

THE GREEN MOUNTAIN GEOLOGIST

QUARTERLY NEWSLETTER OF THE VERMONT GEOLOGICAL SOCIETY

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NUMBER 4

*The Vermont Geological Society's
Fall Field Trip*

Surficial Geology and Groundwater Studies
Underhill, Bolton, Richmond, Huntington, Stowe

Saturday October 19th
Rendezvous and Car Pool 9:30 AM
Richmond Park and Ride (Exit 11/I-89)

**Annual Meeting at the Marsala
Salsa Restaurant, Waterbury**

See inside for details.

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THE GREEN MOUNTAIN GEOLOGIST
VERMONT GEOLOGICAL SOCIETY
DEPARTMENT OF GEOLOGY
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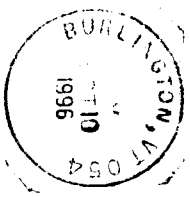
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President's Letter

The changes that are affecting global commerce and information delivery are beginning to have a profound effect on geology as well as science in general. As geologists we think in pictures and must visualize geometries that are not apparent to the untrained eye. The integration of graphics and text in the digital environment is a natural medium for expressing earth science ideas. The study of geology and the way we apply its basic principles to the solution of practical problems is facilitated by digital presentation and manipulation.

I had occasion to talk to a physicist studying neutrinos and he said "physics is about understanding one thing, put those things together and its chemistry, add more of that and its biology." Well, throw a lot of it together with a dash of time and you get geology. As geology is built on the other sciences, it is a tool for explaining and understanding those disciplines in a real-world setting. I'll make a prediction that geology, as a tool to teach students about the earth and science in general, will grow in the public mind because visual presentation is the developing hallmark of the global information age.

As we enter this new era, I believe that recent attacks on the collection of basic scientific information and sound applications of those data will subside and there will again be a demand for new research and applications of that research for wise decision making. I think we are beginning to see this in the interdisciplinary way decisions are made and organizations that are purveyors of geologic information and services have stabilized in number and again are growing. The economy is picking up and we in Vermont should see the benefits. With the easy global transfer of information, rural places such as Vermont can play an equal role in developing geologic research and problem-solving for practical benefits.

I want to congratulate Beth Nadeau, a graduate student at the University of Vermont, who was awarded \$500 from the Vermont Geological Society Student Research Fund for her study titled: "Wetland Evolution and the Effects of Water Level Changes in Lake Champlain Wetlands." I also want to congratulate the two students who won awards at the Spring Meeting: Shelley Sayward, an undergraduate at Middlebury College, for her paper titled: "Hydrodynamic System of Burlington Bay" and Michael Abbott, a graduate student at the University of Vermont, for his paper titled: "Characterization of Groundwater Recharge and Flow in a Vermont Upland Watershed using Stable Isotope Tracing Techniques."

As this brings to a close my tenure as your President, I would like to thank the Executive Committee for their guidance as I became reacquainted with the Society. We've had some exciting sessions from the winter meeting that focused on the mineral industry, the spring student presentations, the summer field trip on the bedrock geology in the Rochester area led by Greg Walsh, and now our annual fall field trip this year's version on surficial geology. I'd like to thank all those that helped organize those events and Stephen Wright and Kent Koptuich for putting the GMG together. Our treasurer Alan Carpenter tells us we are more than solvent and we are an organization approaching 175 members. Eric Lapp is planning a questionnaire as to what the members want this organization to be. There are opportunities ahead because of increasing membership and some monies to fund new ideas, giving your incoming President Dave Westerman and Executive Committee the luxury of choice. I wish you well and it has been a pleasure to serve all of you this past year.

Larry Becker

Vermont State Geologist

The Vermont Geological Society's Fall Field Trip

Surficial Geology and Groundwater Studies

Underhill, Bolton, Richmond, Huntington, Stowe

Leaders: Timothy Whalen, Michael Abbott, Stephen Wright
Department of Geology, University of Vermont

Meeting Time: 9:30 AM

Meeting Place: Richmond Park and Ride, Richmond Exit of I-89

Bring Lunch and Fluids

For Additional Information Contact Stephen Wright (Office 656-4479, Home 644-2439, e-mail: swright@moose.uvm.edu)

The purpose of the fall field trip is to present the results of ongoing research by students and faculty at the University of Vermont into Vermont's late Pleistocene and Holocene history and the evolution of groundwater resources. Abstracts by Timothy Whalen and Michael Abbott were published in the Spring Issue of the *Green Mountain Geologist* and give more background to Stops 1 and 3.

Itinerary:

Stop 1: Underhill Elementary School: We will use the setting of this stop to discuss the results of year-long sampling of precipitation and groundwater in the Browns River Basin. These samples have been analyzed for oxygen isotope ratios to establish how they vary with temperature, storm type, and elevation. The isotope signatures of groundwater are being used to help understand flow paths and residence time in the fractured bedrock aquifers of the region. (Mike Abbott)

Stop 2: Mill Brook, West Bolton: We will look at the results of flash floods during the summer of 1990 and both the late Pleistocene lake history and human history revealed in sediments exposed by those and more recent floods. (Stephen Wright)

Stop 3: Moultroup Farm, Richmond/Huntington:

At this stop we will review detailed leveling data that Tim has collected from the well-developed terraces along the Huntington River. Participants will also have the opportunity to inspect the surficial materials exposed in several recent trenches dug into these terraces and onlapping alluvial fans. Sedimentation events and rates have been determined using ^{14}C dates from buried soils. (Tim Whalen)

Stop 4: Alluvial Fan, Miller Brook Valley:

At this stop we will have the opportunity to inspect an active alluvial fan and to make analogies to the other alluvial fans that will be visited on this trip.

Stop 5: Lake Mansfield "Moraines":

Students and faculty at the University of Vermont are presently mapping the "moraines" downstream from Lake Mansfield. We will present the current results of our recent mapping and soil pits and address the question of whether these ridges really are moraines, and if so, how can they be used to interpret ice movement patterns in the valley. (Stephen Wright)

Dinner and Annual Meeting: Marsala Salsa Restaurant, Waterbury

The Marsala Salsa Restaurant is located on Stowe Street in Waterbury, in the first block north from the intersection with Route 2 (the stop light). We will try to arrive at the restaurant by 6 PM. No reservations are required as we will be ordering from menus.

STATE GEOLOGIST'S REPORT

Laurence R. Becker

Vermont State Geologist and Director, Vermont Geological Survey

Diane Vanecek

Diane Vanecek left State government employ on September 6th for overseas travel to be with her family in Oman. Her long association with the Vermont Geological Survey goes back to the early 1980's. Diane displayed a rare ability to work with the public. She really cared about meeting information requests and exploring people's interest in Geology, whether they were one of the interested "public" or professionals. Receiving the best of treatment, walk-in visitors appreciated the information services she provided. Her efficiency in meeting requests and her care for her work will certainly be missed. And let's not forget she is lucky. To feed her love of the subject, the desert landscapes of Oman should provide a feast of geological possibilities.

Geological Information and Education Specialist

Diane historically worked part-time and now the Survey is approved to rehire the Geological Information and Education Specialist position full-time. By the time you read this, it will be towards the end of the posting of the position by State Personnel.

New Vermont State Geologic Map Progress

July 31, 1996 deliverables for the STATEMAP grant were completed on time and sent to the USGS for release of monies to the Vermont Geologic Survey. Delivered as plots and digital data, bedrock mapping for both Lake Champlain North and South involved a number of mappers and digitizers. Dr. Charlotte Mehrtens editor for these sheets tirelessly conducted new mapping this spring and compiled previous work, including recent contributions from Ron Parker and Jeff Fredericks. Compilation was assisted by Marjorie Gale. Lake Champlain South was digitized by Laura Cadmus and North by Dave Dreher with the assistance of Tom Merryfield of the Agency of Natural Resources' Information Management Section. Mapping in other areas continues under the next grant period beginning August 1, 1996.

Vermont State Parks and Geology

As part of cross-Department cooperation, the State Geologist gave a presentation on Vermont's Geology to Park Naturalists from around the State. The presentation given on the top of Mount Mansfield with views of the Champlain Valley to the west and mountains to the east covered

the geologic history of Vermont. Discussion focused on how to present geology to a public audience increasingly interested in having an educational experience when visiting the State parks.

"Stranger in the Kingdom"

The mineral resources data base in GIS format was used for an unusual request. Vermont's Hollywood on the Highlands came looking for assistance. Kingdom County Productions of St. Johnsbury (soon to film "Stranger in the Kingdom") was looking for quarry locations to shoot a crucial scene for the story. The computer map data base along with information on town, location, quarry name, and owner was queried to assist the production company in finding the shooting location.

Geographic Information System Update

A cooperative agreement is underway between the Lake Champlain Basin Program, Information Management Section of the Agency, and the Vermont Geological Survey to develop data layers, arcviews, a home page, and digital files to create an atlas of the Lake Champlain Basin. Information Management will provide the technical oversight, the Survey will manage the contract work and Lake Champlain Basin Program will provide the funds through New England Interstate Pollution Control Commission as well as the data in a form ready to automate. If all goes well atlas maps will be up on the internet by December 1996.

Missisquoi Bay Hydrodynamic Study

A Project Advisory Committee consisting of local officials and representatives of local concerned groups would like to see data collected to confirm the results of the first phase of the Missisquoi Bay Hydrodynamic study. The first phase used existing information to predict sediment and phosphorous movement with and without the route 78 causeway between Swanton and Alburg. The Agency of Transportation is willing to fund a second study which is to be managed by the Vermont Geological Survey. Applied Sciences Associates of Narragansett Rhode Island will conduct field data collection, hydrodynamic model comparison with field data, model calibration, and a long term model simulation.

Geology and Biology

Laurence R. Becker

As a test of creating derivative products from geologic information in digital format, an ARCVIEW II map of the "Calcareous Rock Units of the Mountain Holly and Ludlow Quadrangles" was constructed by the Vermont Geological Survey. In consultation with the Heritage program of the Department of Fish and Wildlife, the Mount Holly and Ludlow areas were chosen because of access to Green Mountain National Forest land in the southwestern part of the map area. The purpose of providing the information was to locate "rich woods communities" which are associated with calcium-bearing rocks. A color scheme displays the rock units, listed in order from the greatest to least percentage of calcareous material and its chemical availability. Other than serpentine, all other units are not shown except for lithic contacts. The heritage program is now in the possession of the maps and will attempt to visit outcrops, also shown on the map, in order to locate these ecological communities.

Laura Cadmus, under contract to the Survey, created and compiled the theme-based map. Geology mapped by Nicholas Ratcliffe and Norman L. Hatch in 1990, Ratcliffe in 1991, Ratcliffe and Greg Walsh in 1993, assisted by W. Lansing Taylor in 1993, was previously digitized in a cooperative effort between the Vermont Survey and the USGS. The mapping as part of the development of the new state bedrock map displays details on lithology not known before.

WEB SITE DOWNLOAD

Some excerpts from ECOLOGIC GEOLOGICAL ENVIRONMENTS

Laurence R. Becker

http://ourworld.compuserve.com/homepages/shughes_2/ Stuart Hughes of Missoula, MT geologist formerly with the Bureau of Land Management, USDI and Forest Service, USDA.

GEOLOGY IS THE ABIOTIC FRAMEWORK TO THE BIOTIC BODY OF ECOSYSTEMS. GEOLOGIC CONDITIONS INITIATE, ENHANCE, AND PROTECT BIODIVERSITY. LASTLY, GEOLOGY FREQUENTLY PLACES ABSOLUTE LIMITS ON, OR SEVERELY RESTRICTS BIOTIC SPECIES THAT CAN INHABIT A SPECIFIC AREA.

NO COMPONENT OF ECOSYSTEMS IS A RESULT OF ONLY ONE ENVIRONMENTAL FACTOR. GEOLOGY, CLIMATE, AND WATER COUPLED WITH NATURAL PROCESSES OVER TIME PROVIDED THE FOUNDATION OF THE BIOSPHERE. ADDITION OF THE BIOSPHERE COMPONENT TO THE INITIAL ABIOTIC ENVIRONMENT WITH NEW PROCESSES PRODUCED THE NATURAL WORLD WE KNOW.

Geologic materials, structures, chemistry, and processes affect ecosystems in many ways:

- Provides the original source of chemical nutrients;
- Establishes basic climate by tectonic movement of continents into present climatic zones;
- Modifies microclimates with the influence of landforms;
- Geologic processes modifying geologic materials create the great variety of landforms affecting the biosphere;
- Geologic processes create the great variety of natural geologic hazards; earthquakes, volcanoes etc.;
- Controls the groundwater environment;
- Provides the basic abiotic physical environment for the biosphere;
- Greatly influence favorable or unfavorable locations for cities, transportation routes, bridges, dams, and farms/ranches with the type of farm/ranch product produced;
- Determine locations of mineral deposits that produce basic materials, metallic and nonmetallic, that are the foundation of our technology;
- Descriptions of tree and forest habitats, by biologists, frequently make associations with rock types;

- In grasslands, soils derived from sandstone have lower content of organic carbon, nitrogen, and total phosphorus than soils derived from fine-textured materials, such as shale, which have a higher content of clay minerals. Phosphorus contained in organic forms is greater on soils derived from sandstone. These differences can strongly effect local productivity of grasslands
- Dieback of sugar maple is linked to deficiencies of potassium on areas of low-potassium rocks and to deficiencies of magnesium on low-magnesium granites in southeastern Quebec.
- Most rocks have sufficient calcium for plant growth. However, in areas of high precipitation, granite, clean sandstone and other rocks that contain little calcium or release calcium slowly may be deficient in this nutrient needed by plants.
- Excessive nitrogen may lead to loss of mycorrhizal fungi which may exacerbate phosphorus deficiency;
- Death of ducks and cattle feeding in areas of high selenium suggests such interactions might be of widespread significance;
- Most plants have no essential role for sodium, but sodium is an essential element for animals. The wide ratio between sodium of herbivores and that in their foodstuffs suggests sodium might limit mammal populations generally;
- Generally accepted chemical elements required by plants are: the macronutrients nitrogen, oxygen, carbon, hydrogen, phosphorus, potassium, calcium, magnesium, and sulfur and the micronutrients iron, copper, zinc, manganese, boron, chloride, and molybdenum. Deficiencies such as nitrogen and phosphorus commonly limit the productivity of forest ecosystems;
- Continental distributions of vegetation, such as the widespread dominance of conifers in the boreal regions, are likely to be related to the higher nutrient-use efficiency of evergreen vegetation in conditions of limited nutrient turnover in the soil;
- NITROGEN is the most limiting element in soils; PHOSPHORUS is the second most limiting element,; and the third most limiting chemical is POTASSIUM.

SEMINARS, MEETINGS, AND FIELD TRIPS

October 10: New Hampshire Geological Society Annual Meeting. "Glacial Geology of the Northern White Mountains, New Hampshire" Speaker: Woodrow Thompson, Maine Geological Survey. Dinner 7 PM. Call Greg Kirby (603) 271-3624 for details.

October 14: University of Vermont Fall Seminar Series (4 P.M.): "The Plumbing System within an Underplated Sediment Package, Kodiak, Alaska" Sue Brantley, Penn State University.

October 19: Vermont Geological Society Fall Field Trip. See this issue for details.

October 18-20: New York State Geological Association Annual Meeting and Field Trips. "Geology of New York City and Vicinity".

October 27-31: Geological Society of America Annual Meeting, Denver, Colorado.

ABSENTEE BALLOT: 1996 Vermont Geological Society

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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 word "BALLOT" in the lower left hand corner and your name and address in the upper left hand corner to:

Allan Carpenter, Treasurer VGS
Department of Geology
University of Vermont
Burlington, VT 05405

To be counted, this ballot must be received by October 18, 1996.