River in the Northeast Kingdom. The Federal Energy Regulatory Commission (FERC) recently ruled that Citizens must remove the remains of breached dam #11 in Newport as a condition for the renewal of the 40 year license. Citizens has agreed to take down the dam, however, they are currently seeking approval from FERC to funnel water to the #11 powerhouse through a ½ -mile system of pipes and/or penstocks. This would again effectively bypass the riverbed and leave steelhead, trout, and landlocked salmon fisheries proponents high and dry. Citizens has indicated a willingness to negotiate how much water they would allow to remain in the riverbed.



The Palisades Landfill in Moretown has yet to come up on the auction block. A federal appeals court postponed the scheduled U.S. District Court Auction in Rutland last month due to a last minute appeal filed by the Mariden Corporation (a potential buyer and major creditor of the landfill) of Appalachin, New York. Palisades operator, Robert Dowdell, was barred by the DEC from operating any landfill in Vermont for the next ten years in November 1994 due to alleged repeated environmental violations at the site. The owners of the landfill, Rainbow Trust, are approximately \$4.5 million in debt. A minimum bid of \$3.5 million had been set by U.S. Bankruptcy Judge Francis Conrad

GOVERNMENT



The EPA overhaul as proposed by President Clinton includes a mandate to reduce its paperwork requirements by 25%. In addition, a waiver of fines would be available for small business that rectify violations in good faith, or are first-time offenders. Also, provisions have been made to promote EPA multi-media permits and emissions trading. Considerable revisions and consolidations in the air pollution rules have been prepared; Clinton hopes to discard multiple volumes of federal rules. His thrust is to "...set clear goals and challenge people to come up with their own ways to meet them."

A Wetlands Regulatory Reprieve is in sight for some property owners. EPA has agreed to reform programs to allow small businesses to expand wetland impact up to two (2) acres without having to provide off-site mitigating options. Still no compensation in sight for property owners whose real estate values are decreased by wetlands delineation.

The January 13, 1995 Federal Register includes amended RCRA Subtitle C provisions for testing and monitoring activities. The amendment includes Update II with new and revised methods for EPA Publication SW-846, "Test Methods for Evaluating Solid Waste, Physical, Chemical Methods." In addition, SW-846 Third Edition, with Updates I, II, and IIA have been incorporated into 40 CFR 260.11(a) in a move to promote cost-effectiveness and flexibility.

Proposed Changes in Phase III Land Disposal Restrictions (LDRs) by EPA will cover wastes managed in Clean Water Act systems and Class I underground injection wells. The proposed concentration-based treatment standards apply to hazardous constituents in ignitable, corrosive, reactive, and toxic wastes.

SPRING MEETING PROGRAM

Room 1, Calkin Building

University of Vermont, Burlington, Vermont

Saturday, April 29, 1995

- 8:30 **Registration, Coffee & Doughnuts (provided)**
- 9:00 Amy B. Church, and Paul R. Bierman: *Holocene Fan Deposits in Northwestern Vermont.*
- 9:15 Merideth L. Frinsko: *Grain Size Analysis of Amazon Deep Sea Fan Sediments and the Relationship to Physical Properties in Seismically Inferred Architectural Units.*
- 9:30 Happy Hazelton: *The Use of Grain Size Analysis in Determining Sediment Transport of the Amazon Deep-Sea Fan.*
- 9:45 Mathew J. Luecke: *Sediment Dynamics Within A Furrow Field East of Valcour Island, Lake Champlain.*
- 10:00 Brian K. Perry: *Net Flow Volume Estimations Between the Northeast Arm and Main Lake Champlain, Vt.*
- 10:15 Schuck, Russell: *Origin of Arsenic in Arrowhead Mountain Lake, Northwest Vermont.*
- 10:30 Eric D. Simpson: *Changes in Flood Magnitudes and Processes in Northeastern Yellowstone Park.*
- 10:45 James R. Anderson: *Stream Terraces of Lower Soda Butte Creek, Yellowstone National Park.*
- 11:00 Coffeebreak
- 11:15 Darin Desilets: *Depositional Environment and Structure of the Pinnacle Formation and Fairfield Pond Formation Near Osgood Hill Road, Westford, VT.*
- 11:30 Lars C. Cherichetti: *Stratigraphic Variations in the Oak Hill Group of Quebec and Vermont: Implications to Rift History of Iapetus.*
- 11:45 Jonathan L. Goldberg, Charlotte J. Mehrtens, and Ann C. Hadley: *A Sequence Stratigraphy Interpretation of the Monkton Quartzite and Rugg Brook Formation, Western Vermont.*
- 12:00 L. Alexis Richardson: *The Standing Pond Volcanics(?) in Northeastern Vermont*
- 12:15 Gordon H. McGrath: *The Metamorphic Contact Aureole of the Victory Pluton, Northeastern Vermont.*
- 12:30 Daniel C. Pope: *Finite-Difference Tomography of the San Francisco Bay Area: Three Velocity Models.*
- 12:45 Kara N. Sweeney: *Geochemistry and Mineralogy of Mine Tailings in Colorado*
- 1:00 Amy E. Young: *Miocene Volcanism in Southeastern Oregon: Geochemistry and Tectonic Implications.*
- 1:15 VGS Executive Committee Meeting: *All members are welcome to brown-bag a lunch and join the Executive Committee to discuss VGS business!*
- 2:00 Meeting Adjourns.

SPRING MEETING ABSTRACTS
(in Alphabetical Order)

STREAM TERRACES OF LOWER SODA BUTTE CREEK, YELLOWSTONE NATIONAL PARK

Anderson, James R., Department of Geology, Middlebury College, Middlebury, VT, 05753

This study investigates the characteristics of stream terraces of lower Soda Butte Creek in northeastern Yellowstone National Park, Wyoming. The 256 km² drainage basin of Soda Butte Creek consists of steep-walled glacial troughs that produce a high sediment supply, thus much of the stream is constricted between valley-side alluvial fans. The 5.5 km-long lower valley between the Trout Lake landslide (a large late Pinedale debris avalanche) and the Lamar River confluence has more gentle side-slopes and a wider floodplain with well-formed fluvial terraces. Snowmelt produces the majority of annual runoff. Most of the Soda Butte Creek channel exhibits a braided pattern. Downcutting of Soda Butte Creek through glacial outwash deposited in the late Pinedale has formed seven distinct terraces: T0, T1a, T1b, T2, T3a, T3b, and T4, which were mapped on 1:6000 air photos. T0 is the outwash surface and the T4 is the youngest terrace. Long profiles and cross profiles of the terraces were surveyed with a laser theodolite. The data were then converted to UTM grid locations and plotted in map and profile view.

The survey data show that the terraces are paired, thus were formed by episodic (as opposed to continuous) downcutting. Stratigraphic relations reveal that the terraces are fill-cut in nature. Terrace treads formed during periods of vertical stability when the creek was eroding laterally, apparently during generally cooler and wetter periods. Slump reactivation of the Trout Lake landslide debris occurred sometime during the formation of the T3 terraces (2000-1200 yr BP). Shortly after slumping, the stream overtopped and rapidly incised the slump debris. Although the level of Soda Butte Creek was raised by several meters in the slump area, downstream aggradation due to point sediment loading by slump debris appears to have been minor. Channel armoring by boulders within the slump material, however, has retarded downcutting within the slump area and a few hundred meters below it. This control on downcutting may explain why terrace profiles diverge slightly downstream. The terraces display nearly constant gradients along the lower valley. Gradients decline only in the last 1-2 km before the Lamar River confluence, indicating that the upstream extent of this local base level control is limited. An outcrop of volcaniclastic bedrock approximately 2 km upstream from the confluence also has had a limited effect on terrace characteristics. Results of this study suggest that discharge variations in Soda Butte Creek are probably the dominant control on terrace formation and geometry, and that sediment size and load and local base level controls are of secondary importance.

NEW EVIDENCE FROM NORTHWESTERN VERMONT SHOWS ABRUPT STRATIGRAPHIC VARIATIONS IN THE OAK HILL GROUP OF THE QUEBEC REENTRANT: IMPLICATIONS FOR RIFT BASIN MORPHOLOGY

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Understanding the sediments deposited during initial subsidence is key to understanding the morphology of the Iapetan rift basin the Quebec Reentrant of the Appalachians. The Pinnacle Formation is the first rift clastic sediment deposited in this rift basin and is therefore tied to initial subsidence. The Pinnacle exposed in the Oak Hill Group (west of the Brome thrust) is of lowest greenschist facies metamorphism allowing the recognition of original depositional features. This study examines the Pinnacle Formation in northwestern Vermont in order to constrain changes in thickness and grain size from Quebec to west-central Vermont.

The Pinnacle Formation thickens drastically from north to south. New evidence from northwestern Vermont shows this transition as abrupt between relatively thin (200 m.) Pinnacle in southern Quebec to relatively thick (2,000 m.) Pinnacle in northwestern and west-central Vermont.

The Pinnacle Formation coarsens drastically from fine/medium sand in southern Quebec to medium/coarse sand and cobble/boulder conglomerates in northwestern and west-central Vermont. The depositional environment for the Pinnacle Formation in southern Quebec has been described as deltaic to nearshore marine. In Vermont the deposition of the Pinnacle is interpreted as alluvial to fluvial. The more-proximal, thick fluvial/alluvial deposits of Vermont suggest greater initial subsidence than the more-distal, thinner deltaic/marine deposits of southern Quebec.

This evidence suggests the Pinnacle Formation of southern Quebec was deposited on the upper plate of an asymmetric half graben with little initial subsidence. The Pinnacle of northwestern and west-central Vermont, on the other hand, suggests deposition on the rapidly-subsiding lower plate of an asymmetrical half graben. An accommodation zone between the oppositely dipping breakaway faults appears to be located in northern-most Vermont.

HOLOCENE FAN DEPOSITS IN NORTHWESTERN VERMONT

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We present the first detailed description of a humid-temperate fan deposit in northeastern Vermont, including new data characterizing fan depositional activity and aggradation rates during the past 8,900 sidereal years. The fan we studied contains abundant organic material suitable for radiocarbon dating. Fan aggradation rates were constrained using calibrated radiocarbon dates obtained from wood and charcoal exposed within two trenches and from estimated volumes of sediment deposited on the fan during specific time periods. We found average aggradation rates were high during the early Holocene (8,900-8,100 ybp; 4.4 m3y^{-1}), lower (0.5 m3y^{-1}) for the next 4 ky and lower yet (0.23 m3y^{-1}) during the following 4 ky. During the last 250 years of fan existence, coinciding with the time of colonial settlement and land use changes in Vermont, the average fan aggradation rate was higher than it had ever been, 6.1 m3y^{-1} . Grain-size analyses of depositional units within the fan suggest, by analog to a study of humid fans in England by Wells and Harvey (1987), that deposition on Vermont fans occurs by transitional- and stream-flow processes.

**STRATIGRAPHY, DEPOSITIONAL ENVIRONMENT AND STRUCTURE OF
THE PINNACLE FORMATION AND FAIRFIELD POND FORMATION NEAR
OSGOOD HILL ROAD, WESTFORD, VERMONT**

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Field mapping, at a scale of 1:6,000, has given insight into the stratigraphy, structure, and deformational history of the Pinnacle Formation in the vicinity of Westford, northwestern Vermont. The Pinnacle Formation in this area consists of a massively bedded wacke with several isolated units consisting of large quartz clasts, intraformational slate clasts, and cobbles. The massive wacke and conglomeratic horizons suggests alluvial or submarine fan deposition adjacent to basement uplands exposed during rifting. Based on the large size quartz clasts and the abundance of blue quartz, provenance is presumed to be from a local proto Adirondack source area. The nature of the transition from the Pinnacle Formation to the overlying finer grained Fairfield Pond Formation changes significantly along strike. In the southwestern portion of the field area the transition from Pinnacle to Fairfield Pond is gradual. The identification of a transitional unit consisting of fine sands characterizes the contact in this area, elsewhere in the study area the transition is abrupt.

Deformation during the Taconic Orogeny (D_2) has produced a series of open to tightly folded synclines and anticlines gently plunging to the south. The eastern limit of the Fairfield Pond Formation in this area is defined by the Brome Thrust, where it is expressed as the shearing out of the eastern limb of a west verging anticline. D_3 crenulations have since refolded D_2 cleavage.

**GRAIN SIZE ANALYSIS OF AMAZON DEEP SEA FAN SEDIMENTS AND THE
RELATIONSHIP TO PHYSICAL PROPERTIES IN SEISMICALLY INFERRED
ARCHITECTURAL UNITS**

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The Amazon Fan extends 700 km off the continental shelf near the northeastern coast of Brazil. The building of the fan has been influenced by changes in sea level due to glaciation since the Miocene. The majority of the fan was deposited during sea level lowstands. This caused a large volume of sediment in the form of turbidity currents to be deposited in a relatively short period of time.

Seismic studies imaged several channel levee complexes, referred to as the upper, middle and lower levee complexes, each one separated by acoustically transparent units, inferred mass-transit deposits. Each channel levee complex consists of numerous channel levee systems, often overlapping one another and other architectural units. The channels usually display high sinuosity and bifurcate in various areas, creating new channel pathways.

ODP Leg 155 drilled in several locations on the fan to investigate the depositional processes and fan history; site 944A samples the key architectural units of the fan. The channel levee systems, designated by colors, and the HARP's (high amplitude reflection packets) are the main units found within each channel levee complex. In between the levee complexes are mass debris flow deposits, referred to as Unit R.

Grain size analyses of core samples were performed using a Malvern MasterSizer E laser-diffraction machine and a Sedigraph X-ray settling tube. The results correlate well with the onboard sedimentological and physical property investigations. Within each unit, distinct

cycles of alternating coarsening and fining of grains are noted. Down the core, a definite coarsening trend exists; the sediments of the younger channel levee system are significantly finer than those of the older system. The HARPs show slightly coarser grains compared to the channel levees, correlating with their seismic interpretation. The Unit R debris flow shows two distinct sections, differentiated by changes in grain size patterns. This split is also supported by changes in physical property data.

A SEQUENCE STRATIGRAPHY INTERPRETATION OF THE MONKTON QUARTZITE AND RUGG BROOK FORMATION, WESTERN VERMONT

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Sea level curves have been produced for various parts of the lapetus margin, but no attempt has been made to apply the sequence stratigraphy model to the interpretation of these formations. This model would make certain predictions about the stratigraphic sequence and variations from the predicted sequence may reflect local tectonic and sediment distribution phenomena. The Cambrian strata of western Vermont were deposited on a young passive margin. We interpret the Lower Cambrian Dunham Dolomite, the first carbonate unit on the platform, to represent a highstand systems tract on the basis of its prograding parasequences. The stratigraphically lowest facies of the overlying Lower to Middle Cambrian Monkton Quartzite represents non-marine deposition and unconformably overlies the Dunham Dolomite, suggesting that it was deposited as a lowstand systems tract. The non-marine facies of the lower Monkton consists of a white coarse-grained quartzite and is classified as an arkose to subarkose with a minimum thickness of 50 meters. Stratigraphically overlying the non-marine facies is a bioturbated, fine-grained quartzite representing shallow water marine deposition. The two facies of the lower Monkton are overlain by cyclically interbedded red quartzite, dolomite and shale interpreted to represent deposition through tidal sedimentation, and characteristic of deposition of a transgressive systems tract. Coeval with at least a portion of the Monkton are basal deposits (Rugg Brook Fm.) which consist of beds bearing clasts of both white and red quartzite with dolomite interpreted to reflect high-density turbidity current or debris flow deposition. The Monkton is overlain by a Middle Cambrian carbonate unit, the Winooski Dolostone, which may represent a return to highstand deposition.

THE USE OF GRAIN SIZE ANALYSIS IN DETERMINING SEDIMENT TRANSPORT OF THE AMAZON DEEP-SEA FAN

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The Amazon deep-sea fan, located off the northeastern part of Brazil, is the third largest fan of its kind. Beginning in the Miocene, the fan has predominately been built during glacio-eustatic low stands of sea-level. The Amazon channel-levee system is the last known working channel-levee system to exist prior to the most recent sea-level rise, approximately 10,000 ka. By comparing grain size of core samples from ODP cores located on the levee banks of this system, sediment transport both down-fan and within one channel-levee system has been investigated. Comparisons were based on grain size analysis and supported with physical property data. Grain size was measured using the Malvern MasterSizer E and the

SediGraph 5100. The analysis of grain size was chosen because it is the best measurable indicator of previous environments styles of transport and deposition.

The Amazon-Brown channel-levee system was drilled at four locations on the fan: the upper fan at site 939, the middle fan at sites 940 and 944, and the lower fan at site 946. Analysis of these Amazon-Brown channel-levee system cores showed that inner fan mechanisms sort sediments, depositing finer material on the upper fan and an increasing amount of coarser material down fan. Site 940, located in the middle fan, sampled many avulsion responses of the Amazon system. Avulsions have been speculated to cause changes in channel gradient and flow regime changes. We investigated if grain size could be used as an indicator of these avulsions. Grain size changes proved to be able to mark fan development by the occurrence of increased grain size at the beginning of the Aqua levee, Brown-Aqua transition, Brown levee, and Amazon levee-channel systems.

SEDIMENT DYNAMICS WITHIN A FURROW FIELD EAST OF VALCOUR ISLAND, LAKE CHAMPLAIN

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Sedimentary bedforms, created by the interaction of bottom currents and topography, are sustained by a combination of depositional and erosional processes providing indications of long-term conditions. The area due east of Valcour Island, in Lake Champlain, holds the necessary bathymetry and physical processes for furrow existence. These represent current stability allowing an assessment of the mobility of bottom sediments. This is crucial in regions containing highly contaminated bottom sediments.

A mooring array adjacent to the furrow field contained a pair of stereo cameras, sediment traps, a thermistor chain, and an Acoustic Doppler Current Profiler (ADCP). The cameras took pictures for 23 days, at 4 day intervals, while all other apparatus operated for 4 months between mid-June and mid-October. Correlation between the thermistor chain and the ADCP allow for analysis of currents near the bottom boundary layer. Comparison from the stereo pairs with relation to current data gives quantifiable visible analysis of erosion and deposition. A high speed event on June 22, shows erosion at this area. Though not documented by photographs, due to a malfunctioning timing circuit, other high-speed events recorded by the ADCP indicate similar erosional events during the remainder of the study.

A side scan survey was conducted in the area using a Klein system 590 dual frequency (100 and 500 kHz) side scan sonar. The side scan records have been resolved to show the full extent of the furrow field. These furrows have a width spacing ratio of 1: 4.6 which classifies them as type 1C. Furrow lengths range from 16 to 828m with approximately 54 % < 200m. Morphological difference can be seen across the furrow field from east to west, with width spacing increasing to the west, as a consequence of bathymetric variation. Comparison with side scan surveys from 1992 illustrates that similar features are visible. The depositional and erosional rates suggest continued furrow development.

**THE METAMORPHIC CONTACT AUREOLE OF THE VICTORY PLUTON,
NORTHEASTERN VERMONT**

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The Connecticut Valley Trough in Vermont is comprised of the Waits River, Gile Mountain, and Albee Formations, metasedimentary rocks deformed during the Acadian Orogeny due to subsequent westward nappe emplacement along the Monroe Line. The Connecticut Valley Trough is intruded in northeastern Vermont by a sequence of plutons, among them the Victory Pluton, that belong to the New Hampshire Plutonic Series. Similar plutons in the vicinity yield an Rb-Sr age of 376 ± 9 Ma.

Rocks from the contact aureole of the Victory Pluton experienced two episodes of microscopic deformation and two periods of metamorphism. The Gile Mountain Formation country rocks display NE-striking, steeply dipping S_1 schistosity that is near parallel to bedding. It is later deformed into F_2 crenulations that frequently develop into a NE-striking, moderately dipping S_2 schistosity.

Garnet porphyroblasts in the garnet-biotite-chlorite-staurolite-muscovite schists of the contact zone typically exhibit normal growth zoning, but a few indicate a more complicated history. The core to rim trend of X_{Ca} and X_{Mn} in one porphyroblast indicates two periods of garnet growth separated by a period of garnet resorption during prograde metamorphism. The steady increase in $X_{Mg}/X_{Mg} + X_{Fe}$ from core to rim indicates a steady increase in temperature conditions over the time of garnet growth.

Garnet-biotite thermometry yields temperatures of 530°C near the contact to 490°C ~1500m westward, a progression expected in a metamorphic contact aureole. Syn-deformational garnet growth indicates that the Victory Pluton may have been syn-tectonically intruded, despite field observations to the contrary. Garnet-biotite-muscovite-plagioclase barometry yields an average pressure of 4.9 kb at peak thermal conditions, slightly lower than the 6.8 kb peak conditions reported along strike in southeastern Vermont. This discrepancy may reflect northward thinning of emplaced fold nappes. The calculated thermobarometric conditions of 530°C - 490°C and 4.9 kb indicate that the rocks near the Victory Pluton are within the kyanite or sillimanite stability field rather than the andalusite stability field suggested by the Vermont state geologic map.

**NET FLOW VOLUME ESTIMATIONS BETWEEN THE NORTHEAST ARM AND
MAIN LAKE CHAMPLAIN, VT**

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The interchange of water between the Northeast Arm of Lake Champlain and the Main Lake occurs at only at the Alburg Passage and between the Grand Isle and North Hero Island. The complex dynamics of flow in these areas are not well understood, but they serve as an important link in the understanding of the mass balance of water. By measuring and quantifying the net flow in these passages, it is possible to draw larger conclusions on current activity in the Lake Champlain basin.

To accomplish this, two Acoustic Velocity Meters (AVMs) were installed between the central abutments of two different bridges. They are the Alburg Bridge, which spans the channel of the same name, and the Grand Isle Drawbridge, which connects Grand Isle and North Hero Island at the eastern entrance to the Gut.

An AVM uses an ultrasonic pulse to measure the average water velocity across a width of channel. The velocity information obtained from them was used to calculate and quantify

the net flow volumes at the bridge sites. Both these bridges are situated in areas that are well suited for AVM usage, due to their turbulent, sometimes slow ($>2\text{cm/s}$) flow and frequent flow reversals.

The data set covers the period from September 29 to December 4, 1994. Readings were taken every half hour, stored on site and then transferred to Middlebury College by radio telemetry or portable computer. In addition to velocity measurements, temperature, the lake level and wind direction, intensity and duration were obtained to be examined in relation to lake dynamics.

This is the first long-term estimation of these flow volumes using a continuous, detailed record, and therefore should provide a much more detailed idea of the flow processes at work.

FINITE-DIFFERENCE TOMOGRAPHY OF THE SAN FRANCISCO BAY AREA: THREE VELOCITY MODELS

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To gain a better understanding of the upper crustal structure in the San Francisco Bay area, the region has been tomographically mapped using a combination of earthquake travel times recorded by Northern California Seismic Network (NCSN) stations and travel times from active source experiments (e.g. BASIX, etc.) recorded at both NCSN and temporary receivers. The area was imaged on a regional scale (2 models) using a spatial grid of 5 km horizontally and 3 km vertically and a more detailed model was constructed with a 2 km (horizontal) by 2 km (vertical) grid aimed at imaging upper crustal structures ($z < 10\text{ km}$) associated with the San Andreas fault along the San Francisco Peninsula. Two overlapping regional inversions were constructed. The southern inversion encompasses an area from central Monterey Bay to 20 km north of San Pablo Bay and provides excellent ray-path coverage beneath the San Francisco Peninsula and south of San Pablo Bay to a depth of 12 km. Below 12 km the region of dense coverage is localized under San Francisco Bay and east of the Bay. The slightly smaller northern inversion model covers an approximately 120 km square centered on San Pablo Bay with a well sampled region extending 50 km out from the models center and extending to a depth of 15 km before significant decrease in resolution is seen. Although the BASIX and other active source experiments represent only between 10% and 20% of the total data volume they significantly improve resolution in the upper 6 km, particularly in the bays and the surrounding areas. Below 6 km the improvements from the active source data are restricted to San Francisco Bay, the San Francisco Peninsula and offshore. The southern model utilizes 1502 events, 55166 travel times, and 211 stations. The northern model uses 1212 events, 26375 travel times, and 113 receivers. The Peninsula model makes uses of 730 events, 11846 travel times, and 66 stations. The three models succeeded in imaging the structure of the Salinian Block, Franciscan assemblage, the Great Valley sequence, and to a lesser extent the fault boundaries and the proposed detachment surface connecting the San Andreas fault with the Hayward fault. In addition, a serpentinite diapir was imaged beneath Mount Diablo and a large ophiolite was seen within the Franciscan assemblage crossing San Francisco Bay at a depth of $\sim 8\text{ km}$ and a thickness of approximately 7 km.

THE STANDING POND VOLCANICS(?) IN NORTHEASTERN VERMONT

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The Connecticut Valley - Gaspe trough (CVGT), a major Siluro-Devonian litho-stratigraphic belt of the northern Appalachians, is dominated, in Vermont, by two thick pelitic/psammitic sequences and a very thin amphibolitic horizon, the Standing Pond Volcanics (SPV). In southern VT, the SPV has been described as a singular, massive section of amphibolite that lies at the interface between the two metasedimentary units. In northern VT, however, this apparent continuity breaks down. The northern amphibolites occur at different stratigraphic positions that may be near, but not necessarily at, the gradational sedimentary facies interface. The SPV occurs as either: 1) apparently discontinuous, meter-scale lenses of massive amphibolite, or 2) centimeter-scale amphibolitic and quartz- and/or calcite-rich interbeds. The disparity between these two types of outcrops suggests that the SPV amphibolites may not represent a continuous, homogeneous volcanic protolith.

Additionally, several observations suggest that the northern SPV exposures may not represent a strictly volcanic protolith. First, thin section examination of a massive amphibolite reveals microscopic zircon-rich horizons and abundant pleochroic halos within the amphiboles. The zircon-rich bands suggest detrital heavy mineral concentration, indicative of a reworked epiclastic rock. The abundant pleochroic halos suggest that the amphibole replaced original zircon-rich biotite. Typical ortho-amphibolites are unlikely to have such a high Zr content. Second, outcrops displaying thin interbeds show sharp contacts between layers which have only a few mineral phases, a feature possibly indicative of metasomatic mineral segregation. The amphibolitic layers may be the product of extensive hydrothermal alteration and only fortuitously yield roughly basaltic compositions. The bulk composition of these layered outcrops would not be basaltic. Finally, the SPV's characteristic garbenschiefer texture is most prevalent in the thin amphibolitic layers. Previous workers have suggested that garbenschiefer textures form in rocks with substantial pelitic components.

Thus, the primarily volcanic origin of the Standing Pond Volcanics in northeastern Vermont is seriously questioned; geochemical approaches that assume a volcanic protolith must be undertaken with caution.

ORIGIN OF ARSENIC IN ARROWHEAD MOUNTAIN LAKE, NORTHWEST VERMONT

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Two sediment cores from Arrowhead Mountain Lake were analyzed for arsenic and 11 other trace metals (Ag, Al, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn), grain size and percent organic content. The cores were dated using the radioactive isotope, cesium 137. Both cores revealed a peak arsenic concentration at the 26 to 28 centimeter interval, which correlates to a date of approximately 1964. The input of arsenic has decreased since this time and appears to have stabilized at approximately $8 \mu\text{g cm}^{-2} \text{yr}^{-1}$. Arsenic concentrations show a strong positive correlation with Cr, Ni, Pb, and Ag. Arsenic does not show a significant correlation with Fe or Mn which indicates that geochemical remobilization associated with these metals is not responsible for the arsenic distribution in the cores.

Arsenic concentrations in the most recent sediments of Arrowhead Mountain Lake are below levels determined to be toxic to benthic organisms. Dredging of the lake sediments or similar disturbance may introduce elevated arsenic concentrations into the near surface

sediments, creating a toxic environment.

Analyses of stream sediment samples within the lake's drainage basin indicate a marked increase in arsenic concentrations in the Lamoille River immediately downstream of Johnson, Vermont. The sediments in the Gihon River, which enters the Lamoille in Johnson, also show elevated arsenic concentrations. The marked increase in Johnson is attributed to inputs from the Gihon River watershed which contains a talc mine that was active from 1906 until 1984 and from the talc processing mill in Johnson, which operated from 1906 until 1993. Analyses of talc mine spoils exhibit average arsenic concentrations of 248.5 $\mu\text{g/g}$. Analyses of these same spoils with a scanning electron microscope indicates arsenopyrite as a potential source of arsenic. Earlier studies (Clemmer 1936; Cline 1960; Chidester 1962) also suggest the sulfarsenide gersdorffite (NiAsS) as a source of arsenic associated with the talc deposits. Previous geochemical analyses of Vermont talc deposits (Chidester 1962) have identified arsenic associated with the sulfides, pyrite and pyrrhotite. The talc processing mill discharged tailings directly into the Lamoille River until 1967. Since that time, the mill has stored tailings in a large tailings pile located adjacent to the Lamoille River. The decrease in arsenic concentrations in more recent sediments of Arrowhead Mountain Lake is attributed to reduced discharge from the mill upon stockpiling of the tailings.

Background arsenic concentrations for the Lamoille River drainage basin are enriched by a factor of $3\pm$ compared to the rest of the Lake Champlain basin. These high background levels indicate that the bedrock deposits of talc have been a natural source of arsenic since before the mining operations were initiated.

CHANGES IN FLOOD MAGNITUDES AND PROCESSES IN NORTHEASTERN YELLOWSTONE PARK

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Paleohydrologic techniques and dendrochronology were used to investigate the timing and magnitudes of floods over the last 200 years on the Lamar River system in northeastern Yellowstone Park. Anecdotal records exist for floods on the Lamar River in June 1918 (produced by heavy rainfall on melting snow), and on its major tributary Soda Butte Creek in June 1950 (produced by a tailings dam failure). These and earlier floods deposited extensive gravelly bars which provided new locations for conifer growth. Tree-ring dating of conifers on flood bars provides a minimum age for floods. Where dates of flood bar deposition are known (e.g. 1950), maximum tree ages postdate the flood by about 10 years. This ~10-year lag time reflects both tree germination time and the difficulty of encountering the first few years of tree growth in cores. Using this lag time, floods occurred on Soda Butte Creek in 1950, 1918, ca. 1873, and ca. 1810 flood. The Lamar River experienced flooding in 1918, ca. 1873, and ca. 1810. On lower Pebble Creek, a large Soda Butte tributary, flood bars date to 1918. A flood on the alluvial fan of a small, steep Soda Butte Creek tributary dates to ca. 1937.

Peak discharge estimates for the 1918 event were calculated using (1) the slope-area method, (2) a modified slope-area method that eliminates the roughness coefficient by correlation of roughness with slope, and (3) velocity estimates from maximum sizes of flood-transported clasts, and geomorphic indicators of flood stage. Discharges were calculated for (1) the Lamar River just upstream of Soda Butte Creek: 16800 ± 1100 cfs; (2) Soda Butte

Creek just above Pebble Creek: 5900 ± 1300 cfs; and (3) Pebble Creek: 2100 ± 600 cfs. These estimates show that in relation to basin area, the 1918 peak discharges are substantially greater than those for 100-yr floods in the Yellowstone region, where Q100 is estimated by flood-frequency analysis of gage records from the last ~35 years. The lack of such high discharges on trunk streams in recent decades suggests a decline in flood magnitudes, which is supported by the Yellowstone River gage records of 1911 to the present. The highest recorded discharge on the Yellowstone River at Corwin Springs and Billings, Montana occurred in June 1918, and seven of the ten highest discharges occurred before 1930. Dated floods on the alluvial fans of small tributary basins postdate the mainstem floods, and have been attributed to localized high-intensity thunderstorm precipitation (e.g. ~1937, 1988). The dominant flood-generating processes appear to have changed over the last century from prolonged frontal storms and snowmelt to localized thunderstorms which produce floods in small, steep basins with large areas of runoff-generating bare bedrock.

GEOCHEMISTRY AND MINERALOGY OF MINE TAILINGS IN COLORADO

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Mining has exposed sulfide ores and waste rock to an arid/semi-arid weathering environment in Colorado. Many mine dumps exhibit alteration patterns due to acid sulfate weathering. While the surfaces are composed of unaltered waste rock and fresh sulfides, the interiors contain well-indurated zones of highly soluble sulfate minerals produced through exposure to water, dissolved oxygen, ferric iron and chemoautotrophic bacteria. These sulfate minerals, including copiapite ($\text{Fe}_4\text{O}_3(\text{SO}_4)_{18} \cdot 63\text{H}_2\text{O}$), zincobotryogen ($\text{ZnFe}(\text{SO}_4)_2(\text{OH}) \cdot 7\text{H}_2\text{O}$) and jarosite ($\text{KFe}_3(\text{SO}_4)_2(\text{OH})_6$) precipitate from fluids with pH=1.0 to 5.0 and are 15% to 100% soluble. During snow melt and rainstorms, these soluble portions dissolve and become mobile. Acid drainage in the Central City District of the Front Range Mineral Belt, as well as at Bonanza and Summitville in the San Juan Mountains, has been identified as a source of metal contamination, impacting surface water along Clear Creek, North Clear Creek, and the Alamosa River, Iron Creek, and Bitter Creek, some of the main hydrological systems in the study areas.

The chemistry of 41 samples from 16 mines representing the three mineralization zones in Central City as well as the mines at Bonanza and Summitville was evaluated by XRD, SEM, ICAP, pH and solubility analysis. Results in all districts show an increase in solubility as pH decreases. Concentrations of Al, Fe, Cu, Co, Ni, and Mn in dissolved sulfates show a common trend with the water chemistry at drainages in different districts. XRD and SEM analysis of sulfate precipitates shows some correlation with primary mineralogy/ zonation, as well as with deposit type and host rocks.

Acid mine drainage is an accumulation of dissolved precipitates from complex weathering systems, involving several parameters including hydraulics, mineralogy, pH, solubility, and slope aspect, among others. Taking into account the differences in sulfate mineralogy and chemistry in different mining areas, before they are dissolved and diluted by the surface water of a specific hydraulic system, may help to provide effective remediation in the future.

**MIOCENE VOLCANISM IN SOUTHEASTERN OREGON: GEOCHEMISTRY
AND TECTONIC IMPLICATIONS**

Young, Amy E., Department of Geology, Middlebury College, Middlebury, VT 05753

The Juntura field area is an area of extensive Miocene (13 to 10 Ma) volcanism located in southeastern Oregon 60 miles east of Burns. Geochemistry, petrography, stratigraphy and age constraints show that the volcanic rocks of the Juntura may be associated with the Strawberry Mountain, Columbia River, Steens Mountain or Lake Owyhee Volcanic field series.

Volcanic rocks were collected from three 7.5 minute quadrangles - Beulah, DeArmond Mountain and Stemler Ridge. The stratigraphy consists of basaltic flows, interlayered with volcanic sediments, diatomite, ash flow tuffs and tuffaceous sediments. Major and trace element analysis performed on thirty five flow samples indicates that the flows are primarily tholeiitic basalts and basaltic andesites, with some high-alumina olivine basalts. The rocks separate out into two different geochemical groups as seen on Harker and Mg number divariant diagrams: a main group has moderate TiO₂ content (~ 1 wt. %) and Mg # from 75 to 65 whereas a second, smaller group has higher TiO₂ contents (~ 2 wt.%) and Mg # from 65 to 55. Rare earth element patterns are slightly enriched in the light rare earth elements, similar to many continental tholeiites, including Columbia River Basalts. The basaltic rocks plot together as mid ocean ridge basalts and island arc tholeiites on Ti/100-Zr-Y*3, Zr-Ti, Zr-Zr/Y and TiO₂-MnO*10-P₂O₅ tectonic discriminant diagrams. In the Y-Cr diagram, the basalts plot in the mid-ocean ridge field distinct from the island arc field. The overlap between mid-ocean ridge and island arc fields in tectonic discriminant diagrams is typical of many back-arc basalts and continental tholeiites.

The Juntura volcanic series may represent a continental rift environment as a result of asthenosphere upwelling and regional extension. The widespread regional extension, also seen by north-trending imbricate normal faults, may be associated with the subduction of the Juan De Fuca Plate under the North American Plate.



VERMONT GEOLOGICAL SOCIETY
BUSINESS AND NEWS

The VGS is pleased to welcome our Newest Members!

- Tania Bacchus Johnson, VT
- Arlen Bloodworth Pittsford, VT
- Stephen Bracket Keene, NH
- Kathleen Callum Brandon, VT
- Allen Carpenter South Burlington, VT
- Richard Chamberlain Wayland, MA
- Timothy Grover Castleton, VT
- Julia Nicholson Woodstock, VT
- Jeffrey Kelly Montpelier, VT

Treasurer's Report

Stephen Howe is on vacation. A treasurer's report was not available at the time of this publication. As of March 24, 1995, however, the VGS stood in excellent financial condition with a balance of \$4,795.02 in our account. As of that same date, our paid membership stood at 123 members, with several institutional renewals still pending.

I am saddened to announce that Stephen will be resigning as Treasurer of the VGS, effective in May. He has accepted an offer from Northwestern University in Chicago and will begin in June. We will miss his tireless dedication to the Society; his efforts to keep us running smooth, both financially and administratively, have been very rewarding and appreciated.

Please join me in wishing Stephen the best of luck and success in his new position!

Respectfully Submitted,
Kent S. Koptiuch

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**THE GREEN
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UVM, BURLINGTON,
VT. 05405-0122

Executive Committee Meeting Summary -

(Note: the official minutes were not available at time of publication. The following is a summary of meeting discussions)

The Executive Committee of the Vermont Geological Society was called to order at 5:30 p.m. on March 27, 1995 at the University of Vermont, Burlington, Vermont. Members present included Stephen Howe, Nancy Keller, Kent Koptiuch, Helen Mango, Ronald Parker, Bruce Cox, Rolfe Stanley, and Stephen Wright.

- **Treasurer's Report:** Steve Howe reported an approximate balance of \$4,795.00 in the VGS account. Eight new members have joined the Society since the last Executive Committee meeting. Dues and membership renewals have slowed to a trickle. Only a few institutional renewals are pending. Current paid membership is 125. Stephen announced that he will be resigning as Treasurer effective in May; he will be moving to Chicago to take on a new position at Northwestern University. The Treasurer's responsibilities will be shifted to one of the other members of the executive committee until a new Treasurer can be elected at the Fall Annual Meeting.
- **Reciprocal Agreements:** Stephen Wright reported that our reciprocal agreement with the New Hampshire Geological Society has been established; the VGS now shares reciprocal agreements with the *Maine Geological Society*, the *Soil and Water Conservation Society (SWCS)*, and the *New Hampshire Geological Society*.
- **Publications/Editorial Committee:** The Spring Meeting and the next issue of the GMG was discussed. The date suggested for the Spring Meeting was April 29, 1995. The location would be at Calkin Hall, University of Vermont. The Spring GMG would then feature abstracts from those students presenting papers at the Spring Meeting.
- **VGS Research Grants:** The deadline for the VGS Research Grant proposals is May 15, 1995. Ron Parker has agreed to head the review and approval process.
- **Constitution and Bylaw Changes:** Changes to the constitution and bylaws as prepared by Steve Howe and Shelley Snyder will be passed on to Kent Koptiuch. The proposed changes will be circulated among the members of the Executive Committee, and an amended version will appear in the Summer 1995 GMG. A final, referendum vote of the proposed changes will take place at the Fall 1995 meeting.
- **VGS/GSA Campus Representatives:** Helen Mango indicated that Tania Bacchus has agreed to be the representative for Johnson State College.
- **Membership Drive:** Kent Koptiuch is working on an ad, for review and approval by the Executive Committee at the next meeting, to be run in the June 1996 issue of Rock and Mineral magazine; the issue will be featuring Vermont minerals. Kent also reported that he and Ron Parker have not yet had the opportunity to put together the pamphlet to educate others about the VGS. This pamphlet would be mailed to other geologists in Vermont who are not currently members of the VGS. The Executive Committee approved of this mailing in November, 1994. Progress will be reviewed at the next Executive Committee meeting.
- **Summer Field Trip Topics** were discussed, but no topic or trip leader was finalized.
- **Next Meeting:** The Executive Committee will meet following the Spring Meeting on April 29, 1995.
Meeting adjourned at 6:30 p.m.
Respectfully submitted, Kent Koptiuch

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Leave a message with whoever answers; your legislator will call you back.

Question of the Quarter

Should the taxpayer-funded, Vermont Department of Environmental Conservation, R.A. LaRosa State Environmental Laboratory continue to operate in direct competition with private industry laboratories?

Background

The State laboratory does not need to make a profit. They are offering their services to private consultants at-cost to fill their capacity. This is in direct competition to private industry laboratories whose taxes go to fund the State laboratory.

What do YOU think?

Please let me and your State representatives know your opinions.

Kent Koptiuch
164 Osgood Hill
Essex, VT 05452

SEMINARS, MEETINGS, and FIELD TRIPS

- April 28, 1995: *Our Waters - Whose Rights are Right? A Conflict Resolution Workshop* sponsored by the New Hampshire-Vermont Chapter of the Soil and Water Conservation Society. To be held at the Lake Morey Inn, Fairlee, Vermont. Contact: Nick Comerchi at (802) 748-3885.
- April 29, 1995: *Spring Meeting*, Vermont Geological Society, Tentative date, University of Vermont, *Presentation of Student Papers*.
- May 5-7, 1995: *Sixth Annual Maine Mineral Symposium* at the Senator Inn and Conference Center, Augusta, Maine. Contact Robert Hinkley at (207) 657-3732.

At only \$15.00 per year the VGS offers one of the best bargains in Professional Association dues around. Do you know a "rock head" who'd like to enrich his/her depositional environment? Let's get their mudcast today!

- May 10, 1995: *Protecting Your Home Water Supply - Part 1*, A Vermont Interactive Television Program. 6:30 - 10:00 PM, Contact UVM Extension Service.

- May 9-11, 1995: *New England Environmental Expo*, World Trade Center, Boston, MA. Contact (617) 489-2302.

- May 12-14, 1995: *The 1995 Friends of the Pleistocene Field Trip* will be start in Portland, Maine. Itinerary includes coastal deposits and the deglaciation of the Sebago Basin. Contact Woody Thompson, Maine Geological Survey at (207) 287-7178 or e-mail at thompson@mgs1.doc.stste.me.us.

- May 21-24, 1995: *Opening the Toolbox: Strategies for Successful Watershed Management* is the theme of the Fourth National Watershed Conference, Charleston, West Virginia. Sponsored by the National Watershed Coalition.

- May 20, 1995: *Mud School*, Maine Ground Water Association and Goodwin Well Drilling, Inc., Turner, Maine. Contact Jim Ashley, VT DEC, (802) 241-3400.

- June 5, 1995: *Protecting Your Home Water Supply - Part 1*, A Vermont Interactive Television Program. 7:00 - 10:00 PM, Contact UVM Extension Service.

- June 15: *A Seminar on Recent Changes in Federal and State Environmental Laws*. At the Center of New Hampshire in Manchester. Contact Sally Perry at (603) 627-8183.
- June 23 & 24, 1995: *Focus 2000: Wind, Ice, and Fog; Trends in Meteorological Instrumentation, Severe Weather Testing, and Observations* and *The World of Weather*. The Mount Washington Observatory's 1995 symposium at the Sheraton White Mountain Inn, North Conway, NH. Contact Mount Washington Observatory at (603) 356-8345.
- July 9-14, 1995: *Short Course: The Environmental Geology Institute: Mountains, Glaciers, and Water*. Offered by Bates College and the New England Section of the National Association of Geology Teachers - \$300.00, inclusive. Contact Office of Special Projects, Bates College, Lewiston, ME 04240; (207) 786-6077.
- August 6, 1995: *Annual Field Trip*, New Hampshire Geological Society, "Geology of Mount Monadnock" with Peter Thompson.

GUEST VIEWPOINT

Reprinted in its entirety with permission, the following opinion appeared in the April, 1995 edition of *U.S. Water News*. Thomas C. Bell is the newspaper's president and publisher.

U.S. Geological Survey is Indispensable to Nation's Water Resources

By Thomas C. Bell

The U.S. Geological Survey is facing one of its most serious challenges in its history. The agency had been targeted for complete elimination as a part of the Republican's *Contract With America*. Although many programs would be reduced, restructured, or frozen, under the *Contract* proposals, the USGS is among a handful of organizations that would be abolished. Elimination of the U.S. Geological Survey makes absolutely no sense at all and would strike at the very core of our water resources database and research in this country.

The U.S. Geological Survey (USGS) is probably one of the few federal agencies where taxpayers are getting their money's worth. The Survey is made up of hard-working, non-political earth scientists who are dedicated to collecting and analyzing all kinds of natural data in this country, not to mention the vast amount of historical water information they have gathered. It makes little sense to eliminate an agency that is doing its job so efficiently and so well in order to save money at all costs.

It is ironic that Congress is considering abolishing the USGS at a time when the United States is beginning to recognize its increasing vulnerability to natural processes such as floods, droughts, and earthquakes. More than ever, our growing society depends on having excellent data when planning future water use, considering floodplain management, or establishing engineering codes in earthquake-prone areas.

Congressional staff members indicate that abolishing the USGS might be accomplished by transferring some of its functions to other organizations and agencies.

***"If you think
earth-
science
information
is expensive,
wait until
you see the
cost of
earth-
science
ignorance."***

They suggest some programs in the water resources division might be transferred to the Environmental Protection Agency. On the contrary, the USGS needs to be at arms length from the political ebbs and flows of the environmental arena. Placing the water resources data responsibilities inside EPA would jeopardize the apolitical nature of scientific data collection.

Shifting these responsibilities would not save money, and closing the agency would cost this nation more than it would ever save in the loss of the natural resource data the agency is so proficient at collecting. As Samuel Adams, president of the American Geological Society put it, "If you think earth-science information is expensive, wait until you see the cost of earth-science ignorance."

With an annual budget of \$580 million, the USGS dedicates more than half its efforts to analyzing the country's water resources. It is also the largest map-making agency in the United States with about 80,000 maps available to fill the more than 1 million requests from hikers to engineers. In addition, the agency collects data on and monitors earthquakes, floods, droughts, water pollution, volcanic eruptions, global environmental change, contamination from waste disposal, and our reliance on unstable sources of foreign oil and minerals.

(Continued on Page 21)

It is the water data, of course, that we are interested in here. The information that has been collected by the Survey provides tremendous insight into the history of our water resources and how they have behaved on their own with little disturbance from mankind. It is only by having this historical data that we have been able to estimate how man is impacting both surface and groundwaters in this country.

The USGS has a number of excellent programs for analyzing our nation's water resources. The National Water Quality Assessment program is designed to assess historical, current, and future water quality conditions in representative river basins and aquifers nationwide.

The Survey's National Water Use program works in cooperation with local, state, and federal environmental agencies to collect and compile water use information for the country. Every five years the data are compiled into a national water use data system and are published in a national circular.

The Survey also publishes a National Water Summary every two years that provides details about specific water quality and water use data for the nation. This is in addition to all the research and investigations made by the Survey regarding water use, water quality, and groundwater levels throughout the country.

It is amazing that so long ago in the history of this country, men and women felt it important enough to begin collecting water resources data. Those people were far-sighted individuals and we owe a debt of thanks to them for starting the collections of water resources information we have today. Because the USGS has accumulated such a vast amount of information, we can now study and investigate the effects man and his created environment are having on both the quantity and quality of water in this country.

The USGS is an agency that is running efficiently and well. Congress and this nation would be wise to let the agency do its job in its usual and efficient manner. No money will be saved or interests served by abolishing the USGS.

*"Those people
were far-sighted
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them for
starting the
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information we
have today."*

STATE HAPPENINGS

Chalk this one up: The movement to exempt pre-existing slate quarries in Vermont from the Act 250 review process is still alive in the state legislature. Although the House Natural Resources and Energy Committee denied the granite industry a similar request, the House felt that the slate industry merited the exemption. Slate quarries are frequently flooded with water to protect the cut face during periods of inactivity that may last for years. New quarry operations would still be subject to Act 250 review.

Brierly confirmed as DEC Commissioner: Acting Commissioner of the DEC, William Brierly, has been officially named Commissioner to succeed Jack Long. Brierly has been filling the role since Long stepped down in December. **State Geologist, Dianne Conrad,** will replace Brierly as DEC's Chief of Operations. **Lawrence Becker** will serve as **Acting State Geologist.**

A Privileged Audit Program may be up for consideration within the next year at the state level. DEC commissioner William Brierly has indicated that the state is open to the concept of providing leniency towards companies that discover a violation or non-compliance issue of their own accord. Providing the companies were to rectify the violation(s) in a timely manner, protection from prosecution and/or penalties could be extended.

Order your VGS
VERMONT GEOLOGY, VOLUME 7
"FIELD TRIP GUIDEBOOK NUMBER 3"

Editor: Stephen F. Wright

Contents

Cretaceous Intrusions in the Northern Taconic Mountains Region, Vermont	J. Gregory McHone & Nancy W. McHone
Depositional Environments in the Mid-Ordovician Section at Crown Point, New York	Brewster Baldwin & Lucy E. Harding
The Altona Flat Rock Jack Pine Barrens, Altona, New York	David A. Franzl & Kenneth B. Adams
The Champlain Thrust Fault, Lone Rock Point, Burlington, Vermont	Rolfe S. Stanley
Stratigraphy of the Cambrian Platform in Northwestern Vermont	Charlotte J. Mehrtens

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The GREEN MOUNTAIN GEOLOGIST

is published quarterly by the Vermont Geological Society, a non-profit, educational corporation, dedicated to the advancement of the study of geological science in Vermont and its locale.

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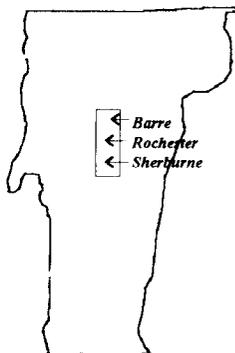
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GREEN MOUNTAIN GEOLOGIST



QUARTERLY NEWSLETTER OF THE VERMONT
GEOLOGICAL SOCIETY

SUMMER/FALL

VOLUME 22

NUMBER 3

*The Vermont Geological Society
Fall Field Trip & Annual Meeting*

A CENTRAL VERMONT QUARRY TOUR
*Rock of Ages Quarry, Antique Verde Quarry
Dinner & Meeting at the Inn at Long Trail*

SATURDAY OCTOBER 28, 1995, 10:00 AM

See Inside For Details.

IMPORTANT ABSENTEE BALLOT INFORMATION INSIDE!

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PRESIDENT'S LETTER

October 14, 1995

Dear Members,

This is my last President's Letter to you (*I heard that collective sigh of relief*). It has truly been a privilege to serve as the VGS President this past geologic blink in time. When I was first approached and asked to be more actively involved with the VGS, I thought I had too many things going on in my life; I really didn't think that I could spare the time or energy required to do a good job for the Society. Looking back now, I realize how much I would have missed by succumbing to that fallacy.

Yes, there definitely is a drain on one's free time occasionally, but not all too frequently. In fact, this is an organization that is fueled by member enthusiasm. My most difficult challenge has been to provide just enough of a nudge to the directional guidance system from time to time to keep things on track and running smoothly (I hope).

As you already know, Stephen Howe has moved on to opportunities in Illinois. The void created has been ably filled by Allen Carpenter. Allen is a CPA with an interest in rocks; how much luckier could we get in finding someone to fill the role as Treasurer?

As you will read on the following page, Ronald Parker, after contributing many years in a number of capacities for the VGS, is now working on his Ph.D in Texas. We will miss Ron and his seemingly endless flow of innovative ideas and thought provoking questions! Traditionally, in this organization, the Vice President has stepped into the President's role to provide a sense of continuity from one year to the next. Although this is not possible this year, thanks to Eric Lapp's efforts, Laurence Becker, our new State Geologist, has agreed to pull double duty by stepping forward and serving as our 1995-1996 President.

Nancy Keller is also stepping down after giving us two excellent years as Secretary. Thank you Nancy for so ably keeping track of the little details that might otherwise have become nothing more than fault gouge.

As my own term grinds to a halt, I will be stepping aside to provide background support as a Director on the Board. Also, I will continue to work with Stephen Wright in putting forth the GMG and other VGS publications (Look for *Vermont Geology* #8 this coming year).

Now I am calling on you members to step forward and take a turn at the helm. We are in need of two nominees to fill the roles of Vice President and Secretary for the upcoming year. The pay is lousy, but the rewards and the feelings of self-satisfaction are high. The efforts required are not that great, and you'll have the satisfaction of knowing that you've helped pilot our organization towards the quarter century mark!

I hope to see you at our annual Fall meeting and field trip on Saturday the 28th. The quarry tour should be informative, and the hike up Deer's Leap should be magnificent. Of course the *Extra Stout* being served up with dinner at the Inn at Long Trail should put everyone in a great frame of mind for Society business! If you can't make the meeting, our Absentee Ballot for the 1995 election is enclosed as the inside back cover of this issue. please take a few minutes now to complete it. Write-in candidates are most welcome, as we will need to fill all vacancies. Please put it in the mail today so that your vote will count!

Thanks for a great year.

Sincerely,

Kent S. Koptiuch

Vice President's Farewell Address

Dear Fellow VGS Members,

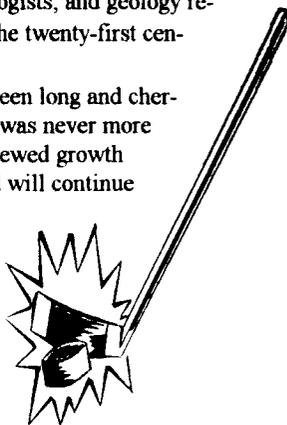
It was with a touch of sadness and glee that I moved myself and my family to College Station, Texas in the early part of August. My move, to pursue a Ph.D. in environmental geochemistry at Texas A & M University, was a long time in the dream stage. After living in Vermont for thirteen wonderful years, I had (almost?) outgrown my flatlander origins. Now that I (along with Kris, Andy and Willie - and, yes, Garp, too) are settling into our new house and yard, Texas isn't looking at all bad (except for the fire ants). Since I have come to terms with sacrificing hockey and outcropping bedrock to the world of heat and flat land (ers), I have decided to say hello, and good-bye.

It has been customary that the Vice-President of the Vermont Geological Society assume the role of President after the passage of a year's time. I regret that I was not able to fulfill the duty of President. I am, however, relieved that it is no longer possible for me to be measured against the performance of current President Kent Koptiuch, who in my estimation has been among the more active and effective Presidents.

I am leaving Vermont at a time that, I think, foresees much growth in the geosciences - albeit growth that is less focussed in the traditional areas. As with almost every sector of society, downsizing and reduction in opportunities have required that every geologist expand into other areas of expertise - computers, industrial hygiene, air quality, materials science, statistics, to name a few. Despite this entrenchment, growth is still apparent in Vermont's geologic scene. This sense of growth is a consequence of revitalization of geology education, both by the addition of new faculty to academic departments and the expansion of programs to increase support for K-12 earth science teachers. The progress on the new state bedrock map, in spite of setbacks at the U.S.G.S, continues to set the standard by which future Geographic Information System based mapping projects will be judged. The recently enhanced regulations for drinking water source protection, and the continued need for point and non-point source pollution management are also positive, long-term factors. All of these developments ensure that geologists, and geology related disciplines will be employed and employable well into the twenty-first century.

My association with the Vermont Geological Society has been long and cherished. I was always happy that that a good geology field trip was never more than a few months away. I expect that the VGS will see a renewed growth as well. Although I am now immersed in geology, I miss (and will continue to miss), those most Vermont of things: the rocks. So, take care of them for me and make sure that there is a faculty position open around there somewhere in a few years so that I can play hockey again.

Sincerely,
Ron Parker
rlp4045@geopsun.tamu.edu
"Eschew surplusage."



"I am leaving Vermont at a time that... foresees much growth in the geosciences - albeit growth that is less focussed in the traditional areas."

STATE GEOLOGIST'S REPORT

Laurence R. Becker

Vermont State Geologist and Director Vermont Geological Survey

In case you hadn't heard, Diane Conrad turned in her Vermont State Geologist badge which she'd worn since 1991 to spend part of her time in Salt Lake City, where she plans to launch a private consultation business. Among her numerous accomplishments, Diane helped to spirit passage of the Texas Low-Level Radioactive Waste Compact through the Vermont Legislature, and established the structure for placing new bedrock mapping into digital format. She continues to serve as Vermont's representative on the Texas Compact Commission, and consults with the Survey on radioactive waste policy issues.



As former VGS Technical Services Chief, Radioactive Waste Special Assistant and hydrogeologist, and Vermont State employee since 1981, I was designated the new State Geologist. My graduate work in geology, under the direction of Allen Hunt at UVM, focused on the shoreline dynamics of sediment transport in Appletree Bay of Lake Champlain. Now I'm getting a chance to use that experience as the Survey is managing a study of sedimentation in Missisquoi Bay, funded by the Highway Department. I received my undergraduate degree in geology from SUNY at Buffalo.

The Vermont Geological Survey itself has undergone some logistical transition. Diane Vanecek has moved her office from the second to the fourth floor of Center Building where she joins the rest of the Survey staff. Her telephone number remains the same (241-3608). For the first time ever, all of the maps are in one location!

The Survey has moved the placement of new bedrock data into GIS format from the experimental stage to production of maps based on protocols established in cooperation with the US Geological Survey. Open file and prototype digital maps and files are now available from VGS.

The VGS catalog of publications is receiving a long-overdue revising. Added to the list will be all available open-file reports, an index to Vermont towns (and in which VGS publication each is referenced), all available topographic maps, and more. It should be available in late September.

Included in the catalog is just-published Special Bulletin #14, "*Stratigraphy and bedrock geology of parts of the St. Albans and Georgia quadrangles, northwestern Vermont,*" by Charlotte Mehrrens and Ann Hadley. This publication also figured prominently as a deliverable for the US Geological Survey's 1994 STATEMAP portion of the National Geologic Mapping Program, submitted last month.

The USGS was enthusiastic about the quality and variety of VGS submissions towards a new state map, which also included: one-degree sheets for Lake Champlain North, Montpelier and Mount Mansfield; digital format paper maps and digital files for the Lincoln, Warren, Mount Ellen, Roxbury, Gilson Mountain, Milton, Rochester, Arlington, the Vermont portion of the Shushan quad, Cavendish, Plymouth, Mount Snow and Readsboro 1:24,000 quadrangles.

In radioactive waste management news, the Texas Compact, which consists of Texas, Ver-

Continued on Page 5

Continued from page 4

mont and Maine, is on track for ratification when the US Congress returns from its August recess. The compact allows Vermont to ship its low-level radioactive waste to a disposal facility in west Texas, which is situated 800 feet above groundwater.

A special joint Senate and House Committee on the granite industry is meeting this fall to examine the condition of the industry and factors which may impede or promote its development. The committee is to report to the Legislature no later than January 15, 1996 with recommendations to improve the conditions of and promote job development within the granite industry.

Under the *National Geologic Mapping Act*, there are proposals before Congress which would increase the amount of money going to the states under the **STATEMAP** program. The *American Geologic Institute* is sponsoring another proposal to establish data repositories in each of the 50 states. The Survey presently archives geoscience data, but other institutions in the state may be interested in doing the same. If you are one of these, or know of one, please contact the Survey, so we can include the name in AGI's national directory. The data repository will serve as an important source of information for the entire geoscience community for a variety of applications, including environmental protection, water resource management, global change studies, reducing risks from earthquakes and other geologic hazards, and basic and applied research. In July, we sold the last of the original printings of the 1961 "*Centennial State Geologic Map of Vermont*." We are currently investigating placing a scanned image of the map on a CD-ROM, with paper copies available from a plotter. Look for more information on this in the next GMG.

Editor's Note: Many thanks to VGS Public Issues Committee Chairman, Phil Jones, for taking the time to contact the State Geologist's Office and for succeeding in getting the first official report in the last three years! Diane Vanacek was quick to inform Phil that there is no truth to the rumor going around that their office was being "phased out." In fact this is their 150th year and they are more active than ever. Thanks also to David Gun at the State Office for supplying the text for this report via e-mail in downloadable format.

You can contact the State Geologist's Office by calling :

(802) 241-3608,

or writing to:

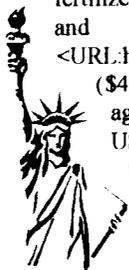
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Agency of Natural Resources
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VGS, DEPT. OF GEOLOGY, UVM, BURLINGTON, VT. 05405-0122**

Research Grants/Scholarships Available

- *Geochron Laboratories* annually awards a series of research grants to graduate students requiring interesting or new applications of isotopic analyses. The awards consist of analytical services performed free of charge to the winner of each category. Recent awards have been offered in K-Ar dating, C-14 dating, stable isotope ratio analyses (SIRA), SIRA in dietary studies, and SIRA of fluid inclusions in minerals. Awards are offered to promote the application of isotopic analytical techniques in solving original and significant problems. Application deadline is May 1, 1996. Early application is suggested. For Research Award Program Guidelines and official rules, call 617-876-3691, fax 617-661-0148, or write 711 Concord Ave., Cambridge, MA 02138
- *Jonathan O. Davis Scholarship: Quaternary Sciences Center of the Desert Research Institute* -This scholarship was established by the family and friends of Jonathan O. Davis to be given annually to support the field research of a graduate student working on the Quaternary geology of the Great Basin or surrounding areas. Administered by the *Quaternary Sciences Center of the Desert Research Institute*, the scholarship is a grant of \$1,000 or more and is open to graduate students enrolled in a M.S. or Ph.D program at any US university. Research must have a substantial geologic component, or demonstrate a strong reliance on geologic techniques. Applications must be received by Feb. 1, 1996. Include a current resume or vita, a two (2) page (single spaced) description of the thesis/dissertation research which also clearly documents the geologic orientation and research significance, and a letter of recommendation from the thesis/dissertation supervisor that emphasizes the student's research ability and potential as a Quaternary scientist. Address applications to: Executive Director, Quaternary Sciences Center, Desert Research Institute, PO Box 60220, Reno, NV 89506.
- *Cole Memorial Research Award* and *Fahnestock Memorial Research Award* applications are available from: *Research Grants Administrator, Geological Society of America, PO Box 9140, Boulder CO, 80301*. Applications must be postmarked by Feb. 15, 1996. The Gladys W. Cole Memorial Research Award provides support for investigations of the geomorphology of semi-arid and arid terrains in the US and Mexico. Application is open to GSA Members and Fellows. Last year's award of \$9,000 went to Robert S. Anderson, University of California, for his project entitled "*Validation of new Cosmogenic Radionuclide Dating Strategy on the Wind River Terraces, Wyoming.*" The Robert K. Fahnestock Memorial Research Award is given annually to the student who submits the most outstanding research proposal in the field of sediment transport or related aspects of fluvial geomorphology. The 1995 recipient is Stephen Drew Thorne, Florida State University, for "*Transverse Bars: their origin and influence on flow structure, sediment transport and channel evolution in a boulder-bed stream.*"
- *Vermont Geological Society Student Research Grants* are designed to aid our future geologists investigate Vermont's geo-history. Awards are presented semi-annually to the student(s) with the best research topic(s) and associated method(s) in Vermont Geology. Students receiving assistance through the program will present their research results at the VGS Spring Meetings. Fall application deadline is November 20, 1995. For applications contact VGS Student Research Grants, Dept of Geology, UVM, Burlington, VT 05405-0122

GOVERNMENT



- The USGS is now offering a digital database of agricultural practices and herbicide, fertilizer, and land use by county over the internet. The database includes the report and 18 GIS graphics layers. To access on the internet: <http://h20.usgs.gov/public/pubs/bat/bat000.html>. Paper (\$36) and microfiche (\$4) copies of "Spatial data in geographic information system format on agricultural chemical use, land use, and cropping practices in the United State," USGS Water-Resources Investigations Report 94-4176 can be obtained by writing the USGS Earth Science Information Center, Open File Reports Section, Box 25286, MS 517, Denver Federal Center, Denver, Colorado 80225. Specify report number and full title.

WATER UPDATE

By Kent S. Koptiuch

- Many of Vermont's small, privately-owned water companies are struggling financially to meet stricter water quality analytical requirements. Currently there are 49 private water supply companies in the State serving approximately 6,000 residents. Heretofore, customers of private companies paid rates generally equivalent to those of customers on public systems in the state, however, some are now facing potential rate increases ranging from 37 to 463% if pending rate increase requests are approved by the Public Service Board. A number of the state's private water suppliers currently are not meeting water quality standards; their customers have been advised to boil their water. Several system owners have suggested turning their private systems into collectively-owned fire districts to qualify for upgrade grants and public loans.
- The USGS has released the results of a national survey encompassing water quality of more than 12,000 groundwater and 22,000 surface-water samples. The results indicate that the drinking water standard for nitrate was exceeded in 21% of shallow wells in agricultural areas. Concentrations were highest in areas of the Northeast, Midwest, and the West coast where row crops are predominant and soils are well-drained. Nitrate concentrations were generally lower in the Southeastern region of the country. Surface-water impacts were noted as generally elevated downstream of agricultural areas, but rarely in excess of drinking water standards. Copies of "Nutrients in Ground Water and Surface Water of the United States-An Analysis of Data Through 1992" are available from the USGS for \$12.25. Call 303-202-4210.
- Seven out of eleven leading US water faucet manufacturers have agreed to a national lead reduction plan aimed at meeting California's standard of 0.5 µg/day. The seven manufacturers will voluntarily step-down lead-containing components in their faucets nationwide. A goal of 65% lead-free composition has been set for 1996; it is anticipated that a 95% lead-free goal can be achieved by 1999.
- In a recent two-month study of tap water quality in 29 Midwestern cities, herbicide concentrations at levels in excess of federal health standards in 6 cities. 21 out of 29 cities had 4 or more herbicides present, while 28 out of 29 cities had some type of agricultural herbicide present in drinking water tested. The study, conducted by the Environmental Working Group listed atrazine and cyanazine as the most frequently encountered compounds. The cities with the most contaminated water were: Danville, Decatur, Granite City, and Springfield, Ill.; Columbus and Bowling Green, OH.; Indianapolis and Fort Wayne, IN.; Kansas City, KS.; Jefferson City, MO.; Omaha, NE; and New Orleans, LA.
- The *Safe Drinking Water Act (SDWA)* and the *Clean Water Act (CWA)* are still struggling through committees in the Congress and the Senate on their long and windy aqueducts to reauthorization. At stake is the quality of public water supplies throughout the country. The hands being played on Capitol Hill are drawing on our taxpayer dollars; ultimately we pay either through poorer water quality and its associated health risks, or through a continued federal deficit that will bankrupt our children's future. No winners in either hand!

(Continued on Page 10)

VERMONT GEOLOGICAL SOCIETY
BUSINESS AND NEWS

The VGS is pleased to welcome our Newest Members!

- Martha M. Doelle White River Junction
- John P. Jemsek White River Junction
- Kimberly A. Hannula Middlebury
- David M. Dreher Waterbury

Treasurer's Report

August 11, 1995

Since I took over as Treasurer from Stephen Howe, the financial condition of the Society has remained strong. As of July 31, 1995 the VGS checking account had a balance of \$3,990.43. Our excess of income over expenses for the period from January 1, 1995 through July 31, 1995 was \$891.94.

UVM graduate student, Amy Church, was awarded \$500.00 Student Research Grant on May 27, 1995. Four membership applications (see listing above), and three renewals were received from Ronald Marcotte (Bakersfield), Leslie Kanat (Johnson), and Middlebury College.

Respectfully Submitted,
Allen Carpenter

Executive Committee Meeting- August 12, 1995

Due to the lack of a quorum at the Summer Field Trip of OMYA's Middlebury Limestone Quarry, an Executive Committee meeting was not convened. Many thanks to Barney Hodges of OMYA for leading a very informative tour of the quarry, and for explaining the intricacies of OMYA's processing technology!

The next Executive Committee Meeting will be held in conjunction with the Annual Fall Banquet Meeting and Officer Elections on October 28, 1995 at the *Inn at Long Trail* in Sherburne, Vermont (*See details on Page 13*).

Proposed VGS Bylaws Changes (Changes highlighted in bold italics)

Article VII, Section B. Vice-president:

The Vice-president shall perform the duties of the President in the absence of the ability of that officer to serve, and those duties assigned by the President. ***The Vice-president shall also coordinate with, and serve with the Chairperson of the Advancement of Science Committee in reviewing all applications for Student Research Grants. If need be, the Vice-president shall have the authority to appoint appropriate additional persons with relevant knowledge of a particular proposed research topic to assist in completing the review of grant applications. Should the Vice-president and the Chairperson of the Advancement of Science Committee not agree on a Student Research Grant recipient, the President shall have the authority to make the final decision.***

SEMINARS, MEETINGS, and FIELD TRIPS

- **Oct 27, 1995: Soil & Water Conservation Society Fall Chapter Meeting - New Hampshire/Vermont Chapter.** A 1-day short course on wetlands delineation at the US Army Corps of Engineers Cold Regions Research & Engineering Laboratory (CRREL) in Hanover, New Hampshire. 9:00 am - 3:30 pm. Contact: Nick Comerci @ (802) 748-3885.
- **Oct 28, 1995: Vermont Geological Society - Annual Fall Meeting and Field Trip - A Central Vermont Quarry Tour and dinner at the Inn at Long Trail with "Extra Stout."** Meet at Rock of Ages Quarry, Barre, Vermont, 10:00 a.m.

At only \$15.00 per year the VGS offers one of the best bargains in Professional Association dues around. Do you know a "rock head" who'd like to enrich his/her depositional environment? Let's get their mudcast today!

- **Oct 29-Nov 3, 1995: Soil Science Society of America - Annual Meeting.** St. Louis, MO. Contact: SSSA, 667 S. Segeo Rd., Madison, WI 53711, (608)273-8080.

- **Nov 6-9, 1995: Geological Society of America - Annual Meeting** - Ernest N. Morial Convention Center, Hyatt Regency, New Orleans, LA. Contact: GSA Meetings Dept., PO Box 9140, Boulder, CO 80301, (303)447-2020, Fax 303-447-6028.

- **Mar 21-23, 1996: Geological Society of America - Northeastern Section Meeting.** Hyatt Regency, Buffalo, NY. Contact: GSA Meetings Dept., PO Box 9140, Boulder, CO 80301, (303)447-2020, Fax 303-447-6028.

CALL FOR PAPERS

**APPLIED ENVIRONMENTAL GEOLOGY IN
NORTHERN NEW ENGLAND:**

A Synopsis of Currently Accepted, or Evolving Investigative & Remedial Practices at Hazardous Waste Sites in Vermont, New Hampshire, Maine, and Upstate New York

To be held as the VGS Winter Symposium. Date and Location to be determined at the annual Fall VGS Executive Committee Meeting.

The VGS is seeking papers that address all aspects of currently accepted practices or evolving innovative practices in hazardous waste site investigation and/or remediation of soils and groundwaters impacted by petroleum and chlorinated hydrocarbons. Instructions:

- Submit four (4) copies of a one (1) -page abstract of 250 words or less in standard Geological Society of America abstract format (floppy disk in any Microsoft Word Processing format or ASCII text-only welcomed also) by **November 30, 1995** to:

*Kent Koptiuch
Vermont Geological Society
c/o KSKGeoS
164 Osgood Hill, Essex, VT 05452
Fax 802-878-1620, e-mail: KSKGeoS@aol.com*

The VGS anticipates a ½ -day program consisting of up to eight (8) presenters. Twenty (20) minutes will be allowed for each presentation followed by ten (10) -minutes of questions and answers. Please indicate your requirements for audio-visual equipment on the abstract.

(Water - Continued from Page 7)

- California water bottler, Paul Mason of Adobe Springs, has been actively promoting the health benefits of magnesium-enriched drinking water for years. After writing just about everyone in the federal government, the FDA has taken note and hired the National Academy of Sciences (NAS) to study the issue. The Dalifornia DOH have also called for additional studies on the issue after initial literature research indicated that there might, indeed, be some health-related benefits associated with magnesium intake in regards to cardiovascular disease. The NAS study results should be forthcoming in the *Journal of Epidemiology Reviews* in 1996.
- In Lincoln, Nebraska, *Groundwater University* - a Summer program for high school students - completed its second successful season. The program pairs students up with groundwater professionals who serve as mentors. The program is funded by the Nebraska Groundwater Foundation, the Nebraska Public Power District, the US EPA Region 7, Nebraska Department of Environmental Quality, the USGS, and the NRCS. The students each complete a project of their own design, over the course of the Summer, related to groundwater quality and/or conservation.
- In a bid to conserve an estimated 15 million gallon of drinking water annually, the city of Boise, Idaho now requires dual water lines to all new construction. The second service line will provide water from irrigation canals to be utilized for lawn watering and car washing. It is estimated that the irrigation water will cost average homeowners approximately \$30.00 per year, while saving them up to \$50.00 per month in potable water fees.

Question of the Quarter

“Should Vermont establish a *Professional Geologist* licensing program similar to that of the existing *Professional Engineer* licensing program?”

Background

We’ve asked this question before with only limited response. Many other states have professional certification programs to establish a baseline of quality, professionalism, and ethics in the industry.

Got an idea for a VGS field trip or seminar? Let us know how you want your Society to work.

What is the “PG” worth to YOU?

Please let me, the State Geologist’s Office, and your State representatives know your opinions.

Kent Koptiuch
164 Osgood Hill
Essex, VT 05452

Tele/fax: 802-878-1620 - e-mail: kskgeos@aol.com

- The responses to last issue’s question: “*Should the taxpayer-funded, Vermont Department of Environmental Conservation, R.A. LaRosa State Environmental Laboratory continue to operate in direct competition with private industry laboratories?*”
- Six (6) respondents were opposed to the State Lab’s competition with the private sector labs.
 - One (1) respondent was in favor of the practice.

How about it folks; we’ve got more than 125 members out there - let me know what you think?

*Come to the
Vermont Geological Society's
Fall Field Trip and Annual Meeting!*

The Trip:

**Rock of Ages Quarry, Barre
Rochester Verde Antique Quarry
Hike up Deer's Leap
Saturday, October 28, 1995, 10:00 AM
Meet at the Rock of Ages Information Center**

*The Annual Meeting and Banquet:
the Inn at Long Trail, Sherburne, 5:00 PM*

Irish Music at 5:00 PM by *Extra Stout*. If you plan on attending, please contact one of the following people as soon as possible:

Helen Mango - 802-468-5611, ext.478; mangoh@sparrow.csc.vsc.edu

Kent Koptiuch - 802-878-1620; kskgeos@aol.com

Stephen Wright - 802-656-4479; swright@moose.uvm.edu

Elections and other VGS business will be conducted regardless of noise level!

When it's Important to you, make your opinion count! Contact Your Representatives today:

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(800) 642-3193

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(202) 224-5141
(800) 835-5500

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The Honorable Bernard Sanders
213 Cannon
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(202) 225-4115
(800) 339-9834

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The GREEN MOUNTAIN GEOLOGIST

is published quarterly by the Vermont Geological Society, a non-profit, educational corporation, dedicated to the advancement of the study of geological science in Vermont and its locale.

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