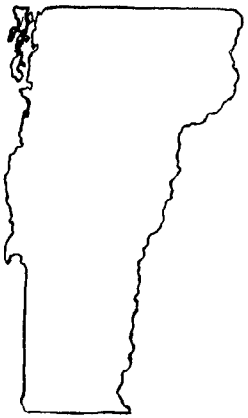
THE
GREEN MOUNTAIN GEOLOGIST



QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

SPRING 1991 VOLUME 18 NUMBER 1

The Vermont Geological Society
&
The Vermont Academy of Arts and Sciences
Combined Spring Meeting
for the
Presentation of Student Papers

SATURDAY APRIL 27, 1991, 9 AM
MIDDLEBURY COLLEGE

Directions: The spring VGS student meeting will take place in the Warner Hemicycle on the Middlebury College campus. Members coming into Middlebury on Route 7 should turn west onto Route 125, which passes through the campus. The Warner Hemicycle is one building uphill from the Science Center, opposite the Catholic Church. Members may park either along Rte. 125 or in the parking lot behind the Science Center.

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PRESIDENT'S NOTE

Dear Members,

The winter meeting at the University of Vermont was a rousing success. The 60+ people who attended were treated to some excellent talks on a wide range of geologic topics. Stephen Wright did a superb job of arranging to have lunch served at the meeting which was appreciated by all. The executive committee wishes to thank all the participants for their presentations.

At the winter meeting Rolfe Stanley and Barry Doolan announced that the 1993 meeting of the Northeastern Section of the Geological Society of America will be held at the Sheraton Hotel in South Burlington. More information on how you as an individual and we as a society can contribute to this event is included in this issue of the *Green Mountain Geologist.* I encourage our members to help make this a successful and memorable GSA.

At the executive meeting a number of new initiatives were discussed, some of which will be taken up by the membership as a whole. One thought was to create a grant fund for geology undergraduates that are either students in Vermont colleges or are working on projects in Vermont. This grant would be awarded annually and funded by a modest increase in the membership dues. Please forward to me any ideas you have regarding this proposal. If there is enough interest, we will present this as a formal proposal to the membership at the annual fall meeting.

Also brought up at the winter meeting was the publication of our next volume of *Vermont Geology.* Over two years ago Sharon O'Loughlin began compiling manuscripts of field trips throughout the state of Vermont designed specifically for secondary school teachers. We are in the process of finalizing these so that they can be incorporated into a single volume.

If you have any ideas on how the society can be effective in accomplishing our mission, please feel free to contact any one of the officers. Telephone numbers are included with our names on the back of this issue of the Green Mountain Geologist. We look forward to seeing you at the upcoming spring meeting and summer field trip.

Sincerely,

Chris Stone
Montpelier, VT

SPRING MEETING PROGRAM

April 27, 1991
Warner Hemicycle, Middlebury College

8:30 **Coffee**

9:00 **Delbert C. Martin:** *Overthrust fault dynamics*

9:20 **G. Robert Todd:** *Fluid inclusions in metamorphic granulites from the Brimfield–Sturbridge area in central Massachusetts: Evidence for a clockwise cooling path*

9:40 **Adam G. Balogh:** *Pb–Zn Sulfide deposits in the Dunham Dolomite: Implications for models of Mississippi Valley-Type deposits*

10:00 **Heather L. Widlund:** *Seismic investigation of the subsurface of a small sub-basin in Middlebury, Vermont*

10:20 Coffee

10:40 **Sarah B. McFeeters:** *Illite crystallinity in western Vermont*

11:00 **Todd A. Smick:** *Trace element geochemistry of Ordovician shales deposited during the Taconic Orogeny*

11:20 **Donna A. Gerace:** *The Saxe Brook Formation in northwestern Vermont*

11:40 **John F. Vietas:** *Paleoenvironment and provenance of the Monkton Formation, western Vermont*

12:00 **Fergus Kinnell:** *A preliminary study of the Newport Pluton indicator fan*

12:20 **VGS Executive Committee Meeting:** *All members are invited to attend over lunch!*

SPRING MEETING ABSTRACTS

PB-ZN SULFIDE OCCURRENCES IN THE DUNHAM DOLOMITE: IMPLICATIONS FOR MODELS OF MVT DEPOSITS

Balogh, Adam G., Department of Geology, University of Vermont, Burlington, VT 05405.

General geologic, fluid inclusion, and lead isotope studies of uneconomic lead-zinc sulfides in Franklin, northwestern Vermont are used to develop empirical models which characterize their occurrences. A conceptual model is presented which interprets the data through best-fit models of genesis. The investigations indicate that the occurrences apparently share several characteristics of Mississippi Valley-type (MVT) deposits and they provide a test of models of MVT genesis in an unconventional setting. Some commonly accepted models for source, transport, and precipitation are consistent with observations.

It is postulated that mineralizing fluids were hydrothermal brines of non-igneous origin with metal ions dissolved and transported as chloride complexes. The fluids may have been interstitial water released by compaction. The underlying Cheshire Quartzite, acting as an aquifer, may have contributed lead to the fluids. The fluids circulated to moderate depths and were introduced into Dunham thrust slices along a Taconic fault system. The sulfide-forming fluids circulated into open spaces; precipitation of galena and sphalerite may have resulted from mixing of warm saline fluids with cooler, more dilute fluids.

The Franklin-area lead-zinc occurrences may represent a MVT deposit, the results of normal basinal evolution, in a deformed and metamorphosed terrain.

THE SAXE BROOK FORMATION IN NORTHWESTERN VERMONT

Gerace, Donna A., Department of Geology, University of Vermont, Burlington, Vermont 05405

The Saxe Brook Formation (Middle Cambrian) in northwestern Vermont is comprised of three lithofacies, which include: (1) a massively bedded, matrix supported conglomerate, (2) a laminated sandstone, and (3) a recrystallized dolomite. Lithofacies (1) is interpreted to represent high-density turbidity current deposition; lithofacies (2) records low-density turbidity currents, and lithofacies (3) is a peri-platform ooze deposit. Field mapping and detailed section descriptions indicate that the Saxe Brook Formation is 250–350 feet thick, as opposed to an earlier estimate of 600–700 feet (Shaw,1958). The provenance of the sand fraction in the Saxe Brook is being determined through the combined techniques of cathode luminescence and backscatter electron microscopy.

A PRELIMINARY STUDY OF THE NEWPORT PLUTON INDICATOR FAN

Kinnell, Fergus, Department of Geology, University of Vermont, Burlington, Vermont 05405

The frequency of cobbles and boulders derived from the Newport Pluton in tills on the northwest flank of the Willoughby Range was compared to those in tills midway between the Newport and Willoughby Plutons. The results of this study suggests that the base of the glacier was frozen over the Newport and Willoughby Plutons and melting over the generally lower ground between them. This basal thermal regime existed when the Laurentide ice sheets were at their maximum extent and their direction of flow across the study area was dominantly southeastward.

OVERTHRUST FAULT DYNAMICS

Martin, Delbert C., Department of Geology, University of Vermont, Burlington, Vermont 05405

The dynamics of large-scale thrust fault motion has long been a problem in structural geology. Based on M. King Hubbert's and William W. Rubey's (1959) empirical work concerning the mechanical problems of overthrust faulting, a system dynamics model has been constructed using STELLA, a Macintosh computer-based system dynamics modeling program. This model addresses the dynamics of fault displacement as a function of fluid pressure, ramp resistance and fault block dimensions. Unlike Hubbert and Rubey's mathematical model, this model allows the behavior of dynamic fault-motion variables to be evaluated through time and incorporates the effects of stick-slip behavior on seismically active faults.

As with Hubbert and Rubey's model, displacement along a thrust fault increases with increasing fluid pressure and displacement decreases with increasing fault surface inclination and/or fault block width or thickness. However, this model shows that fault block displacement increases exponentially per unit time until resisting forces overcome the driving forces. Displacement then continues to increase but at an exponentially decreasing rate until fault block motion ceases. The result is in an 'S' shaped displacement curve of distance versus time.

This computer model can serve as, (1) an interactive teaching-learning environment for the instruction and study of the mechanics of thrust fault motion; and (2) a tool for the researcher wishing to model thrust fault behavior and evaluate the relative importance of the contributing factors. Used in conjunction with field investigation, this model can bring about a better understanding of how large-scale thrust faults develop and evolve with time.

ILLITE CRYSTALLINITY IN WESTERN VERMONT

McFeeters, Sarah B., Department of Geology, University of Vermont, Burlington, Vermont 05405

Illite crystallinity is a numerical index of the transition of illite to muscovite in low-grade pelitic rocks. The crystallinity index is useful to quantitatively differentiate metamorphic grade in sub-biotite zone metamorphic terrains. Samples of white micas were collected from Middle Ordovician shales (Iberville and Stony Point Formations) west of the Champlain Thrust, from the Skeels Corner Formation east of the Champlain Thrust, and from phyllitic slates of the Fairfield Pond Formation east of the Hinesburg Thrust.

Lowest values of illite crystallinity are found in samples west of the Champlain Thrust. Highest values are consistently from samples east of the Hinesburg Thrust but still in sub-biotite metamorphic facies. Pelitic rocks exposed in the northern part of the Champlain Valley can be subdivided into low and high-grades of sub-biotite metamorphism on the basis of illite crystallinity. The boundary between these subfacies appears to be the Champlain Thrust. In the Milton and St.Albans Quadrangles of northwestern Vermont, no sharp break in illite crystallinity is found between rocks of the Skeels Corner Group and those of the Fairfield Pond Formation to the east.

TRACE ELEMENT GEOCHEMISTRY OF ORDOVICIAN SHALES DEPOSITED DURING THE TACONIC OROGENY.

Todd A. Smick, Union College, Geology Department, Schenectady, New York 12308.

Shales, deposited during the Taconic Orogeny, were analyzed using an Inductively Coupled Plasma Mass Spectrometer (ICP-MS) to determine their provenance. Samples were collected from New York and Quebec sections and include: (A) shale partings within the top of the Trenton Group limestones (Glens Falls Limestone and Neuville Formation), (B) the overlying and/or time correlative Utica Shale and, (C) the overlying and/or time correlative clastic-rich sequences of the Normanskill, Schenectady, Lotbiniere, Tourelle, and Chloridorme Formations. Ten samples were analyzed from the Quebec city area (Neuville and Lotbiniere Formations) and seven were analyzed from the Gaspe Peninsula (Tourelle and Chloridorme Formations). The Quebec units are Lower Ordovician to upper Middle Ordovician in age. Thirty-six samples of Middle Ordovician shale were analyzed from eastern New York (Larrabee Formation, Utica Shale, Normanskill Formation, and Schenectady Formation). All samples span the time of synorogenic sedimentation associated with the Taconic Orogeny (circa 450 Ma).

Sample preparation included crushing, igniting, acidifying, dissolving, and diluting each sample with Nb and Sc as internal standards. Analyses were made for Ti, V, Cr, Mn, Co, Ni, and Cu. Average concentrations (ppm) of Cr, Ni, Ti, and V increase both upsection and towards the source area in the Quebec and New York sections. The oldest samples, deposited early in the orogenic cycle

(shale within the Trenton limestones), contain on average 0.3 weight percent Ti, 30 ppm V, 50 ppm Cr, and 15 ppm Ni. Samples of synorogenic flysch (Schenectady, Tourelle, and Chloridorme Formations) contain much higher average concentrations of these elements: ~1.0 weight percent Ti, 175 ppm V, 150 ppm Cr, and 70–160 ppm Ni.

High concentrations of Cr and Ni are inferred to represent the presence of ultramafic rocks in the source area. Samples collected in Quebec that are time-correlative to rocks in the New York section, have the highest concentrations of Cr and Ni, probably because the source terrane was close and contained more ultramafic rocks. Samples from the New York sections have slightly higher concentrations of Ti and V and may indicate a source terrane composed of volcanic rocks and a lesser percentage of ultramafic rocks. The present day distribution of ultramafic rocks in the Taconic orogen supports the interpretation that a greater percentage of ultramafic rocks supplied detritus to the foreland basin in Canada.

FLUID INCLUSIONS IN METAMORPHIC GRANULITES FROM THE BRIMFIELD–STURBRIDGE AREA IN CENTRAL MASSACHUSETTS: EVIDENCE FOR A CLOCKWISE COOLING PATH

Todd, G. Robert, Department of Geology, Middlebury College, Middlebury VT 05753

The studied sample is a metamorphosed impure limestone consisting of quartz, calcite, wollastonite, diopside, garnet, plagioclase, epidote and graphite. Metamorphism took place during the Acadian orogeny and was a regional event. Peak metamorphic conditions, previously determined from Fe–Mg exchange thermometry in encasing schists, are placed at >750 °C and 6 kb. Pressure-temperature path determinations suggest a prograde, counterclockwise development. Mineral zoning patterns in surrounding schists suggest that little metamorphic fluid was present during peak conditions.

Fluid inclusions in quartz and calcite in several different layers were studied in order to deduce the fluid and cooling path history of the rocks in the region. Four somewhat varied fluid-inclusion types are present in the sample; these have been characterized as: (1) high density, primary CO_2–CH_4 inclusions in quartz; (2) secondary, lower density groups of H_2O, CO_2 and CH_4 inclusions in quartz; (3) secondary CO_2–CH_4 inclusions with a presently undetermined density in quartz; and (4) secondary, low salinity H_2O inclusions in quartz and calcite.

The rare primary inclusions have a density consistent with estimated peak metamorphic temperature and pressure. Type-2 inclusions define multiple isochors for single entrapment planes. The relatively low densities and high trapping temperatures of these type-2 inclusions constrain the P–T conditions during uplift. The low salinity H_2O inclusions which represent the final entrapment event, were formed at low temperatures and consist of meteoric water. These entrapment data suggest a clockwise cooling path from peak metamorphism to the surface.

PALEOENVIRONMENT AND PROVENANCE OF THE MONKTON FORMATION

Vietas, John F., Department. of Geology, University of Vermont, Burlington Vt 05405

Two models for the deposition of the Monkton Formation, in the vicinity of Burlington, have been investigated using detailed stratigraphic analysis. (1) *Tidal Flat Model* Dr. Victor Rahmanian (1981) interpreted cylicities in the Monkton as representing tide influenced progradation of peritidal sediments over subtidal sediments. This model explains the host of shallow water structures found in the Monkton, but none of these structures are unique to tidal flat environments. (2) *Marginal Marine Fluvial Model* In the fall of 1989, Dr. John Southard criticized Rahmanian's model based on observations of bedforms at Redstone Quarry in Burlington and the Salmon Hole in Winooski. Based on the high frequencies of planar laminations and lenticular bedding, he argued that the Monkton Formation was deposited by marginal marine fluvial systems which generated pulses of sediment at upper flow regime velocities (personal communication).

After a method described by Miall (1973) the stratigraphy of Red Rocks park, South Burlington, and Redstone Quarry, Burlington were tested for fluvial cyclicity by a Markov Chain analysis. The results indicate fluvial cyclicity for these two localities, although the paucity of channels in the unit is puzzling. A remaining question is whether the provenance of the Monkton Formation is uplifted Adirondack terrain, recycled Lower Cambrian and Eocambrian sandstones, or other sediments from the west.

SEISMIC INVESTIGATION OF THE SUBSURFACE OF A SMALL SUB-BASIN IN MIDDLEBURY, VERMONT

Widlund, Heather L., Department of Geology, Middlebury College, Middlebury, VT 05753

A preliminary seismic survey was undertaken to define the overburden and bedrock surfaces of a small sub-basin near Porter Hospital on South Street in Middlebury. This area is the outlet for one of the two sub-basins which drain the Ralph Myhre Golf Course. Two types of seismic surveys, using a Bison Signal Enhancement Seismograph Model 1570B, were employed; a variable-angle refraction method and a split-spread reflection method. Three reversed refraction lines were made within the basin to obtain velocity, thickness, and dip of the underlying structure. Velocities achieved from this method were used in determining the depth to subsurface interfaces with the split-spread reflection data.

Three subsurface layers were determined. The first layer varies from less than 2 to 6 feet thick and has a velocity ranging between 1,000–1,700 feet/sec. The second layer is ~15–20 feet thick and has a velocity of 4,000–5,000 feet/sec whereas the third layer has a velocity of 9,000–10,000 feet/sec. These layers

consist of (1) a top layer of organics and soil, (2) a layer of clay, and (3) limestone bedrock. Four control wells (each ~16 feet deep) were drilled in this basin and penetrated the first two layers. Bedrock was not reached in these wells but local outcrops of limestone are exposed along the south boundary of the basin. The velocities determined for the three layers are consistent with the recovered subsurface material and that of limestone.

VERMONT GEOLOGICAL SOCIETY BUSINESS AND NEWS

New Members

We want to welcome the following new members who have joined the Vermont Geological Society since the Winter *GMG* was published:

John Garver	Schenectady, NY	Assistant Prof., Union College
Jutta Hager	Waltham, MA	Principal, Hager-Richter Geoscience, Inc.
Judith Hannah	Burlington, VT	Department Chair, UVM
Carl Hanson	Montpelier, VT	Staff Scientist, The Johnson Co.
Stephen Hildreth	Winooski, VT	Graduate Student, UVM
Stephen Howe	St. Albans, VT	Research Geologist, UVM
Delbert Martin	Burlington, VT	Geology student, UVM
Thomas Osborne	Plattsburgh, NY	Carpenter/Geology student SUNY Plattsburgh
Scott Stewart	Montpelier, VT	Hydrogeologist Vermont Department of Health
Anne Volmer	Craftsbury Common, VT	Faculty, Sterling College

About our members:

Christine Ward is now a graduate student at the Oregon Institute of Science and Technology. **Dave Westerman** (Norwich University) and **Fred Lohrengel** (Visiting Professor) have received a grant from VT EPSCoR to aid their search for aquitarchs (acid insoluble microfossils of uncertain origin) in rocks along the western margin of the Connecticut Valley/Gaspe Trough. **Jim Reynolds** (Norwich University) received a grant from the American Chemical Society Petroleum Research Fund to do paleomagnetostratigraphy research in the SubAndes during the next two summers.

Executive Committee Minutes

February 23, 1991
University of Vermont
Kalkin Hall (immediately following paper presentations)

Present:

Chris Stone, Brad Jordan, Bruce Wilson, Eric Lapp, Shelley Snyder, Bruce Wilson, Larry Gatto, Randy Spydell, Stephen Wright, Steve Howe, and Ron Parker.

The meeting convened at approximately 3:30 PM, immediately following the round of excellent talks presented for the Winter Meeting.

Treasurer's Report:

Brad Jordan reported that as of February 23rd, 50% of the membership had sent in their dues. The total balance was reported to be $2278.75. The food purchased to provide lunch for the Winter Meeting cost $240.00. Donations collected at the time of the Meeting totalled $160.00.

Editor's Report:

Stephen Wright reported that the Call for Abstracts for the Spring 1991 meeting had been prepared and was ready for distribution. Steve also mentioned that the next issue of Vermont Geology should be pushed forward to completion. This next issue is to be a compendium of geology field trips that will be applicable to secondary (and even elementary) earth and natural science courses. The exact disposition of the field trip manuscripts needs clarification. The manuscripts will need a final round of editing prior to being typeset.

As a final note, Steve indicated that he had been in touch with UVM president George Davis. President Davis has tentatively agreed to attend the VGS Fall Field Trip on October 5.

Other Business:

Ideas for the summer field trip were traded. It was generally agreed that a trip (or trips) that could be attended and understood by less formally trained individuals would be a good idea. A tentative topic was agreed upon (and since confirmed): Mass-wasting in Vermont led by Dr. Charles Baskerville. More information concerning the field trip appears below.

Shelley Snyder mentioned that teachers associated with the New Haven River Project (NHRP) are assembling a standard package to assist other teachers interested in developing river study programs. (See abstract in the Winter 1991 *GMG).* The involvement of VGS membership in the NHRP and in other river study programs could provide valuable input into the process.

Shelley mentioned that field work and data collection for the NHRP will be conducted during the week of May 21st through May 24th. VGS members are encouraged to participate and should contact Shelley at Mount Abraham Union High School in Bristol.

The occasion of Vermont's Bi-centennial would seem to be an appropriate time to reflect on the history of geology in Vermont. This was suggested as the theme for a possible future edition of *Vermont Geology.*

The announcement that Burlington will host the 1993 Northeastern Section meeting of the Geological Society of America has many implications for the VGS membership. The VGS will have a rare opportunity to contribute to the total effort of orchestrating the GSA. To this end it was suggested that the VGS provide a representative to the GSA coordinating committee. Additionally, a large number of volunteers will be required to provide services for a number of activities. The VGS membership is hereby alerted that the opportunity to participate in this rare event is theirs. Please volunteer to help!

The meeting was convened at 5:15 p.m.

Respectfully and Jovially Submitted
Ronald L. Parker

Future Meetings and Publication Deadlines

The summer field trip will will be led by Charles Baskerville and will take place on Saturday August 15 with a rain date of Sunday August 16. The fall field trip, annual meeting, and banquet is scheduled for Saturday October 5th. More details will be forthcoming in the Summer and Fall GMG's.

Members wishing to submit material for publication in the Summer *GMG* should do so by July 12.

News from Norwich University

Ominous news reaches us out of Norwich University as it struggles to restructure and contract its academic program. The Vice President for Academic Affairs, Ken Smith, has suggested that the B.S. program in Geology be dropped from the curriculum at Norwich. Faculty positions and/or the entire department could be eliminated if this plan is adopted by the University.

Public Issues Update

As of this writing, the proposed water quality standards reported on in the Fall 1990 *GMG,* are in the final stages of adoption, after lengthy negotiations. New geologically related-legislation introduced this session includes the following:

Bill	Short Description	Status 3/20/91	Committee
H. 116:	Gravel Extraction	Missed "cross-over"	H. Natl. Res.
H. 218:	Dredging, Bank stabilization	Missed "cross-over"	H. Natl. Res.
H. 419:	Water program transfer	Passed House	S. Gov't Operations
H. 517	Water Well Board: Creation	Missed "cross-over"	H. Gov't Operations

Both H. 116 and H. 218 propose to allow municipalities to remove gravel from watercourses for the purpose of protecting farmland, highways, and bridges. H. 218 further mentions "maintaining and restoring traditional flow" and "controlling future flow," and shifts decision-making/permit-granting authority from the state to the conservation districts. Both bills appear to be dead for this session, but it may be worthwhile to make sure that the bill sponsors and the Committee understand the erosional processes involved if and when the bill is reintroduced next year.

H. 419 includes a proposal to transfer public water supply management authority from the Department of Health to the Department of Environmental Conservation. As of 4/3/91, the bill has passed the House and is in the Senate Government Operations Committee, chaired by Senator Doyle. At first review, more efficient management and use of groundwater resources in Vermont would appear to be gained by passage of this bill. This is a 'geologic public issue,' to the extent that understanding and communicating hydrogeologic processes is increasingly important. Due to the length of the bill we can not reprint it in this issue of the *GMG,* however members are invited to contact Dave Butterfield or Eric Lapp to get updates or learn how they might assist with legislative support (Dave: 244-1562; Eric: 800-451-4468 x219).

H. 517 proposes to create a Water Well Board with rule-making and advisory responsibilities to help the Agency of Natural Resources manage groundwater resources. This bill would also abolish the Groundwater Coordinating Committee. Although worthy of our consideration, as in H. 419 above, no findings are presented to show what problems this will solve. As it appears unlikely the bill will move this session, I again suggest we might learn more about it before next year.

Eric Lapp
Public Issues Committee

1993 NORTHEASTERN SECTION GEOLOGICAL SOCIETY OF AMERICA ANNUAL MEETING BURLINGTON, VERMONT

The 1993 meeting of the Northeast Section of the Geological Society of America will be in Burlington, Vermont. Barry Doolan and Rolfe Stanley are co-chairmen of the local committee responsible for organizing the meeting. A well run meeting demands extensive planning and there will be ample opportunity for members of the Vermont Geological Society to help. The GMG will regularly publish a section devoted to this upcoming meeting and will also publish the field trip guide as an issue of *Vermont Geology*. A tentative list of persons responsible for different facets of the meeting follows and members are encouraged to contact these people as planning progresses.

Local Committee for 1993

Chairmen	Barry Doolan and Rolfe Stanley
Technical Program	Dave Westerman
Symposia	Rolfe Stanley and Dave Elbert
Field Trips	Stephen Wright
Short Courses	Char Mehrtens
Earth Science Education	Leslie Kanet and Russel Agnee
News Media Liason	Chuck Ratté and Judy Hannah
Treasurer	Jack Drake
Registration	Stephen Wright
Audio-visual/Hotel Services	Barry Doolan
Social Events	Ron Parker
Exhibits	Dave Bucke
Students/Volunteers	Andy Raiford (Castleton), Leslie Kanet (Johnson), Bud Ebbot (Lyndon), Ray Coish (Middlebury), Fred Larson (Norwich), Judy Hannah (UVM)

Summer Soils Workshop

Soil science is probably the most frequently used discipline for natural resource and land-use evaluations. New and practicing professionals in fields that involve soil evaluation must be able to describe soils in a systematic manner. This provides for clear communications with other professionals and consistency in descriptions between sites and over time. In the United States, the terminology for describing soils has been standardized by the U.S.D.A.—Soil Science Service.

Northern Soils and Groundwater and Terra Curriculum Resources have developed a soils workshop to meet the needs of professionals who want to learn or review the fundamental field methods for describing soils using a nationally

recognized terminology. This two day conference, "Field Techniques for Soil Description" will take place July 24–25 at the Sterling Ridge Inn outside Jeffersonville, Vermont. The workshop will focus on hands-on exercises in the morning sessions and two full afternoons describing soil profiles in the nearby area. An evening presentation will show how to gather and use background information for field work in any locale. For more information contact Terra Curriculum Resources, P.O. Box 86, Lowell, VT 05847, 802-744-2468.

SEMINARS, MEETINGS, AND FIELD TRIPS

University of Vermont
All seminars start at 4 PM in Room 200 of the Perkins Geology Building.

April 17:[1] Dr. John Delano, State University of New York at Albany
"Geochemistry and Petrology of Paleozoic Volcanic Ashes in Eastern North America: Tectonic Constraints and Stratigraphic Correlations"

April 22: Dr. Larry Mayer, Miami University
"Fractal Methods Applied to Climatic Records in Arid Regions"

April 27: Vermont Geological Society Presentation of Student Papers, Middlebury College, Middlebury, Vermont

July 24–25: Field Techniques for Soil Description Workshop, Sterling Ridge Inn, Jeffersonville, Vermont (See above note for more information).

August 17: Vermont Geological Society Summer Field Trip: *Slope failure in Vermont, Sharon to Smuggler's Notch.* Trip Leader Dr. Charles A. Baskerville. Details regarding this field trip will be provided in the Summer GMG, or can be obtained by contacting Ron Parker at 865-2237.

September 28–29: New England Intercollegiate Geological Conference. The 1991 NEIGC conference will be in Maine and is being organized by Allan Ludman of Queens College.

October 5: Vermont Geological Society Fall Field Trip: *Structure and Stratigraphy in the northern Lake Champlain Valley and Green Mountains*

March 1993: Northeastern Section of the Geological Society of America holds its annual meeting in Burlington, Vermont

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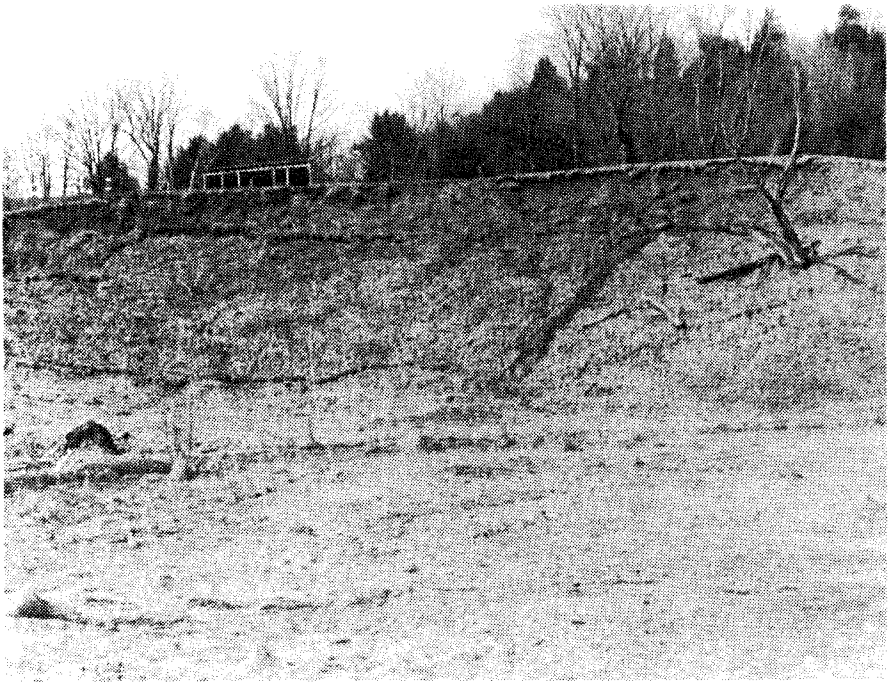
[1]Note change from date published in the Winter GMG.



Small-scale slope failure along an embankment bordering the Lamoille River, "Pumkin Harbor," Cambridge, Vermont. This arcuate slide scarp is typical of many developed along over-steepened slopes commonly found where streams and rivers are actively widening their channels. Old scarps, hummocky relief, and the fallen elm tree all attest to repeated slope failure. The bank is composed of varved silts and clays deposited during one of the high lake stages of glacial Lake Lamoille. *Photo: Stephen Wright*

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VERMONT GEOLOGICAL SOCIETY
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The *GREEN MOUNTAIN GEOLOGIST* is published quarterly by the Vermont Geological Society, a non-profit educational corporation.

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

Charles A. Ratte'
4 Chestnut Hill Road
Montpelier, VT 05602

THE
GREEN MOUNTAIN GEOLOGIST

QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

SUMMER 1991 VOLUME 18 NUMBER 2

Slope Failure in Vermont Sharon to Smugglers Notch

Field Trip with

Charles A. Baskerville

SATURDAY AUGUST 17, 1991, 9:30 AM

See trip description on page 4 for directions to the first stop.

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PRESIDENT'S NOTE

Dear Members,

The headline for the geological community is that Charles (Chuck) Ratté has retired from his position as Vermont State Geologist. After holding this office for 15 years, Chuck has decided to become actively retired. By the time this issue of the *GMG* reaches you, Chuck will be at the University of Kentucky in Lexington where he has a one year teaching position at the University filling in for a professor on sabbatical leave. His long term plans are to travel via teaching—to see the world and be paid for it at the same time. That is, he will take on short term teaching assignments in the U.S. and around the globe where available and desirable.

Much of this issue of the *GMG* is dedicated to Chuck and the contributions he has made to Vermont geology. We thank Chuck for the many hours he has spent helping us understand Vermont geology better. We all wish Chuck the very best with his new endeavors.

Jan Eastman, Secretary of the Agency of Natural Resources, has appointed Diane Conrad as acting State Geologist. Diane is also Director of The Division of Low-Level Radioactive Waste Management. Diane will be remain acting State Geologist until a permanent replacement is chosen. I have worked with Diane over the past five years on a number of different projects and have found her to be an excellent scientist and a fine manager. I am sure she will be a very capable State Geologist.

As Diane settles into her new position she intends to solicit advice and counsel from the geologic community at large. In particular she is intending to put together an advisory board to the State Geologist's office. This will be made up of interested and experienced individuals who wish to help provide direction for Vermont geology at the state level.

The spring meeting of the Society in Middlebury was well attended and the student papers presented were all of very high caliber. We thank each and every student for their excellent efforts. The Charles W. Doll award went to G. Robert Tod of Middlebury College for his presentation titled "Fluid inclusions in metamorphic granulites from the Brimfield–Sturbridge area in central Massachusetts: Evidence for a clockwise cooling path." I am also pleased to note the presence of Todd Smick from Union College in Schenectady, New York. Having students from beyond the Middlebury and UVM sphere is especially gratifying to the Society.

The spring executive committee meeting, which followed the student presentations, focused on two current efforts by the Society. The first item of interest is the development of the next edition of *Vermont Geology*, which will be

a collection of field trips and activities designed to help middle and high school teachers lead field trips for their students. Shelly Snyder is heading up this project with assistance from VGS editorial committee chairman, Stephen Wright. She will combine a number of field trips previously collected by Sharon O'Loughlin with other, newly written, field trips. Members who have material that could be modified to fit this format are encouraged to contact Shelly. Volunteers will be needed to field-test the trips as they are written.

The other item discussed was the creation of a grant or scholarship fund for Vermont college students working on earth science projects or for out-of-state college students doing earth science work in Vermont. We would look to a professor in each college to: (1) encourage his or her students to apply for this grant and (2) to sponsor a given student(s). The recipient of the award would be expected to present the results of their work at the Spring VGS meeting. In order for this program to take on a life of its own it will be necessary to have a stable source of funding. We are proposing that a modest increase in the VGS dues be used to provide at least a base supply of money. Depending on the success of the program, additional funding may be sought from outside organizations. We anticipate that a $5 per year dues increase should be adequate to get the program started. This proposal will be formally presented to the membership and voted on at the annual fall meeting.

One other issue which I wish to bring up is the one-year term of the VGS president. Having spoken to many members and former presidents, there seems to be a general consensus that a one year term hampers the ability of any given president to create enduring programs. Because the executive committee rarely meets more than four or five times a year, it takes about a year to get a feel for the office. I think it would be extremely useful to extend the presidential term to two years. I've asked our Vice-President, Bruce Wilson to spend some time exploring this issue before the publication of the Fall *GMG*. If we find that the rest of the membership finds this to be a reasonable proposition then we may propose an amendment to the by-laws to that effect.

I would like to close by sadly noting the passing of Wallace M. Cady whose extensive mapping in the Champlain Valley and Green Mountains make up substantial areas of the *Centennial Geologic Map of Vermont*. A more extensive note regarding his career will await the Fall *GMG*.

The summer field trip looks exciting. We look forward to seeing you all there.

Sincerely,

Chris Stone
Montpelier, VT

1991 SUMMER FIELD TRIP
STYLES OF MASS WASTING IN VERMONT

The VGS 1991 Summer field trip will feature the processes and products of terrain evolution in Vermont by catastrophic mass wasting. The field trip will be led by Professor Charles Baskerville of Central Connecticut State University. Dr. Baskerville has extensive first-hand knowledge of slope failure styles in Vermont. As a geologist with the U.S.G.S., Dr. Baskerville was instrumental in creating a GIS-based map of slope failure hazards in Vermont (see the reference to this map in the State Geologist's Report). Dr. Baskerville has also authored several publications on slope failures in Vermont. including:

Baskerville, C.A., Ratté, C.A., and Lee, F.T., 1988, A rockfall and debris slide at Smugglers Notch; *Studies in Vermont Geology No. 4.*

Ohlmacher, G.C. and Baskerville, C.A., 1991, Landslides on fluidlike zones in the deposits of glacial Lake Hitchcock, Windsor County, Vermont; *Bull. Assoc. Engineering Geologists,* **28**:31–43.

Baskerville, C.A. and Ohlmacher, G.C., 1988, Some slope movement problems in Windsor County, Vermont—1988; *U.S.G.S. Bull. 1828.*

The proposed field trip will prove to be a test for the uninitiated, primarily because we will cover a lot of ground. The trip will start in Sharon, Vermont, proceed to Plainfield, and will end at Smugglers Notch. Because this is obviously a long distance to travel, we have planned approximate arrival and departure times from strategic landmarks. In this way, it will be easier for those to attend who may not wish to make the entire journey. (Of course, those who do not attend all will miss the best stuff). Hopefully, the varied locations may make it easier for some of our southern members to attend as well.

Meeting Place

The field trip will commence at 9:30 AM at a rest area/pullover approximately 2 miles north of the Sharon (I-89) exit on Route 14. Get off I-89 at Exit 2. Take Route 132 a short distance to the south and connect with Route 14. Take Route 14 north toward Royalton going under the interstate overpass. The rest area pull-off is on the west side of the road approximately 2 miles from 132. The first stop is on the opposite side of Route 14.

STOP 1:

The first stop is the location of the Sharon slide. The slide developed as the result of quarrying activities at the top of a vertical section of surficial materials consisting of boulder tills, kame moraine, Lake Hitchcock rhythmites, and overlying gravelly sands. Gravel extraction exposed the Lake Hitchcock sediments allowing increased infiltration of meteoric waters. In 1984, a torrential rainstorm precipitated a massive slope failure that partially filled the quarry,

covered Route 14 and the rest area, spilled into the White River, and disrupted communications.

The field trip will depart this stop at 10:45 AM and head toward Plainfield. Get back on I-89 north and follow this to Exit 7 in Berlin. Follow Route 62 into Barre City. When Route 62 ends, proceed straight through the light onto Route 14 (again!). Follow Route 14 north for 5.1 miles to East Montpelier. Turn right onto Route 2 and follow this east for 3.1 miles to the picnic area on the south side of the road just before the left turnoff to Goddard College. The field trip will pause for an early lunch at this campground allowing others to join the trip. We will plan on being at this picnic area from 11:30 AM until 12:15 PM.

STOP 2:

The second field trip stop will scrutinize the damage incurred to the Great Brook drainage basin during the catastrophic flooding of 1989. As a result of the extreme property damage that resulted from this event, the area was classified as a national disaster area. The field trip will make several mini-stops along the course of this stream to view the results of the disastrous flood. We will plan on leaving for Stop 3 at 2:00 PM.

From Plainfield we will proceed down Route 2 (west) to Montpelier and from there travel, via I-89, to Waterbury (Exit 10). Follow Route 100 north to Stowe Village and take a left onto Route 108 and proceed north to Smugglers Notch. We will stop in the parking area just over the crest of the Notch. We will plan on arriving at the Notch at 2:45 PM.

STOP 3:

This stop will view the mechanics of rockfall mass wasting that characterize the glacially oversteepened Notch. The most recent rockfalls and debris avalanches were recorded in 1984, 1987, and 1988.

Immediately after the last stop the Vermont Geological Society will sponsor a pot luck barbecue at Ron Parker's house on the Edwards Road in South Cambridge. Field trip participants are encouraged to bring along some food or beverages (the VGS will supply food to barbecue) and to stop by after the trip. Continue north down from the Notch past the Smugglers Notch Ski Area. Take a right-hand turn onto Edwards Road approximately 3 miles beyond Smugglers Village (follow the signs to the Red Fox and Sterling Ridge Inns). Ron's house is white and immediately north (across the road) from the Salty Dog.

A BIOGRAPHY OF CHARLES A. RATTE'

Shortly after Chuck announced his retirement I had the pleasure of sitting down with him for an hour or so and discussing some of the highlights of his career as State Geologist. Diane Vanecek of the State Geologist's office also provided me with pages from back issues of the *State Geologist Journal.* Between these two sources I have attempted to put together a picture of the things that Chuck has done over the past 15 years. Chuck had mentioned that when he first came into the State Geologist's office his intention was to stay five years and get a few things accomplished. Well he ended up being here 15 years and got some of those things accomplished and worked on a whole suite of projects and issues that no one could have predicted would come up.

It was with the retirement of Dr. Charles Doll in June of 1976 that the Office of State Geologist became a full-time position. At that time the Secretary of the Agency of Environmental Conservation, Martin L. Johnson, hired Chuck Ratté into the State Geologist position. At that time, Chuck laid out eight areas that he wished to see the State Geologist emphasize and promote:

1) Basic research investigations including bedrock and surficial mapping
2) Detailed geologic mapping of urban areas
3) Cooperative program with the U.S.G.S. Topographic Division
4) Bedrock and sediment geochemistry
5) Environmental Geology and Geologic Hazards Program
6) Economic Geology
7) Information and educational services
8) Resumption of Vermont Geological Publications

In 1977 the legislature redefined the position of State Geologist as a permanent full-time position appointed by the secretary of the Agency of Environmental Conservation with advise from the Vermont Geological Society. Appointment by the secretary of the AEC meant the State Geologist position was susceptible to the winds of changing politics. After Chuck's first full year in office he had begun to develop a cooperative research program with the U.S. Bureau of Mines (U.S.B.M.) for developing useful products from mine tailings and for comprehensive chemical and mineralogical analyses of bedrock resources in Vermont. Much of Chuck's duties at this point included working with Act 250, but he also was on the Environmental Review Team, a task force member on nuclear waste disposal, chairman of the Task Force on Erosion and Sedimen-tation Problems, Advisor to the State and Regional 208 program planning, Advisor to the Vermont's Natural Resources Council, on the State Mapping Advisory Committee, and on the AASG review group to DOE–HLW Program. In 1978 Chuck completed the first *Bibliography of Vermont Geology.* As an editorial note, I will add that this was a very comprehensive bibliography and well received by all of us in the geologic community. It was in 1978 that considerable attention was given to uranium exploration in Vermont's

Precambrian terrain. There was a great public reaction to the news that there might be uranium in Vermont.

By 1979 the issue of uranium exploration was consuming much of the State Geologist's time. The public opposition to exploration convinced Governor Snelling to deny private industry the right to explore for uranium on the Okemo State Forest lands. At the same time the Governor directed the State Geologist to conduct detailed geologic, mineral, and water resource assessments of state lands to allow for future planned management of all resources. At the same time, legislation was being developed to deal specifically with uranium exploration, mining, and milling. Also in 1979, an $80,000 grant was awarded to Arthur D. Little to conduct a comprehensive analysis of the Vermont slate industry. This project was sponsored by the USBM through the office of the State Geologist. By the summer of 1979 a detailed geologic mapping and mineral resource assessment began in the Okemo State Forest in Ludlow, Vermont.

In 1980 the Vermont General Assembly passed a new law requiring firms wishing to explore for uranium to first seek a permit for any subsurface work. Also in 1980 the study of the slate mining industry in Vermont, which had been sponsored by the USBM and State Geologist's office, was completed. Continued geologic mapping and mineral resource assessment of Okemo's State Forest progressed and included a detailed radiometric survey. Also during these years, the State Geologist's office was providing financial and/or logistical support for field studies which included the ophiolite zone of northern Vermont, the depositional environments of Vermont limestones, the geology of Vermont's state parks, the application of geology to Vermont's environmental problems including forensic and medical geology, and the mapping and analysis of high angle faults along the Green Mountain front in western Vermont.

When the above mentioned law passed in 1980, whose major intent was to inhibit uranium exploration, it seemed like major a geologic controversy was behind us. However it was at this time that the U.S. Department of Energy (DOE) began looking into the state's potential for geologic disposal of high level nuclear waste. It was also during 1981 that a strong renewed interest on the part of several oil companies in the oil and gas potential of Vermont created demand for geologic information related to the "eastern overthrust belt."

In 1982 Chuck worked with the Attorney General's office and also Jan Eastman, as attorney for Columbia Gas, in developing the State's first comprehensive oil and gas legislation which was passed in that year. In 1982 the DOE was showing more interest in Vermont for the disposal of high level radioactive waste. Also, at this time, a cooperative program was initiated between the USGS and the State Geologist's office to assess Vermont's potential for damaging land slides at the higher elevations in the Green Mountains. Also, work with the USBM continued to provide statistical data on mineral production and furthered investigations of mineral resources within the state. In 1983 the use of Vermont

as a potential repository for high level radioactive waste continued to be of concern. In 1983 the second year of field and laboratory work was completed for the USGS Conterminous U.S. Mineral Assessment Program (CUSMP). On October 22, 1984 the Columbia Gas exploration well in Fairfield, Vermont was abandoned and plugged. After a depth of 6,970 feet through the Pinnacle Formation the project ran out of money and their intended goal of reaching the Champlain Thrust was never attained. In 1984 Chuck also enrolled Vermont in the U.S.G.S.'s Cooperative Geologic Mapping Program (COGEO-MAP).

1985 was uneventful but in 1986 Vermont was eliminated from the search for a repository site for high level nuclear waste. A sigh of relief could be heard throughout the state. But at the same time a program was developed to investigate the disposal of low level radioactive waste. In 1986 the compilation of data was completed for both metallic and nonmetallic mineral resources in Vermont. The CUSMAP project was also completed in 1986. The COGEOMAP program by 1987 was sponsoring geologic studies through out the state. This included both bedrock geology and surficial geology. Projects were ongoing in the following quadrangles: Jamaica, Mount Snow, Pownel, Readsboro, Stanford, Stratton Mountain, Sunderland, and Woodford. Also in 1987 the first five-year phase of the slope stability project which was carried on by Chuck Ratté, Charlie Baskerville, and Greg Ohlmacher was completed. *(Special note: you will see the results of some of that work on this summer's field trip).*

Through the past several years work aimed at mapping the entire state on 7.5 minute topographic maps has continued through the COGEOMAP program. Probably of greatest interest was the development of the Division of Low Level Radioactive Waste Management. Chuck was in charge of developing this division and hired all eight individuals in it. Also of enduring value and impact was the creation, in 1990, of the Division of Geology and Mineral Resources within the Agency of Natural Resources. This has been a goal that Chuck and others have been working on for many years. The fact that this division has been created in spite of the state's many fiscal woes is tribute to Chuck's perseverance in spite of a number of disappointments.

Not mentioned above are the over 23 publications and numerous topographic maps that have been published during Chuck's tenure. Thank you for your hard work Chuck, we have all really appreciated it.

Chris Stone

THE VERMONT DIVISION OF GEOLOGY AND MINERAL RESOURCES

It is perhaps timely for members of the Vermont Geological Society to review the job description of the State Geologist and the Geological Survey. During the 1989–1990 Vermont Legislative Session, Act 245 was passed by the General Assembly creating the Division of Geology and Mineral Resources (see the Summer 1990 *GMG).* The new division, as stated in the act, will be administered by a director who will be the State Geologist.

The duties of the new division are as follows:

- •Conduct surveys and research related to the geology, mineral resources and topography of the state.
- •Give aid and advice relating to the development and working of rock or mineral deposits suitable for building, road making, and economic or other purposes.
- •Provide information and education to government, industry and other institutions and organizations and to citizens regarding the geology, mineral resources and topography of the state.
- •Provide technical information and advice regarding the management of mineral resources on state-owned lands, and cooperate where possible by providing geologic expertise and advice to person conducting regulatory programs for the state.
- •Provide geologic services for the natural gas and oil resources board.
- •Maintain records of old and new information relating to the geology, mineral resources and topography of the state and make public new information resulting from research and field studies conducted by or for the division. Certain information provided by the mineral industries of the state may be held in confidential status at the industries request and used in a manner permitted by the industry.
- •Prepare and publish reports on the geology, mineral resources and topography of the state.

Act 245 also provided the mechanism whereby the new division can contract with agencies or departments of the Unites States government for "...maintaining the geologic, mineral resource and topographic surveys of this state...." This contract provision allowed for the work which is required to maintain the appropriate surveys for the state. It also required that all maps and other contract products conform to high standards for quality as established by the state and any federal agency.

Finally, Act 245 reaffirmed that the position of state geologist shall be an exempt position (i.e., appointed by the governor) "...as long as the person in that office on the effective date of this act remains in office." Thereafter, the state geologists position becomes a classified state position.

Some recent issues that the State Geologist's Office deals with are waste disposal and ground water protection, Act 200 and the geographic information system (GIS), and geology information and publications services. The surface and subsurface disposal of wastes on the one hand and protection of groundwater on the other hand are incompatible processes. In order to assure that some degree of success can be achieved when dealing with these processes, the best surficial and bedrock geologic information must be available to state program people, the public, and the consulting community. The state geologist office is trying to maintain and accelerate bedrock and surficial geologic mapping and research programs.

In order to enhance proper land use planning, surface and subsurface geology and geologic processes need to be better defined. This information can be used with new computer technologies (such as GIS) to view the surface and subsurface in three dimensions. The state geologist's office is gathering this data by using seismic survey and bore hole logging information.

The state geologist's office has developed an extensive amount of geologic information and maintains a comprehensive bibliography of publications apropos Vermont geology. They provide this information to schools, private and public organizations, consultants, government agencies, and the general public. The number of requests for information from these various groups continually increases.

Presently, the Office of the State Geologist is understaffed. A full-time Geologic Information/Publications Specialists position was cut in July of 1990 to half-time. The remaining half-time has been devoted to organization and supervision of the newly created Division of Radioactive Waste Management. Consequently, this arrangement does not allow the State Geologist to attend to the duties of the Division of Geology and Mineral Resources as specified in Act 245 and passed by the 1989–1990 legislature. Funding and staffing must be restored to allow the Division to carry out its responsibilities.

LETTERS TO AND ABOUT CHUCK RATTE'

Dear VGS Members:

The people of Vermont, in general, and her mineral industries in particular, have been fortunate to have had the benefit of Charles A. Ratté's expertise as Vermont State Geologist.

Chuck's credibility enhances and solidifies relationships between State Government, the general public, and the mining community. His strong academic background, vast teaching experience, and the "hands on" visits to Vermont's numerous mining operations is how that confidence was obtained.

His positive desire to help is unusual in this Society. His reviews and suggestions are based on a professional background starting as an underclassman at Middlebury College. I was fortunate to know Chuck when he was the "veteran" senior. He was there to help us all and to set a high standard for the College's geology department. His policies of critical review have helped the State achieve its expected Geological goals during this tenure.

Over the years, the Vermont properties of Pluess-Staufer Industries have included Vermont Talc's operations and now include the calcium carbonate operations of OMYA and the dimension stone operations of Vermont Marble. Our numerous land-use permit applications for quarry development and land reclamation have all been reviewed by Charles Ratté. Together, we have developed a concept of progressive reclamation that is unique to the industry. The OMYA Foote Street Quarry at Middlebury, Vermont, is our quarry standard.

The State of Vermont has vast agriculture, timber, and mineral resources and these assets, under the Act 250 land use laws, are given first priority for development. The guidance of Charles Ratté has been instrumental in documenting the location of these economic mineral resources. The policy for using these resources, which provide for satisfying our basic needs, is better understood by all because of Chuck. Hopefully, Charles A. Ratté will remain with us for a very long time as an example in this cooperative development effort.

Sincerely,

Duncan G. Ogden
Chief Geologist
Pluess-Staufer Industries, Inc.

A Tribute to Chuck Ratté

I have known Chuck for over 25 years, first as Professor of Geology at Windham College, and second as State Geologist. Most of my dealings with Chuck have been in his capacity as State Geologist where he has been instrumental in bringing the Survey into a legally recognized Division of the Agency of Natural Resources. Prior to his administration, the Survey had largely focused on scientific problems that where perceived by many as being too academic or "pure" in their goals. Chuck not only continued these efforts but demonstrated to many other organizations within and outside of state government the importance and value of geological information. The need for modern bedrock mapping was well illustrated when he and I worked on the High Level Nuclear Storage problem during the mid 1980's. As a result, we now have a bedrock program that involves members of the United States Geological Survey and professionals from nearby colleges and universities. His efforts have provided limited funds for a number of Master of Science theses. Many of these projects are published by the State Geological Survey. Publications of mapping projects will continue in the future due to Chuck's leadership in the past. In short, Chuck Ratté has made the Geological Survey a viable organization within the Agency of Natural Resources.

Over the years I have found Chuck to be not only a good friend, but a diplomatic professional who had the ability to bring diverse interests into focus for the common good. His friendship and consul will be missed in Vermont. I wish him well as he returns to teaching. Thanks, Chuck, for a job well done.

Rolfe Stanley
University of Vermont

Dear VGS members:

Finding a few words to describe my working relationship with Dr. C.A. (Chuck) Ratté during his tenure as State Geologist is rather difficult. Chuck has, during this time, been fulfilling so many different roles for so many different people and groups that I thought it might be easier if I focused on one area, his sense of professionalism.

As most of you know, the role of geology has expanded in the past few years to encompass many different disciplines and at the same time there have been many different demands and expectations placed on the profession by the public. during his tenure, Chuck has successfully supplied technical support to state agencies, various legislative boards, the general public, as well as large international mineral and oil/gas exploration efforts in the State.

It has been Chuck's sense of professional responsibility, integrity, and commitment to fulfill these roles that have allowed him to be such a memorable addition to the line of Vermont State Geologists. Twenty years ago there were no full-time practicing geological consultants in the State of Vermont. Today, I would hesitate to count that number. When you add this group of professionals to the geologists that are active in the education systems, as well as those working in state agencies, engineering firms, and other service groups, there is a large number of geologists who have utilized Chucks' assistance. We all owe him a great big thanks for his support.

Lance Meade
Senior Geologist
Cyprus Industrial Minerals Co.

Dear VGS members:

The Vermont Mapping Advisory committee (VMAC, "V-MAC") was instituted in 1952 between the U.S. Geological Survey and the State of Vermont. As head of mapping in the Department of Highways, I was its first chairman. Initially its function was to ascertain the various state agencies' needs for topographic maps produced by the U.S.G.S. It lapsed into quiescence after a number of years, but in the 1970's was revived as the forum for the mapping needs of all map makers and map users in Vermont: state, private, academic, and utilities.

At that time, then Governor Richard Snelling appointed the state geologist ex-officio VMAC chairman. This was Chuck, and we worked through several successive chairmen until I retired from VMAC in 1989 or so.

I found Chuck to be knowledgeable, dedicated to the cause, very effective, and a pleasure to work with. His incisive, inquisitive mind and attitude, both as VMAC chairman and as an ordinary member were most instrumental in increasing VMAC's viability and effectiveness. I also got to know him personally and socially. Looking back, as his retirement occasions, I can say he has been a great guy to have been associated with and I shall miss him and emphatically wish him and Judy, his lovable wife, the very best.

Emerson F. Baker
Retired Director
Vermont Mapping Program

Dear Chuck,

Bon Voyage and best wishes to Judy and you as you depart this rocky Green Mountain outcrop for the blue/greener grass of Kentucky.

With a large lump in my throat I recall those pleasant times at the Vermont Mapping Advisory Committee meetings which you chaired so well. I remember too, those informative and fun field trips to examine rock slides and gravel pits. I am especially grateful for the support and advice which you gave to our groundwater program.

I am confident that your work and kindly spirit will be long remembered and appreciated here in Vermont. Come back soon.

Dave Butterfield
Vermont Dept. of Envir. Cons.
Water Supply Division

STATE GEOLOGIST'S REPORT

Charles A. Ratté
Vermont State Geologist

New Publications

The U.S.G.S. has recently published a new Geologic Quadrangle Map and text: *Bedrock geologic map of the Woodford Quadrangle,* by William C. Burton, GQ 1687. This map is available for $3.60/copy from: U.S.G.S. Map Distribution, Box 25286, Federal Center, Denver, CO 80225.

Also from the U.S.G.S. is Charles Baskerville's new 1:250,000 map titled: *Vermont Landslide Map—Digital Version;* Open File Report 90–621.

Geologic Mapping Act of 1991

A new bill designed to promote the production of a "...geologic-map information base for the Nation..." is being considered by the Senate. This bill would put the U.S.G.S. in charge of the "...overall management of the nationwide mapping program...." Members are encouraged to obtain a copy of S.1179 and to contact Senators Leahy and Jeffords to encourage their support.

VERMONT GEOLOGICAL SOCIETY BUSINESS AND NEWS

Executive Committee Minutes

April 27th, 1991, Middlebury College

Present:
Stephen Wright, Brad Jordan, Shelley Snyder, Bruce Wilson, Ron Parker, Chris Stone, Steve Howe, Barry Doolan.

The meeting convened at approximately 12:45 immediately after the VGS Spring Presentation of Student Papers and an excellent catered lunch.

Meeting Summary:
Much discussion was centered around the involvement of the VGS and it's membership in the Spring 1993 Northeastern GSA meeting to be held in Burlington. A general request was sounded to solicit topics for symposia. Those who may have such ideas should contact Dave Elbert at Middlebury College. Also voiced was a general call to the membership to volunteer time and energy to various GSA committees. A blank form is likely to appear in upcoming issues of the GMG requesting such assistance. Don't hesitate!

The Spring student presentation meeting was discussed. It was determined that not enough information was available to prospective student researchers to encourage them to submit abstracts. It was decided that students should be informed that an award is available. An increase in the award was considered to be a necessary and appropriate adjustment. A little information on the method of judging may increase the consistency of student talks. Additionally, all students should be referred to "A Scrutiny of the Abstract" by Kenneth Landes republished in the Winter 1991 issue of the *GMG* (pp. 22–23).

Brad Jordan brought forward the concept of a VGS funded Grant-In-Aid of Research. Such a grant would be awarded to worthy graduate or undergraduate students based upon the merit of their applications and their need. The program would be administered in similar fashion to Grant-In-Aid programs run by the GSA or Sigma Xi. The institution of a Grant-In-Aid program would benefit the VGS by allowing it to ascend to a greater level of professionalism, by funding additional research in Vermont-related topics of geologic endeavor, and by fostering research for future student presentations.

An obvious requirement preceding a Grant-In-Aid program is the generation of sufficient investment capital to yield the necessary annual return. A secondary necessity is the development of the program guidelines. It was

agreed that funds should be solicited from outside sources such as consulting firms, industrial concerns, lending and investment firms, charitable foundations, etc. Additional options may include an increase in membership dues. Please contact any of the Executive Committee members if you have any insight to offer regarding this proposal.

The meeting concluded at 1:50 PM.

Respectfully and Jovially Submitted
Ronald L. Parker

Future Meetings and Publication Deadlines

The fall field trip will will be led by Rolfe Stanley and Char Mehrtens and will take place in northwestern Vermont on Saturday October 5. The annual meeting and banquet will follow the field trip. More details will be forthcoming in the Fall *GMG*.

Members wishing to submit material for publication in the Fall *GMG* should do so by September 9.

Public Issues Commentary — A Thank You to Chuck Ratté

On the occasion of Dr. Charles A. Ratté's retirement as Vermont State Geologist, I offer some observations. I first met Chuck Ratté over a decade ago, ...and up the thick wooded slopes of Okemo we did go. Back then, potential uranium mining was a 'hot' public issue. During and after graduate school, I became more aware of Chuck's wide ranging interest in and support of mapping and other research projects at many levels, both in this state and others. This interest ranged from elementary school earth science education to graduate, faculty and major government research projects.

I believe that during the past 15 years, Chuck has been the state's greatest contributor to the understanding of geologic "public issues." As State Geologist, he has worked on a myriad of difficult topics, somehow maintaining a balanced, unbiased perspective. Chuck has been a true advocate for the environment, including continual contributions to the Act 250 land use process; planning efforts; rock, mineral, soil and water resource use; and waste (many types of) disposal issues. In this role he has communicated with a wide range of other government agencies and personalities including representatives from local, state, national, and international governments. On the legislative front, Chuck has often provided needed guidance and understanding of geologic subjects that directly affect Vermonters. From well-established, classical geologic mapping to

the latest in computer-based geographic information system developments, Chuck's efforts have evolved to meet the needs.

Through all of this, Chuck's warm and friendly personality stands out. A quick glance through old *GMG's* shows the wealth of contributions Chuck has made to the Vermont Geological Society. With fond memories of the view from the top of the Green Mountains and the ice cold water at Buttermilk Falls, I recall hearing that 'Okemo' is a word of Native American origin, meaning "All Come Home." Closing with thanks and wishing Chuck the best of luck in his next endeavor, I hope he will 'come home' to Vermont from time to time in the days to come.

Eric Lapp
Public Issues Committee

SEMINARS, MEETINGS, AND FIELD TRIPS

August 17: Vermont Geological Society Summer Field Trip: *Slope failure in Vermont, Sharon to Smuggler's Notch.* Trip Leader Dr. Charles A. Baskerville.

September 28–29: New England Intercollegiate Geological Conference. The 1991 NEIGC conference will be in Maine and is being organized by Allan Ludman of Queens College.

October 5: Vermont Geological Society Fall Field Trip: *Structure and Stratigraphy in the northern Lake Champlain Valley and Green Mountains*

April 1992: New England Section of the National Association of Geology Teachers (NAGT) will be meeting at Johnson State College, Johnson, Vermont.

GREEN MOUNTAIN GEOLOGIST
VERMONT GEOLOGICAL SOCIETY
P.O. BOX 304
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Please send it to the Treasurer at the above address.

THE
GREEN MOUNTAIN GEOLOGIST

QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

FALL 1991 VOLUME 18 NUMBER 3

Structure and Stratigraphy of Northwest Vermont

Field Trip with
Char Mehrtens and Rolfe Stanley

Vermont Geological Society Annual Meeting and Banquet

Guest Speaker
George Davis, President, University of Vermont

SATURDAY OCTOBER 5, 1991, 9:30 AM

Meeting Place: The field trip will start at the Apple Barn on the east side of the Village of South Hero. Members can car pool from here.

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PRESIDENT'S LETTER

Dear Members,

The fall field trip/annual meeting is two short weeks away. Char Merhtens and Rolfe Stanley of UVM will lead the fall field trip. George Davis, geologist and President of UVM, will be a guest of **VGS** on this field trip and will give the keynote address following the Annual Meeting. This promises to be an exciting and educational trip. Details on the trip and meeting are published further on in this issue of the *Green Mountain Geologist.*

The **VGS** wants to extend a particularly warm thanks to Charles Baskerville for leading this summer's field trip to view recent examples of slope failure and catastrophic erosion. It was a beautiful day and all those who attended were treated to some real time examples of earth science in action. The field trip was capped off with a fine barbecue at Ron Parker's house.

In the previous *GMG,* I brought up two issues that have been on my mind during my term as president. The first issue was the development of a scholarship or grant for funding undergraduate work in the Earth Sciences. Through the year members of the executive committee and I have discussed this idea with a number of our members and have received a universally positive response. The funding mechanism for this grant would be a nominal increase in dues to the **VGS.** This increase requires a vote by the membership in the form of a bylaw amendment. The amendment is included in this issue of the *GMG.* Please review it and come to the annual meeting to discuss and vote on it.

The second issue that I discussed last time revolved around extending the term of the **VGS** presidency from one to two years. Because the **VGS** has no paid staff and because the executive meeting meets at most six times a year, it is very difficult to get much accomplished. Having talked to other presidents and long-time members I kept on hearing how one year really limits the effectiveness of a president's ability to accomplish much. For that reason I suggested that the Society consider a longer term for the president. Bruce Wilson, our current Vice-President interviewed eight former presidents to get their opinions. (The results of Bruce's effort published in this issue of the *GMG.)* At our most recent meeting

the Executive Committee discussed this issue and concluded that the current bylaws allow for a President to serve more than one term. We concluded that should a President desire and the Nomination Committee concur then a current president can run for a successive term and be elected. Speaking on behalf of the Executive Committee, I would like to emphasize that there is no rule that limits a President to one term. We would like to encourage future Presidents to consider this possibility.

My term will come to a close at the upcoming annual meeting. First, I wish to thank all the individuals, members and non-members, who have contributed to the Society by presenting papers, leading field trips, writing pieces for the *GMG,* or just sharing ideas. It has been a particularly rewarding year and I have enjoyed meeting, working, and talking to each and every one of you. Bruce Wilson is the sole candidate for President, and therefore most probably will be elected to that office. He has already begun some very significant initiatives for the '93 GSA. He will talk about this at the annual meeting and in forthcoming *GMG's*.

See you at the Fall Field Trip and Annual Meeting.

Sincerely,

Chris Stone
Montpelier, VT

1991 FALL FIELD TRIP

Structure and Stratigraphy of Northwest Vermont

Saturday October 5, 1991, 9:30 AM

Char Mehrtens and Rolfe Stanley
Department of Geology, University of Vermont

This year's annual Fall Field Trip will begin on South Hero Island. We will meet and pool cars at the Apple Barn in the Village of South Hero. Participants can get food and coffee here. The first field stop will be at Lessor's Quarry. We will then visit "The Beam", travel north to St. Albans, circle back south to look at rocks in Fairfax and Milton, and end up at the Salmon Hole. Writeups to most of these field stops can be found in the 1987 NEIGC field trip guidebook, copies of which are available through the geology office at UVM or through Dave Westerman at Norwich University.

and uranium, low-level nuclear waste, mining, and oil and gas exploration all found a home under Chuck's watchful eye.

Through various programs, Chuck worked to encourage and fund field personnel actively engaged in mapping the geology of Vermont. He maintained good relationships with geologists at various colleges and universities in Vermont and in other states. During Chuck's years as State Geologist, he encouraged new mapping and research projects and worked to compile a new bedrock geologic map for the State of Vermont. Although the field work for this map has not been completed, significant areas of the state have been remapped and progress has been made toward compilation of a new map. One hundred years passed between the completion of the original geologic map of Vermont and the publication of the 1961 *Centennial Geologic Map of Vermont.* With the dedication and perseverance of the current geologic mappers in the state, and the pressing need for updated geologic information in Vermont, it can only take less time to complete the next bedrock map. The final compilation and publication of this map remains as a challenge to the next State Geologist.

This is but a partial list of the accomplishments of Chuck Ratté during his fifteen years as State Geologist. Many more achievements could be enumerated and embellished upon. The list would be long and impressive, a statement of the concrete results of his actions. Chuck, who was never loud or forceful, managed to get some very important tasks accomplished in his quiet ways. These are results that everyone connected with geology in Vermont will benefit from for quite some time to come.

I hope this letter can at least attempt to do justice to the many achievements that our retiring State Geologist has produced. It is sometimes difficult to be eloquent when faced with a deadline. Whether I have accomplished my dual purposes in writing this letter or not is immaterial. If nothing else, I *will* say "Thank you, Chuck!" and state, for the record, that I feel privileged and proud to have had the opportunity to work with, and know, Chuck Ratté.

Sharon B. O'Loughlin

Comment on Chuck Ratté

My first experience with Chuck was as a graduate student at the University of Rhode Island. I was trying to find a job in a state survey by applying to all of those who that were listed in *Geotimes*. After receiving form letter after form letter, I received a handwritten letter from a State Geologist who took the time to describe his need for more personnel and his frustration with the lack of funding. It concluded with a sincere wish for my career search that left me wishing I could work for him for free. Thanks Chuck.

Brad Jordan

VERMONT GEOLOGICAL SOCIETY BUSINESS AND NEWS

New Members

We want to welcome the following new members who have joined the Vermont Geological Society since the Spring *GMG* was published:

Joanne M. Calvi	Fair Haven, VT	Public Health Nurse Interests in river & wetland ecology
Diane L. Conrad	Essex Jct., VT	Vermont State Geologist
Werner W. Gansz	Stow, MA	Engineer, Raytheon Co. Interest in oil shale extraction techniques

Changing your address?

Every so often, issues of the *Green Mountain Geologist* are returned because a member has moved and their forwarding address is either unknown, or expired. Please include the VGS on your list of people to inform if you are planning an address change. By the way, if anyone knows the whereabouts of Layne Millington or Sally Tacy, please tell them to let us know where they are!

Treasurer's Report

As of September 1st, the VGS is 190 members strong. A "breakdown" of the membership reveals: 158 full members, 7 associate members, 10 student members and 15 institutional members (mostly U.S. and foreign libraries). As of this late date, 83% of the membership have paid their dues, contributing to our current holdings of $2,627.63.

Contributions

We recently received a contribution of $25.00 from the **Vermont Timberland Owner's Association, Inc.** in the name of **Craig Ileindel**. Craig gave a geologic talk and tour to their organization and asked that a contribution be made to the VGS in lieu of a speaker's fee. Thank you Craig, for your kind gesture!

From the Mailbag...

The University of Vermont is offering **Geographic Information System (GIS) training courses** for Fall, 1991. Instructors Gary Smith and Eileen Powers will offer courses on Information Management with GIS (Sept. 19, Oct. 16 & Dec. 3); Introduction to PC ARC/INFO (Sept. 25–27 & Dec 11–13); Programming with SML (Oct. 17–18); Introduction to NETWORK (Nov. 7–8); and Advanced ARCEDIT (Nov. 19–20). The courses will take place in the UVM GIS Lab, a newly-equipped facility featuring 12 386/25 MHz work stations. For more information contact the GIS Training Coordinator at (802) 656-2085 (1-800-639-3210 VT/NH).

Elsevier Science Publishers lists their publications in four separate catalogues: Applied Earth Sciences; Geology, Geochemistry, and Geophysics; Water Science, Soil Science, and Geomorphology; and Oceanography & Atmospheric Sciences. To request one or more of their 1991 catalogues, write to: Direct Mail Dept., Elsevier Science Publishers, P.O. Box 211, 100 AH Amsterdam, The Netherlands.

Many of you are familiar with the Decade of North American Geology Project (DNAG) involving the publication of synthesis volumes and maps summarizing the geology and geophysics of North America and surrounding ocean areas, published by the Geological Society of America. The **National Geophysical Data Center** has made several contributions to this project and also serves as a distribution center for much of the resulting digital data. Data used to produce the magnetic and gravity anomaly maps of North America, as well as seismicity, crustal stress, thermal aspect data for North America are available in a variety of formats including magnetic tape and IBM-PC compatible diskettes. The entire data set is also available on compact disc. Contact the NOAA/National Geophysical Data Center, 325 Broadway, Boulder, CO, 80303, or call 303-497-6419. For information about the DNAG publications call 1-800-GSA-1988.

Brad Jordan

Executive Committee Minutes

September 6, 1991, Johnson Company Offices, Montpelier, Vermont

Present:

Chris Stone, Bruce Wilson, Stephen Wright, Brad Jordan, and Larry Gatto

The meeting convened at approximately 6:45 P.M. Stephen Wright agreed to serve as Secretary in Ron's absence.

Meeting Summary:

The meeting opened with nominees confirmed for open positions on the executive committee. No one has yet accepted the nomination of secretary. These nominees will be on the ballot for election during the annual fall meeting.

Stephen summarized the status of the fall field trip, annual meeting, and keynote address. Ron Parker had previously suggested the Deja Vu restaurant as a good location for the banquet and annual meeting and the committee agreed to make a reservation for the Society.

Chris discussed the proposal for a student research grant. The grant would be available to students from Vermont colleges, regardless of their research topics, and to students from colleges outside the state working on research projects in Vermont. The grant will be announced in the Winter, awarded during the Spring Meeting, and the recipient of the award will be asked to present their work during the following Spring meeting. The grant will be initially funded through a dues increase. The following motion to amend the bylaws was made and unanimously passed:

Article II Dues

A. Dues for members and associate members shall be *$15.00* for each fiscal year *of which $5 shall be devoted to the Vermont Geological Society Student Research Grant.*
B. Dues for student members shall be *$8.00* for each fiscal year *of which $3 shall be devoted to the Vermont Geological Society Student Research Grant.*

Stephen reviewed the contents of the Fall *GMG*. It was decided to wait until the Winter issue to put together a tribute to Wally Cady. An extensive proposal concerning the Society's role in sponsoring the upcoming Northeastern Section meeting of the G.S.A. was prepared by Bruce Wilson. The executive committee decided to wait until the Winter meeting of the executive committee to fully discuss Bruce's proposals.

Chris suggested that future issues of the *GMG* have a particular focus and that one person, besides the editor, be in charge of putting together one or more articles on that topic. Larry agreed to make the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, New Hampshire the focus of the Spring 1992 issue of the *GMG*.

The meeting adjourned at 9:15 PM.

Respectfully Submitted
Stephen Wright

Two Year Presidency

I polled 8 past presidents and two others who had been active on the executive committee for several years. The following is a summary of the various comments, opinions, and suggestions that the various people had to make. The number in parentheses before the sentence is the number of people who made essentially the same comment (although usually in different words).

Arguments favoring a 2 year term:

(4) The president needs more time to get his/her feet on the ground or get a program established.
(2) It is too easy for the vice president not to do anything because the president handles all the duties of the office.
(1) The two year term provides better continuity in the organization.

Arguments favoring retaining the one year term:

(4) It is easier to find someone willing to serve only one year.
(2) One year term gets more people involved.
(2) The vice president inheriting the role of the president provides the needed continuity.
(1) Many potential presidents don't have a program, just a willingness to serve (the idea of the "citizen legislator").
(1) There didn't seem that much to the job that requires two years of preparation.
(1) A 2-year president may fine him/herself over committed after one year.
(1) We may be stuck for a longer time with a poor/inactive two-year president than one serving one year.
(1) Involvement and accomplishing things doesn't require being president.

Alternate suggestions to the proposal:

(1) Have the vice president be the president-elect, formalizing tradition.
(1) Have the vice president work on some aspect of the president's duties that he/she is interested in pursuing as president.
(2) Allow a president to a serve a second term if he/she has the desire to, or the nominating committee wants them to.
(2) We need to consider the logistics of any change; when will such a change go into effect and which president will it affect; will this require a two year vice presidency and a 4-year board of directors stint (a lot of time)?

Bruce Wilson

Future Meetings and Publication Deadlines

The "Call for Abstracts" for the Winter meeting and "Dues Notice" for 1992 will be mailed in early December. Members wishing to submit material for publication in the Winter *GMG* should do so by **January 10.**

STATE GEOLOGIST'S REPORT

Diane Conrad
Vermont State Geologist and Director of the
Geology and Mineral Sciences Division, Agency of Natural Resources

With the retirement of Chuck Ratté as Vermont's State Geologist, and my assignment as the new State Geologist , new directions for the Office are in the making. As many of you are aware, the Agency of Natural Resources has recently undergone an Agency-wide program review to determine the appropriate functions of Divisions and Departments within the Agency. I am pleased to announce the following proposed changes for the Geology and Mineral Sciences Division, changes that we hope will move the Division closer to a "State Geological Survey."

Building on the solid program foundation established by Chuck Ratté, three programs would be combined in the Geology and Mineral Sciences Division under the direction of the State Geologist—the State Geology program, the Agency Geographic Information Systems program, and the Radioactive Waste Management program. There are many gains to be made from such a merger. Primary among these is the consolidation of programs with similar functions. The State Geologist's office would then become a "clearinghouse" for mapping efforts across the Agency and other parts of state government, thereby enhancing its state-wide geological information coordination efforts and its capacity to serve the public. The merger also makes a diverse group of people available for all three programs, including engineers, a computer guru, a data base specialist, two geologists, a hydrogeologist, an attorney, an education and information specialist, and support staff. In addition, funding is available for digitizing information once it has been collected. For example, we recently were granted funds for digitizing sand and gravel deposits in Vermont as part of a Northeast Governors Conference project.

We plan to continue to expand our mapping initiatives under the COGEOMAP program with the U.S.G.S. Our priority remains the completion and production of a new bedrock geology map for Vermont, and updating topographic maps across the state as needed. A long range goal is mapping "groundwater as a resource", an enterprise not yet attempted in Vermont. We will be seeking new sources of funding to inaugurate this effort in the next several months.

We intend to continue our cooperative effort with Vermont's mining industries to promote innovative and environmentally conscious mining in the state. Our involvement with the Act 250 process will also continue, as we review

We hope that our new initiatives and continued endeavors meet with your acceptance and enthusiasm. Included in this publication is a "clip and return" flier announcing the formation of a new Vermont Geology Advisory Committee. We urge anyone who is interested in participating to send in your name, and help us determine directions for the new Division. I'm looking forward to working with you.

Office of the State Geologist

Vermont Agency of Natural Resources

The Geology and Mineral Sciences Division wants your expertise. We are soliciting individuals for a Vermont Geology Advisory Committee, which will work toward assessing ongoing and changing geological needs across the state.

We anticipate the new advisory committee will meet quarterly.

If you are interested in joining the committee, please fill out, detach, and mail the form below to:

Office of the State Geologist
103 South Main Street
W aterbury, VT 05676

For more information, call 244-5164

Yes, I am interested in becoming a member of the Vermont Geology Advisory Committee.

Name:_____

Address:_____

_____

Phone:_____

SEMINARS, MEETINGS, AND FIELD TRIPS

September 23: University of Vermont Fall Seminar Series (4 P.M.): *"Mesothermal Gold Deposits"* Dr. Bruce Taylor, University of Ottawa.

September 28–29: New England Intercollegiate Geological Conference. The 1991 NEIGC conference will be in Maine and is being organized by Allan Ludman of Queens College.

October 5: Vermont Geological Society Fall Field Trip: Trip Leaders Rolfe Stanley and Char Mehrtens, *Structure and Stratigraphy in the northern Lake Champlain Valley and Green Mountains*

October 7: University of Vermont Fall Seminar Series (4 P.M.): *"The Origin of Ocean Floor Basalts"* Dr. Paul Hess, Brown University.

October 28: University of Vermont Fall Seminar Series (4 P.M.): *"Ecologic Succession as an Aspect of Structure in Fossil Communities"* Dr. William Parker, Florida State University.

November 18: University of Vermont Fall Seminar Series (4 P.M.): *"The Gulf Stream as a Geologic Agent in the Evolution of the North American Continental Margin"* Dr. Paul Pinet, Colgate University.

ABSENTEE BALLOT: 1991
Vermont Geological Society

Officers:

President	Bruce Wilson	_____
	_____	_____
Vice-President	Lucy Harding	_____
	_____	_____
Secretary	To be Announced	_____
	_____	_____
Treasurer	Brad Jordan	_____
	_____	_____

Board of Directors (2-year term):

Les Kanat	_____
_____	_____

Shall the following amendments to the Bylaws of the Vermont Geological Society be made? Changes are shown in italicized type.

Yes_____ No____

Article II Dues

A. Dues for members and associate members shall be *$15.00* for each fiscal year *of which $5 shall be devoted to the Vermont Geological Society Student Research Grant.*

B. Dues for student members shall be *$8.00* for each fiscal year *of which $3 shall be devoted to the Vermont Geological Society Student Research Grant.*

If you will not be attending the VGS Annual Meeting in Burlington, please complete this ballot and return it in an envelope marked with the work "BALLOT" in the lower left hand corner and your name and address in the upper left hand corner to:

Ron Parker, Secretary
Vermont Geological Society
P.O. Box 304
Montpelier, VT 05602

To be counted, this ballot must be received by October 4, 1991.

The "Lone Pine" in the Allard Brothers gravel pit, north of Brattleboro, Vermont, is the highest point in the gravel pit and was formerly visible from I-91. First described by Fred Larsen in 1983, this prominent tree's base marks the topset-foreset contact for a large ice-contact delta which was deposited in Glacial Lake Hitchcock as the Wisconsin ice sheet retreated up the Connecticut River Valley. As with most topset-forset contacts measured in the Brattleboro area by Larsen and Koteff (1988), the elevation of the contact is about 3.6 m below the lake's "water plane" which they determined from ice-contact deltas in the valley as a whole.

Below the tree are sandy (resistant) and gravelly (slumped) foreset beds which dip to the south (right). As late as spring of 1989, thin gravelly topset beds could be seen at the base of the tree and extending to the photo's left. These have been removed by gravel extraction, a fate which has recently befallen the tree itself. Photo by Jackie Linton.

Bruce Wilson

Larsen, F.D., 1983, Morphosequences in the Brattleboro, Vermont Area; Field Trip B, NAGT New England Section, 31st Annual Meeting.

Larsen, F.D. and Koteff, C., 1988, Deglaciation in the Connecticut Valley: Vernon, Vermont to Westmoreland, New Hampshire; Field Trip A-6, NEIGC 80th Annual Meeting Guidebook, Keene, New Hampshire.

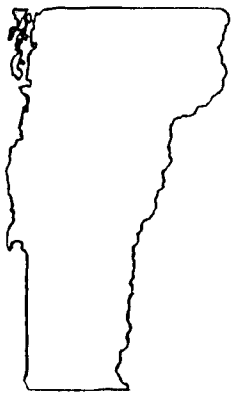
GREEN MOUNTAIN GEOLOGIST
VERMONT GEOLOGICAL SOCIETY
P.O. BOX 304
MONTPELIER, VERMONT 05601

The *GREEN MOUNTAIN GEOLOGIST* is published quarterly by the Vermont Geological Society, a non-profit educational corporation.

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

THE

GREEN MOUNTAIN GEOLOGIST



QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

WINTER 1991 VOLUME 17 NUMBER 4

Vermont Geological Society's

Annual Winter Meeting

SATURDAY FEBRUARY 23, 1991, 9 AM

UNIVERSITY OF VERMONT, BURLINGTON, VT

Room 004 Kalkin Building

Directions: Kalkin Building lies immediately behind the Perkins Geology Building. Both are accessed from Colchester Ave. Room 004 is one of the basement rooms. The parking lot immediately in front of Perkins Hall will be available for VGS members attending the meeting.

Table of Contents

PRESIDENT'S NOTE

I am honored to be President of this society. During my involvement with the VGS I have seen a dedicated group of individuals who share a strong interest in advancing the science of geology and related disciplines for the benefit of a wide cross section of people. Those who have benefitted range from elementary school students to users of state-of-the-art computer technology.

Equally impressive is the diverse disciplines that our membership encompasses. This includes educators at the elementary, secondary, and college levels and also government officials, public interest groups, private consultants, researchers, and economic geologists.

I would like to begin my term by thanking both Brew Baldwin and Andy Raiford for leading us on a well organized field trip to some classic Taconic field sites on a splendid fall day. The luxury of having a prepared field guide to accompany the trip was especially appreciated. Special thanks are also extended to Mike Hussey and Duncan Ogden for facilitating our tour of OMYA's quarry in Middlebury before the banquet. Dave Westerman presented a stimulating talk on the emplacement history of granites on an island off the western coast of Italy that led many of us to think of taking up Mediterranean geology more seriously.

One purpose of the society is to develop communication between and among those interested in the science and profession of geology. In my term as president I would like to support and expand some of the great initiatives that have evolved over the past 17 years. Enduring accomplishments have included:

- Publication of *Vermont Geology*
- Symposia on topics important to Vermont geoscientists
- Professional scientific meetings
- Field trips showing the full gamut of geological sciences in Vermont
- Meetings for students to present their work
- The quarterly publication of the *Green Mountain Geologist*
- Educational scholarships for students

All of these efforts have been successful not just because of the executive committee, but because of a broader involvement by this membership. To continue this tradition of involvement and success, we cordially invite you to join us at the executive meeting which follows the winter meeting. Bring your ideas, energy, and commitment and we'll see what new and fulfilling goals the Society can accomplish in this and in the following years. I look forward to seeing you at the winter meeting and upcoming society functions.

Sincerely,

Chris Stone
Montpelier, VT

WINTER MEETING PROGRAM

February 23, 1991, Rm. 004 Kalkin Building, University of Vermont

8:30 **Coffee**

9:00 **Peter A. Nielsen:** *Fluorite, goethite, and sulfide mineralization associated with Triassic rifting—Southwestern New Hampshire*

9:20 **Judith Hannah:** *Are major ore deposits genetically linked to calderas? An example from the Tintic Mining District, Utah*

9:40 **Joseph J. Hayes:** *Acidification of surface water and groundwater by sulfide mineral oxidation*

10:00 **David S. Westerman:** *The Stowe and Moretown Formations: Transformation of a single sedimentary unit into two mappable formations*

10:20 **Rolfe Stanley:** *Palinspastic Analysis of the Ultramafic belt, Northcentral Vermont*

10:40 **Coffee**

11:00 **Shelley F. Snyder and Mary Sullivan:** *New Haven River Project*

11:20 **Paul E. Grams:** *Degradation of alluvial sand deposits along the Snake River below Hells Canyon Dam, Hells Canyon National Recreation Area, Idaho*

11:40 **Douglas M. Thompson:** *The Effects of large organic debris on sediment processes in the Green Mountains of Vermont*

12:00 **Lunch:** *Deli sandwiches, salads, and desserts will be prepared by a caterer for the meeting. A donation of $3–$5 will cover the cost of lunch.*

1:00 **Lawrence W. Gatto:** *Reservoir bank recession in the Connecticut River Basin, New Hampshire and Vermont*

1:20 **Patricia L. Manley:** *Side-scan targets in Lake Champlain—Evidence of active sedimentary processes*

1:40 **Don Maynard:** *Deglaciation sequences in a small south-facing valley near Kents Corner, Calais, Vermont*

2:00 **Bernard J. Franks, Steven Goldberg, and Julie Hackbarth:** *An overview of the Vermont landfill assessment program*

2:20 **Sally Tacy:** *Environmental liability issues—Who is responsible?*

2:50 **VGS Executive Committee Meeting:** *All members are invited to attend!*

WINTER MEETING ABSTRACTS

AN OVERVIEW OF THE VERMONT LANDFILL ASSESSMENT PROGRAM

Franks, Bernard J.*, Goldberg, Steven P.*, and Hackbarth, Julie**, *Wehran Engineering, 1 Mill St., Burlington, Vermont 05401, **Vermont Department of Environmental Conservation, Waterbury, Vermont, 05676

Act 78 of the 1987 Vermont Legislative Session required the State of Vermont Department of Environmental Conservation (VDEC) to assess the existing or potential environmental impact of municipal landfills which were operating or certified to operate on July1,1987. The Vermont Landfill Assessment Program (VLAP) divided the State into five regions containing a total of 47 landfill sites for further investigation. The purpose of VLAP is to provide a comprehensive, state-wide assessment of the landfills in Vermont. The program is directed at evaluating the environmental impacts from each landfill as opposed to a detailed hydrogeologic study of each site.

Phase I, hydrogeologic data acquisition, is now complete for 24 of the landfill sites. An assessment strategy was developed for each site to facilitate data acquisition and comparison of data among different sites. Tasks included inventory and evaluation of existing data, site reconnaissance and walkover, aerial photographic interpretation, surface geophysical surveys, photogrammetric mapping, monitoring well installation, hydrologic testing, and interpretation of data. Phase I is being followed by collection and review of water quality data and preparation of a final report evaluating environmental impacts of each landfill.

The Palisades Landfill, adjacent to Route 2, near Moretown, Vermont, is used as an example of the VLAP program. The site is underlain by surficial sand and gravel deposits. Phyllites and schists of the Ordovician Stowe Formation underlie the surficial deposits at a depth between 0 and 74 feet below land surface. Groundwater in the surficial deposits flows generally to the north, with a gradient of about 0.1 ft/ft. Mean hydraulic conductivity of the overburden is 3 x 10^{-3} cm/s.

RESERVOIR BANK RECESSION IN THE CONNECTICUT RIVER BASIN, NEW HAMPSHIRE AND VERMONT

Gatto, Lawrence W., U.S. Army Cold Regions Research and Engineering Laboratory, 72 Lyme Rd., Hanover, NH 03755

Most reservoirs in the upper Connecticut River Basin were built primarily for flood control, but they also supply water, support recreation, enhance habitats, and provide water for hydropower. Bank erosion is a concern along some of the reservoirs because it causes loss of land, disrupts shoreline habitats, destroys

cultural resources sites, and introduces sediment into the reservoirs which can subsequently degrade them for their intended uses.

The objective of this study was to evaluate recession at selected sites so as to provide insights into the likely causes of erosion and recession at other reservoirs within northern New England. Bank conditions were documented at 8 sites along five reservoirs. Bank sediments at the sites were commonly fine to medium silt over very fine silts and clays. Sands and gravels occur at the top of a few banks. Vegetation landward of bank crests was mixed forest, brush, and grasses. Recession was measured with 11 bank profiles and 4 bank crest maps on three reservoirs. Recession rates varied among profiles and averaged 0.1–1.5 ft/yr.

Positive pore water pressure, fall and spring freeze-thaw processes, channelized surface runoff, and winter sloughing are major causes of bank erosion at the sites. Sediment eroded from the banks and deposited at the bank toe is removed by waves and currents when water levels are high. This removal prevents banks from reaching stable slopes allowing erosion to continue. Changes in reservoir water-level fluctuations may reduce the amount of annual erosion and recession.

DEGRADATION OF ALLUVIAL SAND DEPOSITS ALONG THE SNAKE RIVER BELOW HELLS CANYON DAM, HELLS CANYON NATIONAL RECREATION AREA, IDAHO

Grams, Paul E., Department of Geology, Middlebury College, Middlebury, Vermont 05753.

The number and area of sand bars along the Snake River in Hells Canyon has decreased by over 75 percent following closure of 3 large upstream dams completed between 1957–67. Five aerial photograph series taken between 1955–82, supplemented by field work conducted in summer 1990, document these changes.

The greatest amount of sand-bar erosion occurred between 1964–73, during a period when 3 clear-water spillway floods occurred, each exceeding the pre-regulation mean annual flood by more than 20 percent. The rate of sand-bar erosion decreased thereafter, however change only became negligible after 1982. Erosion of high terraces still continues at some sites.

The erosion of sand-bars in Hells Canyon greatly exceeds the erosion of similar eddy-system bars in Grand Canyon downstream from Glen Canyon Dam. The primary difference in regulation of these two rivers is that the ratio of total reservoir storage to mean annual flow is much lower on the Snake River. Therefore, the flood-control potential is much less. In fact, post-dam floods in Hells Canyon are similar in magnitude and frequency to those prior to regulation. In Grand Canyon, flood control is much greater and few large clear-water floods have occurred. The contrasting styles of downstream response in sand-bar change suggest that high magnitude flows in a sediment-starved system have been the primary erosive force in Hells Canyon.

ARE MAJOR ORE DEPOSITS GENETICALLY LINKED TO CALDERAS? AN EXAMPLE FROM THE TINTIC MINING DISTRICT, UTAH

Hannah, Judith L., Department of Geology, University of Vermont, Burlington, VT 05405

Exploration for hydrothermal ore deposits depends on thorough knowledge of sources for heat and ore fluids, and of the geometry of the hydrothermal system. Mature caldera systems offer all of the necessary components to create an ore deposit, and serve as a possible model for several important ore deposit types. The Tintic mining district hosts major base- and precious-metal deposits produced by a complex magmatic/hydrothermal event, including caldera collapse and resurgence, which invaded deformed Paleozoic carbonate rocks in early Oligocene time. Caldera-related processes and ore genesis are clearly linked both spatially and temporally in the Tintic district. Moreover, calderas and ore deposits are spatially related throughout the 170-km-long Tintic-Deep Creek Mineral Belt.

Recently defined lithologic sequences in the East Tintic Mountains were produced in six magmatic episodes: (1) construction of an early rhyolite dome field; (2) growth of small andesitic stratocones; (3) two phases of explosive volcanism and caldera collapse, leaving an 8-km-wide semicircular depression filled with at least 1 km of latite tuff and lacustrine siltstone; (4) eruption of post-caldera latite tuff during early resurgence; (5) extensive post-caldera magmatism producing monzonite intrusions both within and along the margins of the caldera (notably, the Silver City Stock); and (6) eruption of post-resurgent latite flows and tuffs. Mineralized areas are spatially and temporally correlated with intrusions of episode 5.

Different ore deposit types comprising the four Tintic sub-districts (Main, East, North, and Southwest) were the result of varying host rock, depth, and distance from the source of mineralizing fluid. The major polymetallic replacement deposits of the Main and East Tintic districts are spatially related to the Silver City Stock and its many satellite intrusions. Carbonate rocks in these districts host polymetallic vein and replacement deposits that display lateral and vertical zonation from Pb- and Ag-rich to Zn- and Mn-rich with increasing distance from the Silver City Stock. The Main Tintic ores are dominated by argentiferous galena and sphalerite; the distal North Tintic ore consists largely of carbonate-hosted, secondary, oxidized Pb and Zn minerals. Fractured and brecciated quartzite, notably in the East Tintic district, hosts economic gold with quartz + pyrite + barite gangue; the nonreactive quartzite host rock limits alteration and may inhibit precipitation of other metal sulfides. The marginal intrusions, including the Silver City Stock, contain quartz veins that locally host Au and Cu sulfides. Finally, in the Southwest Tintic district, a primary Cu-Mo stockwork cap is present above a porphyry intrusion at about 3000' depth; weathering has produced a secondary supergene Cu-enrichment blanket in porous tuffs above the porphyry system. In addition to these well-described ore deposits, two other types should be considered in any exploration program: (1)

near-surface, low-temperature, gold-bearing silicified rocks (including jasperoid), and (2) potentially metalliferous calc-silicate assemblages along the margins of intrusions. Thus a variety of ore deposit types, not normally classified together, were the product of a single magmatic/hydrothermal event spatially and temporally related to caldera formation. The caldera geometry is the key that reveals structural and stratigraphic control of the ore deposits.

ACIDIFICATION OF SURFACE WATER AND GROUNDWATER BY SULFIDE MINERAL OXIDATION

Hayes, Joseph J., Wehran Engineering, 1 Mill St., Burlington, Vermont 05401

In the surface water and shallow groundwater near Laneville, Texas, considerable quantities of dissolved and suspended iron are being transported and deposited. High sulfate concentrations and low-pH values (3.5 to 4.5) are associated with these waters. As a result, the natural buffering capacity of the water is diminished, and the recreational and agricultural uses of the streams and ponds are hampered by the low-pH conditions.

Field observation and laboratory analysis revealed that finely disseminated, microscopic quantities of iron sulfides, mostly pyrite in the Reklaw Formation, are being oxidized and subsequently releasing hydrogen ions into aqueous solution. The pyrite does not appear to be a primary mineralogic component of the sediment, but rather a recent precipitate of dissolved iron under reducing conditions. Precipitation of the finely disseminated microscopic quantities (4–6 micrometers) of pyrite results when reduced ferrous iron comes in contact with elemental sulfur. Pyrite is not formed directly, but crystallizes from other metastable iron sulfides, which are transformed into pyrite. Elemental sulfur is produced by bacterial reduction of sulfate and decomposition of organic matter.

Subsurface investigations indicate that the hydrogeology of the Reklaw Aquitard influences the weathering and oxidation rate of the pyrite. Perched water table conditions exist where there is a vertical sequence of discontinuous saturated and unsaturated zones. The shallow perched water table responds quickly to events of precipitation producing a fluctuating groundwater table. The pyrite is subjected to alternating periods of oxidation and reduction, and as a result the oxidation products are not completely removed from the soil. The acidified water either resurfaces as groundwater discharge in the immediate study area or continues to infiltrate the subsurface flow system.

SIDE-SCAN TARGETS IN LAKE CHAMPLAIN—EVIDENCE OF ACTIVE SEDIMENTARY PROCESSES

Manley, Patricia L., Department of Geology, Middlebury College, Middlebury, VT 05753

A high-resolution side-scan sonar survey conducted in west-central Lake Champlain demonstrated that bottom currents are affecting the lake bed morphology. Sedimentary bed forms such as sand waves, lineations, furrows,

and pockmarks have been identified. These features have dimensions on the order of 0.5 to 2 m height and in the case of the furrows, wavelengths of 20 m. Lineations and furrows tend to align themselves with the major current flow direction whereas sand waves tend to orient themselves perpendicular to the flow. Thus the identified bed forms were used to describe the flow direction of bottom currents in the vicinity of Schuyler Island. From the observed bed form morphology within this region, bottom currents flow from southwest to northeast through Schuyler Trough. In addition, some of the flow is diverted both to the west and east, around Schuyler Reef.

Similar side-scan surveys done in Burlington Harbor have identified pockmarks which occur as single units (~30 meter in diameter) as well as smaller multiple-units which are aligned (pockmark strings). These pockmarks are located slightly west of the lake-bed surface expression of the Champlain Thrust and suggest that one or more active processes, such as de-watering of sediments, water migration along the thrust fault, and/or gas seepage, may play an important role in their formation.

DEGLAC IATION SEQUENCES IN A SMALL SOUTH-FACING VALLEY NEAR KENTS CORNER, CALAIS, VERMONT

Maynard, Don, The Johnson Company, 5 State St., Montpelier, VT 05602

Two terminal moraines and a series of alternating till and lacustrine sequences provide evidence of multiple lake levels and alpine glaciation in a small valley approximately 1 km NE of Kents Corner, Vermont. The moraines exhibit classical loop morphology and consist of silty tills. Test borings up-valley from the moraines revealed four separate horizontally laminated silt/sand packages,interpreted as lacustrine sediments, clearly separated by silty glacial tills. The lowest elevation at which lacustrine sediments were observed was about 974 feet above sea level (fasl). The highest documented lake sediments occur at about 1010 fasl.

Glacial retreat in this area was episodic. An initial glacial retreat to the south and regional glacial lake (shoreline near 1000 fasl) was followed by a northward surge of ice moving up the valley from the Dugar Brook Valley to the south. Each subsequent retreat is marked by the deposition of lacustrine sediments, and each advance by ice contact and/or silty till deposits. Some of the silty tills are laterally discontinuous and are interpreted to represent subaqueous flow deposits during the lacustrine events. Based on lateral variation in sediment grain size, currents flowing through these glacial lakes occurred preferentially on the west side of the valley. Following the second lacustrine event, glacial advances came from the north, and left terminal loop moraines in the valley. These advances are interpreted as evidence of alpine glaciation subsequent to regional melting of the continental glacier.

If the local changes in the ice margin are related to climatic variation, then the Wisconsin Glacial retreat was marked by at least five warming episodes, each lasting longer than the previous one. These warm spells were separated by colder climatic events with no discernable pattern to their duration or intensity.

FLUORITE, GOETHITE, SULFIDE MINERALIZATION ASSOCIATED WITH TRIASSIC RIFTING, SOUTHWESTERN NEWHAMPSHIRE

Nielsen, Peter A., Geology Department, Keene State University, Keene, NH 03431

Fluorite deposits, goethite cemented breccia zones, silicified fault zones and a reported sulfide/gold prospect are discussed. All of these types of mineralization are associated with N to NE trending steeply dipping brittle fracture zones. These deposits show a west to east pattern of mineral content. Fluorite deposits form the western-most zones and include fluorite, cockscomb quartz, and minor galena and pyrite. The quartz monzonite host rock is altered to a low-temperature sericite-clay-quartz assemblage. Well-formed fluorite octahedra, showing several stages of growth and resorption, as well as sceptered quartz indicate growth in progressively developed tensional environment.

The silicified and goethite cemented fault zones occur farther to the east and contain clasts of Clough Quartzite and Littleton Formation. The sulfide/gold prospect on Surry Mountain contains argentiferrous galena, pyrite, and chalcopyrite along with quartz crystals and goethite, again in an open-fracture tensional environment.

I suggest that all of these mineral associations developed along a N and NE extension of the Connecticut Valley – Deerfield Basin failed rift trend. Hydrothermal systems developed in a thinned brittle crust ascended along steeply-dipping normal faults. The type of mineralization reflects the proximity to magma centers active during Triassic rifting. Thus, the fluorite-rich deposits are least contaminated. Goethite cemented regions occur where ascending solutions dissolved and oxidized pyrite from the underlying Littleton Formation. Polymetallic sulfides may represent a combination of sulfur from the Littleton Formation with metals derived from the Ammonoosic Volcanics and younger intrusive units (Oliverian and New Hampshire Plutonic Series).

Trace element analysis of the oxide/hydroxide phases associated with the Surry Mountain gold prospect and nearby silicified breccia zones may indicate whether gold mineralization of economic grade exists at depth.

NEW HAVEN RIVER PROJECT

Snyder, Shelley F., and Sullivan, Mary, Mt. Abraham Union High School, Bristol, Vermont

One goal of middle-level education today is to break down the artificial barriers that separate fields of study within our schools and within the experience of our children. Development of interdisciplinary programs of study, such as the New Haven River (NHR) Project, is a significant step toward reaching the goal of more relevant, realistic, and meaningful educational experiences. During the course of the NHR project, students were expected to participate in preparatory classwork in the natural history of a variety of

Vermont's aquatic ecosystems, including study of ecology, hydrogeology, water quality and resource management. Knowledge and skills gained here were then applied during the collection of data in the field, analysis of data, synthesis of conclusions, and communication of findings through written, oral, and graphic representation.

Mathematics concepts including area, volume, velocity, slope, average, and proportion were used in the determination and calculation of stream cross-sections, gradient, discharge, and chemical parameters of water quality. Research and laboratory skills were an integral part of the work. The students were involved in the reading of scales, determination of mass, metric linear measurement, use of oxygen and pH meters, construction of tables and graphs, analysis of data, and formulation of hypotheses and conclusions. Observation, reading comprehension, concept application, and decision-making were put to the test when students used field guides, color charts, and identification keys. Written, oral, graphic, and artistic expression were revealed in reports of group results and in related creative writing.

PALINSPASTIC ANALYSIS OF THE ULTRAMAFIC BELT, NORTH CENTRAL VERMONT

Stanley, Rolfe, Dept. of Geology, University of Vermont, Burlington, VT., 05401.

The ultramafic belt in northern Vermont is part of the regionally extensive zone of fragmented ocean crust that has been tectonically mixed during the Taconian orogeny with rift and post-rift sediments (Hazen Notch, Ottauquechee, Stowe, western Moretown Formations) of ancient North America during the Taconian orogeny. At the scale of regional analysis, this zone has been considered to be a tectonic melange marking the major Taconian suture of western New England and adjacent Quebec. Despite its structural and metamorphic complexity involving multiple Taconian and even Acadian events, detailed 10,000 or larger-scaled mapping has shown that a recognizable stratigraphy is present and can be traced, with some change in sedimentary facies, among the different thrust slices. Furthermore, one of the stratigraphic sequences which consists of green phyllite, dark gray phyllite, metabasaltic flows and minor metawacke of the Stowe-western Moretown belt is cut by metadiabasic and metagabbroic dikes. These dikes are cut by early thrust faults that were subsequently deformed by younger faults and folds. Geochemical analysis of the dikes and associated flows (actinolite-chlorite-epidote-albite) indicate a mid-oceanic ridge affinity (MORB) based on Ti-Zr-Y, Cr vs Y, Ti vs V and Zr vs Zr/Y discriminant diagrams (Dick, 1989). LREE enrichment of these rocks suggest that they may be T-type MOR basalts related to the transition from undepleted to depleted mantle sources.

Using these stratigraphic, structural, and geochemical relations, 8 cross-sections were constructed from the International Border to the village of Lowell Vermont, a distance of 15 miles. Retrodeformation of several of these sections using the structural chronology established for the belt indicate that the present width of 2 miles was originally 25 miles or a shortening of 92 percent. These

analyses explain the emplacement of ultramafic rocks within and along the Stowe and western Moretown as simple slices of oceanic crust. A unique explanation can not be given for the ultramafic and associated rocks within and along the rift and post-rift rocks of the Ottauquechee and Hazen Notch Formations, although their geochemistry indicates an oceanic origin (Doolan and others, 1982; Pugin, 1989).

ENVIRONMENTAL LIABILITY ISSUES—WHO IS RESPONSIBLE?

Tacy, Sally, Wehran Engineering, 1 Mill St., Burlington, Vermont 05401

Underground storage tanks, particularly large volume tanks such as the ones used at gas stations, are a regular source of contamination. Liability issues associated with underground storage tank contamination are complex and varied. The hydrogeology of each individual site greatly influences the extent of contamination. Pin-pointing the source of contamination can be difficult, especially when the product is petroleum. As the issues of liability become more common in assessment of environmental projects, it becomes increasingly important for State officials and private consultants to work together more effectively. Enhancement of this existing relationship will provide a framework for better understanding the complex hydrogeology that is often encountered and will also assist in the design and implementation of creative, cost-effective remedial solutions.

In 1989, Wehran Engineering provided expert testimony in a court case that illustrates the importance of coordination and understanding between the State and private consultants. Wehran was retained to assess the probable liability and to review the performance of the consultants contracted to remediate a petroleum spill at a particular gas station. To investigate this case, Wehran used file data from State Agencies and previous consultants for both the site and neighboring properties. This information was utilized to reinterpret the hydrogeology of the area and to assess the potential contributions of other contaminant sources. There were many questions that had not been fully explored. Re-examination of the available data suggested that contamination was likely to be from more than one source and that the gas station owner was not solely accountable for the contaminant release.

THE EFFECTS OF LARGE ORGANIC DEBRIS ON SEDIMENT PROCESSES IN THE GREEN MOUNTAINS OF VERMONT

Thompson, Douglas M., Department of Geology, Middlebury College, Middlebury, VT 05753

Research conducted on a small third-order stream in the Green Mountains of Vermont showed that large organic debris has an important influence on sediment storage, areal sorting, spacing of pool-riffle sequences, and channel geometry. Along a 412 m reach of the stream large woody debris traps over 26 m^3 of sediment and causes over 14 percent of the vertical drop. Upstream pools

trap sand and gravel, and plunge pools contain large rocks and boulders. The large organic debris accumulations may be the most important control on the creation of a stepped profile and sediment storage between large bedrock knickpoints along the channel.

There is a correlation among the areal density of standing timber, large organic debris, and sediment stored behind large organic debris. In unlogged areas, the density comparisons show similar relationships, but differed from the proportions of standing timber, large woody debris, and sediment stored behind large organic debris in the logged region. The relationship between areal densities seems to indicate that large organic debris may operate through a positive feedback-type mechanism where degra-dation leads to increased debris loading and more sediment storage sites. Tree ring dating of saplings growing on top of large woody debris accumulations has shown these structures have remained stable for periods in excess of eight years.

THE STOWE AND MORETOWN FORMATIONS: TRANSFORMATION OF A SINGLE SEDIMENTARY UNIT INTO TWO MAPPABLE FORMATIONS

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

Detailed mapping and study of rocks in the northwestern quarter of the Northfield 7.5-minute Quadrangle suggest that the Moretown and Stowe Formations were deposited as a single stratigraphic unit. Higher degrees of tectonism in the more westward exposures of this unit have introduced sufficient differences in the rocks to map them as two separate formations. The presence of primary structures, namely bedding, in rocks of the Moretown Formation constitutes the principle mapping criterion for separating that formation from the Stowe Formation to the west where pervasive strain has eliminated all such structures.

Mappable units within the Stowe Formation include 1) undifferentiated Stowe schist made primarily of muscovite, chlorite, quartz and Na-plagioclase in varying proportions, 2) Stowe greenschists which have been subdivided geographically into three units with unique structural geometries, and 3) garnetiferous Stowe schist which is coarse-grained and locally contains staurolite. Lithologies of the Moretown Formation are collectively described as fine-grained micaceous schists with associated discontinuous greenschist horizons. The range of lithologies is broad but their distribution has not yet allowed for subdivision of the unit. Included within the two major formations are fault-bound horizons of dark gray to black phyllites and quartzites, here correlated with the Ottauquechee Formation. All significant lithologic contacts within the study area are recognized as faults.

Tectonism in the study area was dominated by westward-directed thrust faulting within a stratigraphic section caught in an eastward-dipping accretionary complex. The major eastern fault zone, the Felchner Brook fault zone, separates the Stowe and Moretown Formations and is thought to be the

oldest fault zone in the study area. As each slice migrated westward, adding to the total thickness of the section, the level of tectonism produced by the next (deeper) episode of movement was "kicked up a notch." In this fashion, garnet- and staurolite-bearing schists with abundant silicification were produced and transported, and are presently exposed at the highest elevations in the study area. The final phase of Paleozoic faulting in the region appears to have occurred along steeply inclined surfaces with a significant right-lateral component.

VERMONT GEOLOGICAL SOCIETY BUSINESS AND NEWS

New Members

We want to welcome the following new members who have joined the Vermont Geological Society since the last issue of this newsletter was published:

Neil Bliss	Montgomery Ctr., VT	Chief Geologist, Alcan Int'l, Montreal, Quebec
Frederic Emigh	Montpelier, VT	Environmental Lawyer
Susan Hadden	Grafton, VT	Co-Founder, Grafton Museum of Natural History
Christopher Halladay	N. Brattleboro, VT	Technical Manager, Vt. Low-Level Rad.ioactiveWaste Authority
Chip Osgood	Brattleboro, VT	Staff Geologist, Haley and Aldrich, Inc.
Matthew Robinson	Burlington, VT	UVM student & Draftsperson, Groundwater Technologies, Inc.
Steve Winters	South Barre, VT	Hazardous Materials Specialist, State of Vermont

Contributions

We recently received a note from **Chris Allen** telling us that he has moved out-of-state and will be withdrawing from the VGS for now. With his letter however, he sent a $30.00 contribution to the VGS as his going away present. Thanks Chris, and the best of luck to you!

"Old" Members!

Have you recently changed employers, received a promotion, graduated, etc.? If so, drop us a line so we can tell the Society through the GMG. Inquiring minds want to know!

Annual Report of the Treasurer

Balance as of 1/1/90	**$2377.60**
Income	
Interest	146.54
Dues	1760.50
Publication Sales	519.04
Total 1990 Income	**+2426.08**
Previous Balance + 1990 Income	**$4803.68**
Expenses	
Postage	524.07
Printing/Copying	1230.72
Editor's Page Charge	200.00
Office Supplies	264.70
Meeting Expenses	135.00
Doll Student Prizes	50.00
Awards	106.82
Computer	192.00
P.O. Box Rent	28.00
Money Orders	0.50
Telephone	14.80
Fax	6.00
Executive Committee Travel	266.25
Total 1990 Expenses	**-3018.86**
Balance as of 12/31/90	**$1784.82**

While the Society shows a positive balance for 1990, a quick look at our income vs. expenses shows that we actually lost money this year. This is due to both larger than normal printing costs and several "big ticket" items purchased this year. The printing of *Vermont Geology Volume 6* ($539.65) came near the end of the year and sales have not yet offset this initial cost. Two filing cabinets ($249.49) were purchased to facilitate organization and storage of the Society's paperwork and publications. A database program (Borland's *Reflex*, $192.00) was purchased by the Treasurer to help organize membership information and the Geoscience Directory.

With respect to income, please note that a large part of the Society's activities are funded by membership dues. Our publications are priced not to make a profit, but to provide geologic information to the public at an affordable cost.

Respectfully submitted,
Brad Jordan, Treasurer

Future Meetings and Publication Deadlines

Student papers will be presented at our spring meeting tentatively set for April 27 at Middlebury College. A "call for abstracts" notice will be sent in mid-February. Members wishing to submit material for publication in the Spring *GMG* should do so by March 20.

Annual Meeting Minutes

October 20, 1990
Sugar House Restaurant, Middlebury, Vermont

Meeting called to order at 7:25 PM with 21 members in attendance.

Treasurer's Report:

The first edition of the Geoscience Directory will be published in January 1991.

Awards:

Jeanne Detenbeck and Dave Westerman were presented with marble bookends in appreciation for their many years of service and dedication to the Vermont Geological Society. Lengthy repsonses followed from each of the awardees.

Election of New Officers:

Presentation of the ballot. Barry Doolan made the motion for the Secretary to cast one (1) ballot to bring in the new officers. The motion was seconded and the vote cast by the Secretary.

Other Business:

Chris Stone, the new president, announced a call for papers for the winter meeting. No specific theme was set and a papers representing all aspects of the geological sciences will be accepted. The winter meeting will be held in February 1991. Barry Doolan invited the society to hold the winter meeting at the University of Vermont.

The meeting was adjourned at 7:45 PM.

Respectfully submitted,
Susan L. Williford

Executive Committee Minutes
November 12, 1990
Vermont 'Technical College

Present: Chris Stone, Brad Jordan, Bruce Wilson, Eric Lapp, and Ron Parker

The meeting was held at VTC in order to mitigate the large travel distances some committee members had to endure. The weather that evening, however, erased any advantages that might have been won. The night was a full-scale blizzard and several arrived about an hour past mark. Chris Stone is herein recognized, not only for his steadfast driving abililities, but also for acting the samaritan and rescuing a pair of stranded Bostonians.

The meeting was convened at 7:20 PM (although scheduled for 6:30).

A round of introductions started off the meeting as there were several new faces. This led to a proposal that Executive Committee members submit brief biographical sketches to the *GMG.*

Brad reported a bank balance of $1965.71. Major expenditures had been doled out so as to acquire several filing cabinets and two administrative computer programs: dBASE MAC & REFLEX. These purchases will increase organizational efficiency and allow better management of membership information and data in the geoscience directory.

Old Business

The winter meeting has been scheduled for Saturday, February 23, 1991 and will be held in Kalkin Hall at UVM.

A brief review of the Executive Committee Expense Reimbursement guidelines brought new officers up to speed.

New Business

A discussion was initiated regarding the logistics of the Spring Student meeting and proposed topics and dates for the Fall field trip. One item of concern for the fall is a field trip date that will not conflict with the NEIGC or NYSGA offerings.

Brad unveiled a newly minted version of the VGS pulications list. It was decided that this list would be sent to members with the Winter *GMG.*

A discussion was tabled regarding the meaning of language in the VGS membership application. Does this language seem predisposed to insult an interested applicant who does not have a post-secondary degree? Does the application seem to request more information than is really necessary

(especially when the VGS doesn't have any criteria for denying an applicant)? This matter will be discussed further at a future session.

Methods for attracting new membership were discussed. Also, the concept of offering Hororary memberships to special contributors was touched upon.

A topic was raised concerning the role of the VGS as a facilitator of geologic information. Could/would/should the VGS sponser seminars on selected geologic topics that would target different audiences than are traditionally attracted to our meetings? Such seminars could provide professional discussion of such topics as:

- Low-level radioactive waste or hazardous waste facility siting
- Groundwater protection
- Glacial geologic history of Vermont, etc., etc.

Seminars of this type could be tailored for delivery to Regional Planning Commission members, Town Officials, real-estate boards, high-school students, citizens, etc. They could be used as a way of tranlating academic informaion into proctical information (i.e. How can we translate f_2 into water-bearing fractures?). Bruce Wilson has experience assembling speakers for such events and could provide much needed assistance.

The membership is hereby requested to submit their commentary on this (or any other) topic.

The Executive Committee meeting adjourned at 9:15.

Respectfully and Jovially Submitted
Ronald L. Parker

Biographical Sketches of Society Officers

Chris Stone (President) graduated from UVM in 1979 with a BA in the Geological Sciences. He worked for a short time in mineral exploration in the upper peninsula of Michigan before returning to school where he received his Masters of Geological Sciences from the University of Maine at Orono, concentrating in hydrogeology. Since 1983 Chris has worked in a variety of functions involving water resources and the environment for both State Government and the private sector. Chris is currently Vice President of Hydrology and Earth Sciences at The Johnson Company, Inc., Montpelier, Vermont where he works with over 20 other scientists and engineers working on environmental problems throughout Vermont and the United States.

Bruce Wilson (Vice President) received his B.S. in geology at Bates College and a M.S. from the University of Wyoming where he specialized in the structural analysis and history of metamorphic rocks. After a year mapping landslides for

the West Virginia Geological Survey, Bruce attended the University of Texas at Austin where he tried to make sense of some Franciscan rocks in northern California under the direction of J.C. Maxwell. In 1981–82 he spent a year teaching at Bates College. Since then Bruce has resided in Brattleboro with his wife, Meg. He is currently employed on the surveying staff of C.T. Male Associates in Greenfield, MA. He has continued to teach and to participate in educational programs in geology and math, as an adjunct faculty member at the Community College of Vermont, Keene State College, and the Southern Vermont Educational Center.

Ron Parker (Secretary) is a Senior Geologist and Project Coordinator with Groundwater Technology, Inc., in Williston, Vermont. His duties at GTI include conducting groundwater contaminant investigations and designing and implementing contamination-remediation strategies. He received his B.S. in Geology from Colgate University in 1982 and his M.S. in Geology from the University of Vermont in 1986. Prior to joining GTI in April of 1990, he worked as a Geologist for TWM Northeast and as a Hydrogeologist for the Vermont Department of Health. He is a member of the Association of Groundwater Scientists and Engineers, the National Water Well Association, and The Geological Society of America. His major interests are geochemical interactions in groundwater, the influence of bedrock and surficial geology upon groundwater quality, and the protection of groundwater resources from adverse environmental impacts.

Brad Jordan (Treasurer) is originally from Kalamazoo, Michigan, and obtained his B.S. in Geology from Western Michigan University in Kalamazoo. He obtained a M.S. in Geology from the University of Rhode Island (URI) in 1983. His thesis focused on the petrology of the Devonian East Greenwich pluton in central Rhode Island, establishing the mineralogical and geochemical characteristics for that plutonic-volcanic complex. After teaching for a year at URI, he and his wife Sallie moved to Vermont in 1984, where Brad spent 3 years as an Instructor of Geology at Norwich University. Presently, he works at Norwich University as the Science Technician for the Geology and Chemistry Departments. He maintains an interest in characterizing the small granitic bodies in the vicinity of the Dog River Fault Zone (Taconian Line) in central Vermont, and the "structure" of his 180 year-old home.

Larry Gatto (Board of Directors) is a geologist in the Geological Sciences Branch, U.S. Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, New Hampshire. He received a B.S. in Geology from the University of Dayton (Ohio) in 1967 and a M.S. in Marine Geology from the University of Southern California in 1970. He's been at CRREL since 1970 and his primary research areas are coastal and bank erosion processes and remote sensing applications in geology, geomorphology, and hydrology.

Stephen Wright (Editor and Publisher) teaches geology through the Continuing Education Division of the University of Vermont, consults for,

among others, the Northwest Vermont Solid Waste Management District, leads informal geology field trips for children and adults, maps geology in Cambridge, and serves on both the Cambridge and Lamoille county planning commissions. After receiving his B.S. degree in geology from Penn State, Stephen worked with the New York State Geological Survey mapping brittle structures in the Adirondacks before attending graduate school at the University of Minnesota. His M.S. thesis (1985) detailed a study of small-scale structures that accompany monoclinal folding on the Colorado Plateau and his PhD. dissertation (1988) outlined the deformational history of an early Proterozoic granite-greenstone terrane centered on Kiruna, northern Sweden.

From the Mailbag...

The VGS receives many advertisements and announcements pertaining to geology and related subjects. The intent of this section is to inform our members about new publications, events, etc. and is not meant as a recommendation of these products.

The **American Society for Photogrammetry and Remote Sensing** has recently offered 11 new publications for sale that focus on photogrammetry, remote sensing, and GIS. "The ASPRS is a scientific association...involved in the art, science, and technology of obtaining reliable information about physical objects and the environment through the process of recording, measuring, and interpreting photographic images" and patterns of electromagnetic radiant energy and other phenomena (whew!...from their press release). Write to, ASPRS, 5410 Grosvenor Lane, Suite 210, Bethesda, Maryland, 20814-2160

Kalmbach Publishing Co. (editors of *ASTRONOMY* magazine) is launching a new magazine called *EARTH,* which debuted on January 8, 1991. This magazine covers a wide range of topics from volcanic eruptions and glaciers, to mass extinctions and global warming. The first issue featured articles such as: "Extinctions, or—Which Way Did They Go?" by Steven M. Stanley, "Hawaii's Volcanoes: Windows Into The Earth" by John Dvorak, "Are We Mining An Asteroid?" by Robert S. Dietz and "Building A Mississippi In Your Backyard" by Norman P. Lasca. For more information, call Robert Burnham, editor, at (414) 796-8776, ext. 572. They are seeking editorial contributions.

The South African Geological Survey (SAGEO) is the principal earth science research organization in the Republic of South Africa. Research is currently undertaken in the fields of regional and economic geology, geochemistry, geophysics, mineralogy, palaeontology, and engineering geology, and results are published regularly in several series of publications. To receive a Catalogue of Publications write: The Chief Director, Geological Survey, Private Bag X112, Pretoria 0001, Republic of South Africa.

Looking for an out-of-print book on geology, mining or a related subject? Check out **The Hannum Company**. Their Fall, 1990 catalog contains a listing of books and articles, government publications, trade journals, periodicals and many publications that are listed by state. For their catalog send $2 to: The Hannum Company, C. E. Hannum, C. S. Verhoeven, P. O. Box 1505, Ardmore, OK 73402 (405) 223-4826.

A SCRUTINY OF THE ABSTRACT, II

Kenneth K. Landes

Editor's Note: With regard to students (and others of us) preparing abstracts for future meetings and papers, we have obtained permission from the American Association of Petroleum Geologists to reprint Kenneth Landes' well-regarded "A Scrutiny of the Abstract, II" which appeared in Volume 50, page 1992, of the AAPG Bulletin, 1966.

ABSTRACT

A partial biography of the writer is given. The inadequate abstract is discussed. What should be covered by an abstract is considered. The importance of the abstract is described. Dictionary definitions of "abstract" are quoted. At the conclusion a revised abstract is presented.

For many years I have been annoyed by the inadequate abstract. This became acute while I was serving a term as editor of the *Bulletin* of the American Association of Petroleum Geologists. In addition to returning manuscripts to authors for rewriting of abstracts, I also took 30 minutes in which to lower my ire by writing, "A Scrutiny of the Abstract." This little squib has had a fantastic distribution. If only one of my scientific outpourings would do as well! Now the editorial board of the Association has requested a revision. This is it.

The inadequate abstract is illustrated at the top of the page. The passive voice is positively screaming at the reader! It is an outline, with each item in the outline expanded into a sentence. The reader is told what the paper is about, but not what it contributes. Such abstracts are merely overgrown titles. They are produced by writers who are either (1) beginners, (2) lazy, or (3) have not written the paper yet.

To many writers the preparation of an abstract is an unwanted chore required at the last minute by an editor or insisted upon even before the paper has been written by a deadline-bedeviled program chairman. However, in terms of market reached, the abstract is *the most important part of the paper.* For every individual who reads or listens to your entire paper, from 10 to 500 will read the abstract.

If you are presenting a paper before a learned society, the abstract alone may appear in a preconvention program; it may also be run by trade journals. The abstract which accompanies a published paper will most certainly reappear in abstract journals in various languages, and perhaps in company internal circulars as well. It is much better to please than to antagonize this great audience. Papers written for oral presentation should be *completed prior to the deadline for the abstract,* so that the abstract can be prepared from the written paper and not from raw ideas gestating in the writer's mind.

My dictionary describes an abstract as "a summary of a statement, document, speech, etc...." and that which *concentrates in itself the essential*

information of a paper or article. The definition I prefer has been set in italics. May all writers learn the art (it is not easy) of preparing an abstract containing the *essential information* in their compositions. With this goal in mind, I append an abstract that should be an improvement over the one appearing at the beginning of this discussion.

ABSTRACT

The abstract is of utmost importance, for it is read by 10 to 500 times more people than hear or read the entire article. It should not be a mere recital of the subjects covered. Expressions such as "is discussed" should *never* be included! The abstract should be a condensation and concentration of the *essential information* in the paper.

STATE GEOLOGIST'S REPORT

Charles A. Ratté
Vermont State Geologist

GEOLOGICAL PUBLICATIONS AND PRODUCTS

Several changes and additions should be noted:

Name of Organization

All publications will now carry the official organization name *"Agency of Natural Resources, Division of Geology and Mineral Resources"* on the title page.

Out-of-Print Publications

Bulletin #5: *The Green Mountain Anticlinorium in the vicinity of Rochester and East Middlebury, Vermont*, by Philip H. Osberg, 1952, (A photocopy costs $7.00, including copies of maps.)

Bulletin #7: *The Geology of the Bennington area, Vermont,* by John A. MacFadyen, 1956, (A photocopy costs $5.00, including copies of maps.)

Special Publication #2: *Mineral Collecting in Vermont,* by R.W. Grant, 1968, (Due to changes in land ownership, restrictions on access to private property, and other types of information that were published in this volume, copies of this publication will no longer be available.)

Due to budget problems and in anticipation of the availability of new mapping, our office does not anticipate reprinting any of the above publications.

Additions

Two "Official Rock Collections" are now sold by our office and include samples that are approximately 2 inches in diameter. The prices quoted below

include $2.50 for shipping and handling at 3rd Class rate. First Class, UPS, and other package delivery services will be charged accordingly.

20 Common Vermont Rocks $10.50

Includes black shale, slate, phyllite with pyrite, chlorite schist, muscovite schist with quartz and garnet, muscovite schist with chlorite, graphitic schist, gneiss, granite, limestone, fossiliferous limestone, micaceous marble (crystalline limestone), dolostone, marble, metaquartzite, orthoquartzite, breccia, greenstone, serpentine, amphibolite.

12 Rare and Unusual Rocks and Minerals $10.50

Includes talc, magnetite schist, graphitic schist with pyrite, concretion, Bethel white granite, white marble, chromite, verde antique, kaolinite, purple slate, green slate, mottled green and purple slate.

If anyone would like to see these new rock kits, you are welcome to come to our office in Waterbury to see them. They are intended to serve the needs of elementary earth science teachers, and are excellent starter sets for beginning rock collectors.

Sales of topographic maps and publications continues to be brisk, as are walk-in requests for geological information. We attempt to maintain full state coverage of U.S.G.S. topographic maps.

An up-to-date publications/price list is available, free of charge, from:

The State Geologist
103 S. Main St.—Center Building
Waterbury, VT 05676

LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT IN VERMONT

Diane Conrad
Director, Radioactive Waste Management Division

In 1990, the Vermont Legislature passed and the Governor signed into law Act 296. The Act created the new Radioactive Waste Management Division within the Agency of Natural Resources for the purpose of developing criteria for siting and operating a disposal facility for low-level radioactive wastes within Vermont. The Act also created a Low-Level Radioactive Waste Authority which is charged with locating a suitable and safe place for a disposal facility within Vermont. The money to pay all costs associated with the Agency and the Authority comes from the generators of the waste.

Low-level radioactive waste is defined as radioactive material that is not high-level waste, transuranic waste, spent fuel, or byproduct material. Most low-level waste is generally short-lived and has low radioactivity. Low-level wastes are generated through the operation of nuclear power plants and as byproducts of medical research and industrial activities. These wastes occur in a variety of forms such as contaminated cleaning rags, clothing, tools, and medical treatment and research materials.

Currently, 99% of all low-level radioactive waste produced in Vermont is generated by the Vermont Yankee Nuclear Power Corporation and the University of Vermont. The remaining 1% is produced by other small generators across the State.

High-level radioactive wastes, containing fission products, traces of uranium and plutonium, and other transuranic elements that result from reprocessing of spent fuel, are managed under federal law. High-level wastes are currently being stored at the location of generation until a high-level waste disposal facility can be constructed. The location under consideration for disposal of high-level wastes is Yucca Mountain in Nevada.

Under the Low-level waste Policy Act, passed by Congress in 1980, responsibility fell to each state for assuring disposal capacity for the low-level waste generated within its borders. The law allows for various states to come together in compacts, with each member in turn hosting a facility for the disposal of the accumulated low-level radioactive waste. A state may also enter into a contractual agreement with a compact commission of a region for the use of its disposal facility for the low-level radioactive waste generated within that state.

Since 1986, the State of Vermont has been attempting to enter into such an agreement, without success. Until Vermont can either make arrangements with

an out-of-state compact or construct its own disposal facility, the approximately 6,000 to 10,000 cubic feet of low-level radioactive waste produced each year in Vermont must be stored where it is produced in temporary facilities.

The Radioactive Waste Management Division is initially mandated to "vigorously pursue all opportunities to join an interstate compact...or to sign an agreement with a state or compact" [Act 296, Section 2 (a)]. However, entering into a compact could result in the ultimate disposal of a far greater volume of low-level waste in Vermont than is generated within the State. On the other hand, any agreement by Vermont to dispose of its waste within an out-of-state compact facility would likely be expensive.

The Division has recently finalized a contract with Evasco Environmental for developing the siting requirements, screening procedures, and certification procedures for a low-level radioactive waste disposal facility in Vermont. Work has commenced and draft rules are expected to be ready for proceeding through the adoption process in early March. Public hearings will be announced in late January.

The Low-Level Radioactive Waste Authority is currently taking the initial steps in selecting a disposal site. The initial focus for site characterization, as mandated by the legislation, is on the Vermont Yankee site in Vernon, Vermont. Once a site is selected, the Authority will have the responsibility of constructing and managing the disposal facility for its operating life, and overseeing its closure and post-closure care. In the coming months, the Agency of Natural Resources will be working closely with the Authority to oversee and regulate the site selection process and the ongoing activities associated with disposal.

The new Radioactive Waste Management Division is staffed by: Diane Conrad, Division Director; Bill Field, Attorney; Pierre Jonault, Radiological Specialist; Michael Cassara, Engineer; David Gunn, Administrative Assistant; and Lecia Wilson, Secretary. The Division is now operating in its office space at 92 South Main St. in Waterbury, Vermont 05676 and can be reached by phone (244-4525) or FAX (244-4528). Charles Ratté, State Geologist, continues to divide his time between the State Geologist's office and the new division. The Division is currently recruiting for a hydrogeologist.

SEMINARS & MEETINGS

University of Vermont
All seminars start at 4 PM in Room 200 of the Perkins Geology Building.

January 28: Dr. G. Michael Grammer, University of Miami
"Evolution of Bahamian Foreslopes: Highstand vs. Lowstand Deposition"

February 11: Dr. E.N.K. Clarkson, Edinburgh University
"The Visual System of Trilobites—The Oldest Eyes of All"

March 11: Dr. David Hodell, University of Florida
UVM Geology Department Distinguished Alumni Speaker
"Application of Oxygen and Carbon Isotopes to Lake Sediments: Examples from Haiti and Lake Ontario"

April 15: Dr. John Delano, State University of New York at Albany
"Geochemistry and Petrology of Paleozoic Volcanic Ashes in Eastern North America: Tectonic Constraints and Stratigraphic Correlations"

April 22: Dr. Larry Mayer, Miami University
"Fractal Methods Applied to Climatic Records in Arid Regions"

March 14–16: Northeastern/Southeastern Geological Society of America Meeting, Baltimore, MD

April 27: Vermont Geological Society Presentation of Student Papers, Middlebury College, Middlebury, Vermont.

September 28–29: New England Intercollegiate Geological Conference. The 1991 NEIGC conference will be in Maine and is being organized by Allan Ludman of Queens College.

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